EFFECTS OF SENSORY PROCESSING INTERVENTION ON DEPRESSION AND ANXIETY AMONG INTERNATIONAL STUDENTS IN A PUBLIC UNIVERSITY

SOMAYEH KHODABAKHSH

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Name of Candidate: SOMAYEH KHODABAKHSH

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EFFECTS OF SENSORY PROCESSING INTERVENTION ON DEPRESSION AND ANXIETY AMONG INTERNATIONAL STUDENTS IN A PUBLIC UNIVERSITY

ABSTRACT

Depression and anxiety are among the most common psychological difficulties in adults. International students also are not immune to these problems. Studying the factors that individuals are facing in their daily life may provide information about the possible causes of these psychological difficulties. One of these factors is individuals' sensory processing pattern, which is the way that they receive, process and respond to sensory stimuli in their daily life. Studies show, extreme patterns of sensory processing pattern affect individual's behavior and quality of life. Considering these facts, the aim of this study was first to explore the relationship between sensory processing patterns, depression, and anxiety, and to explore which of the sensory patterns are the best predictors of depression and anxiety (First Phase of the study). The second aim was investigating the effectiveness of intervention based on sensory processing approach on depression and anxiety (Second Phase of the study). For the First Phase, 354 international postgraduate students were randomly selected and completed the study's questionnaires including Demographic Questionnaire, Adolescent/Adult Sensory Profile®, PROMIS® Depression Item bank, and PROMIS® Anxiety Item bank. For the second phase of the study, one-group repeated-measures design was considered and the participants' depression and anxiety were measured for four times (two pretests, a posttest, and a follow-up). Thirty-eight students who had high level of depression and anxiety in the first phase of the study participated. Four weekly intervention sessions were carried out for them based on their sensory processing patterns. As finding revealed, there is positive significant relationship between three of the sensory

processing patterns and depression, including sensation avoiding (r = .31, p < .001), sensory sensitivity (r = .24, p < .001), and low registration (r = .13, p = .009). There is also positive significant relationship between sensation avoiding (r = .35, p < .001), sensory sensitivity (r = .35, p < .001) and low registration (r = .23, p = .001) and anxiety. The results showed that there is a negative significant relationship between sensation seeking and depression (r = -.12, p = .019), but the relationship between sensation seeking and anxiety is not statistically significant. Multiple regression analysis showed that sensation avoiding (β = .25, p < .05) and sensation seeking (β = .14, p < .05) are significant predictors for depression and sensory avoiding (β = .192, p < .05) and sensory sensitivity (β = .180, p < .05) are significant predictors for anxiety. The results showed that sensory processing interventions had a significant effect on reducing depression, with F(3,111) = 68.92, p < .001 and anxiety, with F(3,111) = 68.33, p < .001) between the time points. In addition, the reduction of anxiety continued even a month after the intervention sessions. The results of this study have implications for different groups of professionals in mental health and education field and for individuals themselves. In conclusion, sensory processing intervention provides sensory awareness to individuals that help them to experience lower levels of psychological difficulties.

KESAN INTERVENSI PEMPROSESAN SENSORI KE ATAS KEMURUNGAN DAN KERISAUAN DALAM KALANGAN PELAJAR ANTARABANGSA DI SEBUAH UNIVERSITI AWAM

ABSTRAK

Kemurungan dan kerisauan adalah antara masalah psikologi yang sering wujud dalam kalangan golongan dewasa. Pelajar antarabangsa juga tidak terkecuali daripada mengalami masalah ini. Makluman tentang punca berlakunya masalah psikologi ini dapat dikaji melalui faktor yang dihadapi oleh individu dalam kehidupan. Salah satu daripada faktornya ialah rangsangan sensori yang diterima oleh individu dari persekitaran; dan cara bagaimana individu menerima, memproses dan memberi gerakbalas terhadap rangsangan digelar corak pemprosesan sensori. Kajian lepas menunjukkan bahawa corak pemprosesan sensori yang ekstrim akan mempengaruhi tingkah laku dan kualiti kehidupan seseorang. Berdasarkan fakta ini, maka kajian ini dijalankan untuk: 1) meneroka hubungan antara corak pemprosesan sensori, kemurungan, dan kerisauan (Fasa Pertama); 2) untuk meneroka keberkesanan intervensi berdasarkan pendekatan pemprosesan sensori sewaktu mengalami kemurungan dan kerisauan dalam kalangan pelajar antarabangsa (Fasa Kedua). Dalam Fasa Pertama, seramai 354 orang pelajar antarabangsa telah dipilih secara rawak dan telah melengkapkan soal selidik Demografi *Adolescent/Adult Sensory Profile*, PROMIS *Depression Item bank* dan PROMIS *Anxiety Item bank*. Fasa Kedua meneroka keberkesanan intervensi pemprosesan sensori ke atas kemurungan dan kerisauan. Untuk fasa ini, kajian reka bentuk-berulang satu-kumpulan telah dijalankan dan secara keseluruhannya, tahap kemurungan dan kerisauan sampel telah diukur sebanyak empat kali (iaitu dua kali ujian pra, sekali ujian pasca dan sekali ujian susulan). Seramai 38 orang sampel yang mengalami tahap kemurungan dan kerisauan yang tinggi dalam Fasa

Pertama telah dipanggil semula untuk mengikuti intervensi di Fasa Kedua. Terdapat sebanyak empat sesi intervensi dijalankan secara mingguan untuk setiap corak pemprosesan sensori (iaitu *Sensation Seeking*, *Sensation Avoiding*, *Sensory Sensitivity*, dan *Low Registration*). Hasil kajian menunjukkan terdapat hubungan signifikan yang positif di antara corak pemprosesan sensori dengan kemurungan, termasuklah *sensation avoiding* (r = .31, p < .001), *sensory sensitivity* (r = .24 p < .001), dan *low registration* (r = .13, p = .009). Dapatan kajian juga menunjukkan wujudnya hubungan signifikan yang positif di antara *sensation avoiding* (r = .35, p < .001), *sensory sensitivity* (r = .35, p < .001) dan *low registration* (r = .23, p = .001) dengan kerisauan. Keputusan kajian menunjukkan terdapat hubungan signifikan yang negatif di antara *sensation seeking* dan kemurungan (r = -.12, p = .019) walaupun tiada hubungan signifikan di antara *sensation seeking* dan kerisauan. Analisis Regresi Berganda menunjukkan *sensation avoiding* (β = .25, p < .05) dan *sensation seeking* (β = .14, p < .05) merupakan peramal signifikan terhadap kemurungan, sementara *sensation avoiding* (β = .192, p < .05) dan *sensory sensitivity* (β = .180, p < .05) merupakan peramal signifikan terhadap kerisauan. Keputusan kajian juga menunjukkan bahawa intervensi pemprosesan sensori mempunyai kesan yang signifikan untuk mengurangkan kemurungan, dengan nilai F(3, 111) = 68.92, p < .001 dan kerisauan dengan nilai F(3, 111) = 68.33, p < .001. Tambahan pula, tahap kerisauan didapati berkurangan secara berterusan selama satu bulan selepas sesi intervensi. Keputusan kajian ini memberi implikasi terhadap pelbagai kumpulan pakar dari kesihatan mental, pendidikan, malahan kepada indidividu perseorangan. Kesimpulannya, intervensi pemprosesan sensori memberi kesedaran sensori kepada individu demi membantu mereka mengalami masalah psikologi pada tahap yang lebih rendah.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

For all individuals, physical, mental, and social health is very important to stand for a good life. As the level of physical, mental, and social health aspects of health increases, it shows more how mental health is vital and important to the overall well-being of individuals, societies, and countries. Indeed, mental health is a concept that can be defined as a state of well-being that enables a person to realize his or her abilities, cope with the normal stresses of life, and to manage them, work productively, and make effective communications with others (WHO, 2004).

Unfortunately, in most parts of the world, psychological problems were not considered as important as physical health. Rather, they had been largely neglected; but nowadays, a considerable number of studies have been done in the field of mental health. Mental health researchers and professionals have significantly determined the importance of different physiological, social, educational, and environmental factors to increase the level of mental health in individuals and societies and to decrease symptoms of psychological problems to improve the well-being of individuals and societies.

Mental health professionals have mentioned the individual's lifestyle as one of the important factors for mental health. More specifically, they have mentioned the importance of unhealthy lifestyle factors in contributing to multiple psychological problems, as well as the importance of healthy lifestyles for treating multiple psychological problems, to foster psychological and social well-being (WHO, 2004). Awareness of factors that can affect mental health offers major advantages for individuals and professionals. This research aimed at studying one of the individual

differences, which is the way people receive process and respond to sensory stimuli in their daily life to investigate another possible factor that may influence a person's mental health.

One of the most important facts that should be considered in daily life is the stimuli in the individual's environment. People express their experiences from the view of their senses. For example, when people want to explain what dream they had last night they define it by explaining using words related to their senses. Dunn (2001) mentions that common sense is a common language between people that makes it possible for them to explain their experiences through that and to make it understandable to each other. Sensory capacities of persons differ from each other and people have their unique sensory properties and patterns. This can be considered as one of the ways that help us to describe them through their individual differences. For example, what sensory experiences they are interested in having or what level of sensory stimuli they can or cannot tolerate. Considering each of the individuals has personal and unique experience of senses, sometimes understanding and perception of one's sensory experience about an event in a similar way is difficult and sometimes impossible for others. We try to place people's sensory experiences in our own sensory framework and describe their experiences as "very similar" or "very different" to our own sensory experiences. People are different in sensory experiences priority. Researchers' findings led to developing the knowledge and understanding about the sensory integration that makes it easier to understand people's sensory experiences. The increase of knowledge in this field shows the relationship between sensory processing and life satisfaction. People do like a translator for their perception of their sensory experiences and by translating their experience, they explain the level of life satisfaction that they experience through their sensation and it makes them understand each other more easily (Dunn, 2001).

Cognitive mechanisms such as attention, organization, memory and problem solving, are working based on information received through sensory systems. Therefore, cognitive function indicates the existence of balance in the neural threshold. There is a natural competition in the brain between the internal information (such as visceral) and external information (such as environmental stimuli like hearing and vision). Cognitive processing will have the best performance when these internal and external information processing are in a balance with each other (Gijsbers Van Wijk & Kolk, 1997, as cited in Dunn, 2001).

There are two different neural mechanisms through which the brain makes the neural balance: stimulation and inhibition. Through these two the brain responses to a certain level of inputs. Hereditary and environmental characteristics affect how the person responds to stimulation or inhibition. Therefore, people have different thresholds of attention, inhibition, and responsiveness to sensory stimulation. Based on the people thresholds, they have preferences in their daily life that have a direct effect on their mood, temperament and the way they prefer to organize their life (Baranek, 1999; Dunn, 1997; Rothbart & Jones, 1999; Zuckerman, 1994, as cited in Dunn, 2001).

The whole nervous system works based on excitation and inhibition. Excitation makes neurons able to respond or activate. Inhibition happens when the probability of responding is reduced or responses are blocked. It is the balance of these two actions that determines when nervous system responses are made; this balance of the neurological continuum is mentioned as modulation. Modulation is the brain's regulation of neural messages by inhibiting or enabling responses, as required in specific situations. When the function of modulation is working completely, the nervous system responds to some stimuli while it is ignoring other stimuli. This action makes individuals able to have an appropriate and right adaptive response to the situation (Brown & Dunn, 2002).

According to Brown and Dunn (2002), in the neuroscience literature, habituation and sensitization are the extreme ends of the neurological threshold continuum. The process, which represents that the nervous system recognized a familiar thing has happened, is called "habituation." At the cellular level, we can say that the neuron has experienced the firing pattern, and by passing the time, this familiar pattern needs no more attention. At a system level, habituation is needed for people to cope with many stimuli available at any moment of the day in the environment. If there was no habituation, people would be distracted repeatedly by each new stimulus, including the sounds in the hall, how their clothing feels, the flowers blowing in the breeze outside, the feel and the sound of saliva while they are swallowing, and so forth. Habituation is essential for humans to make them able to focus their attention on their tasks. If people have a problem with habituation, they may seem agitated, distractible, or inattentive. Their nervous systems keep interrupting continuing performance to direct attention to each new stimulus in their environment (Brown & Dunn, 2002).

The nervous system mechanism that increases the importance of the stimuli is called sensitization. Some stimuli need attention immediately, though they may also be familiar. This is most true when the organism predicts that the stimulus may be linked with any kind of harm or danger. When the nervous system recognizes a stimulus as one that requires sharp and immediate attention, more neurons can be recruited to make the message stronger and then generate a more powerful and immediate response. For example, even though the smell of smoke could be a comparatively small stimulus in the room after bedtime, because of its potential harmfulness, this stimulus could cause sensitization; therefore the person would be aroused (even from sleep) and act immediately to collect more information about what is going on there or get out of danger. People improve and use sensitization through their life experiences so they can

keep concentrating on their environments while involved in school, work, leisure and their other daily life activities.

As people grow and get mature, their nervous systems develop and their experiences develop the nervous system. As part of this procedure, a balance of sensitization and habituation must be developed to support adaptive behavior (for example, suitable reactions to environmental demands). Along the neurological continuum, there are points that make a person able to notice, reply, and become irritated with specific stimuli; these points are named thresholds for those stimuli. There is a range of thresholds that support adaptive behavior and thresholds that are not in the acceptable ranges for efficient performance. People whose thresholds are so high have a tendency to be under-responsive (for example, it needs many stimuli to reach the threshold, as when people do not reply to signals in their environment). People whose thresholds are so low have a tendency to be unreasonably responsive (for example, a reaction will happen due to very little stimuli, as when people are unfocused by every stimulus in their environment) (Brown & Dunn, 2002).

We can know people's behavioral tendencies and interests by their persistence at a task or their attempt to quit being on a task. As with the neurological continuum, there is a range of performance in the middle that provides adaptive behavior. At the ends of the continuum, there are patterns of behavior that are not adaptive and cause unsuccessful performance. At one end of the behavioral continuum, individuals are so ambitious to do some certain customs and procedures that these procedures interfere with the routines of daily life. At the other end of the continuum, they are so disengaged from the circumstances going around them that they miss the experience of daily life routines (Brown & Dunn, 2002).

An individual also must have a motivation to behave in a specific way. People act in a way that they see those certain ways will move them toward their goals, and

there must be some level of interest for them in the act of doing. Individuals have skills, interests, and preferences about the way they spend their time. These choices are not only because of the nervous system operations if not all people would show exactly the same behavior (Brown & Dunn, 2002).

As people have different preferences for sensory stimuli in their environment and they react differently regarding the sensory stimuli happening around them. Having knowledge and insight about these matters can help people to understand how their brain is processing the sensory stimuli and how they react. This knowledge can help individuals, teachers, colleagues, parents, and partners to try to provide the best sort of environments to increase mental health and satisfaction in their lives and to reduce psychological problems and reach their highest performance on their tasks. Therefore, this study aimed at opening the new doors of knowledge in the field of mental health for professionals and individuals based on sensory processing information in daily life.

1.2 Rationale of the Study

It is clear that to lead a good life, good mental health is very important and essential. Mental health is the ability to deal with the challenges in life. It should be considered that mental health is as important and vital as physical health for everyone. Most people usually experience problems that relate to mental health such as anxiety, depression, harassment, stress, learning disability, family problems, and so forth. One of the most noticeable facts these days is that severe mental health problems, and difficulties such as suicide and self-injurious behaviors, have increased among youth. If youth is struggling with a mental health problem, such as depression, anxiety or any other mental health problems, they cannot be successful in their personal and academic life effectively. Different negative consequences, such as social isolation, drugs and

alcohol abuse, unsafe sexual behavior, unemployment, academic failure, suicide attempts and poor health can be a result of mental health problems.

Studies showed that the most common psychological problems that come in many different forms are depression and anxiety (American Psychiatric Association, 2000; Dubovsky & Dubovsky, 2002). These psychological problems can affect individual life in various fields. As these two can affect people performance and efficacy, this research aimed at studying the mental health issues in students as a population who need to have consultancy and needed interventions along their education procedure to pass through their way and reach their goals.

It is believed that one of the essential mental health services is a prevention program that helps to identify mental health problems in people. Such a program can provide education for youth on mental health issues, social skills training, suicide prevention, harassment prevention, improving, and training coping skills, conflict resolution, violence prevention and screening for emotional and behavioral problems. These kinds of prevention programs are very important to increase the individual's standard of life. In students, this also positively affects their personal life and academic achievements. Individuals and societies benefit when mental health problems are identified and prevented earlier.

As researchers in psychology and mental health, fields have proved the interaction of mental and physical health for a long time, doing researches to investigate more figures of physical and psychological aspects of people is really necessary and useful. Improving research in different fields on different approaches can help professionals to generate prevention and therapeutic interventions to have lots of important effects on individual's health such as promoting mental health in society and raising the standard of treatments, providing services for the person with mental health difficulties and supporting their caregivers and family members.

On the other hand, our environmental sensory stimuli are affecting us in our daily life. We are receiving many sensory stimuli in different sorts and levels. In fact, being human is an experience of being set to the sensory events of daily life. If we notice we will easily see how people live their lives with their sensation experiences, we find out that they describe their experiences from a sensory viewpoint. When people want to explain what happened to them or what they have experienced during the past day the use sensory words to describe that experience to other people. In addition, people try to use sensory words when they want to narrate their dreams. Sensation is a common language among human beings that make it easy and possible to talk and explain their experiences in life and make it feasible for them to understand each other and share their experiences (Dunn, 2001).

As Dunn (1987) stated, students are often referred to school psychologists because of their incapability to adapt to conventional classroom settings. The signs of this inability are often understood as hyperactivity, childishness, academic insufficiency, or emotional stress. Their research findings show that when students are learning or keep focused on the challenging material, they show individual learning patterns or preferences for noise level, the amount of light, type of classroom equipment, time of day, the amount of movement, or temperature. Children have a tendency to get greater achievement test results and show better approaches to learning under instructional circumstances that match, rather than a mismatch, their environmental preferences.

Generally, the way that the nervous system receives stimuli differs among individuals. People have different neurological thresholds in different senses. In addition, individuals have different types of behaviors on reacting to the sensory stimuli in their environment. Considering these two concepts, it leads us to Dunn's model of

sensory processing, which help us to understand individual's sensory processing pattern. It is one of the issues that needs more research.

On the other hand, several studies make it clear that living in a foreign country may be challenging for people due to difficulties related to environmental, communication, and cultural differences. It will be much more challenging for international students because they have academic stresses as well. International students face different stresses such as homesickness, financial difficulties, racial discrimination, and adjustment difficulties, relationship with local people, adapting to the new educational system, academics issues, and so many other stressors. In addition to adjusting to a new educational system and a new social environment (Hyun, Quinn, Madon, & Lustig, 2007), they often are struggling with language barriers, immigration difficulties, culture shock, social adjustment, and homesickness (Sümer, Poyrazli, & Grahame, 2008). Students will find themselves in an environment that needs them to receive many sensory inputs from their visual, auditory, taste, smell, and touch senses and have different movement and activity level compare to the time that they were in their home country. This fact may affect their adjustment to the new country. It may cause them psychological difficulties, as this adjustment difficulty is very important for people life satisfactions, happiness, and therefore their psychological health. Because of the constant need for cultural adjustment and for coping with all these stresses, international students are at greater risk for various psychological problems (Misra & Castillo, 2004; Mori, 2000).

Therefore, the rationale behind this study was first to find the relationship between sensory processing patterns, depression, and anxiety, which are the most common psychological problems. The study carried out on postgraduate international students as they may suffer more from depression and anxiety as the immigrant individuals (Barton, 2011; Behrens, 1990; Hyun, Quinn, Madon, & Lustig, 2006; Misra

& Castillo, 2004; Mori, 2000). The postgraduate students were the target of the study as they are in the same structure of the program in the university. I did not involve undergraduate students because their program structure is different than postgraduate students and their academic calendar is also different than postgraduate students. In addition, postgraduate students, in master and Ph.D. program, are in almost same program structure, which is mostly research. They are required to conduct rigorous and fieldwork researches which should be in advanced level. They are also required to have a satisfactory progress in their research and their publications, which can be very stressful for them. Therefore, I targeted the research population as postgraduate students to have more accurate results from the study. Besides that, several studies showed that international students and particularly postgraduate students have a high level of depression and anxiety. In the second part of our study, I explored the possible effect of interventions based on sensory processing approach that may assist adult students to experience less depression and anxiety in their daily life.

1.3 Statement of Problem

Depression and anxiety are among the most common psychological problems in adults. Both are associated with reduced quality of life and poor social functioning. Depression alone affects over 121 million individuals worldwide and is the third leading contributor to the total burden of disease (WHO, 2004). Besides those clinical depressions, everybody experiences depressive symptoms, such as a feeling of sadness, worthlessness, others' unfriendliness, helplessness, loneliness, and so forth, to some degree in everyday life (Muñoz & Ying, 2002).

In the university setting, a national survey of over 20,000 college students from 39 institutions was done in the US in 2007. The survey result showed that over 43% of students reported feeling so depressed that it was difficult to function at least once in the

past 12 months of their study, and 10.3% of students admitted seriously considering suicide within the same period. Moreover, approximately 2% reported that they had actually attempted suicide. In that survey, about 16% of students reported being diagnosed with depression, and of those students, 24% were in therapy for depression and 36% were taking antidepressant medication (American College Health Association, 2008). Gallagher (2008, as cited in Barton, 2011) reported that the proportion of students taking psychiatric medication increased from 9% in 1994 to 26% in 2008 in the US.

Studies have been done in different nations to investigate the prevalence of depression and anxiety in the university student setting (Perveen, 2015). Hunt and Eisenberg's study in 29 colleges and universities in 2007 and 2009 showed that 17% of students had screened positive for depression and 10% had a positive screen for anxiety (Hunt & Eisenberg, 2010). In another study, Bayram and Bilgel reported that there is high rate prevalence of depression, anxiety, and stress in their study, which was done among a group of Turkish students in a university. They reported that 27.1% is the depression prevalence rate, 41.1% of students has anxiety, and 27% has reported stress in their sample of participants. these findings were in line with the some of the other studies finding such as the study that Adewuya, Ola, and Afolabi (2006) done among Nigeria university students, and Ovuga, Boardman, and Wasserman (2006) done in Uganda university students, Tomoda, Mori, Kimura, Takahashi, and Kitamura (2000) in Japan, and Wong, Gao, and Tam (2007) in Hong Kong university students.

In a very recent study, which was done on international students studying in China, the result showed that international students have very difficulties to adjust the new environment. As students are coming from different countries with different culture, they will feel very stressed which is because of the new culture of the host country, which requires them to adjust to it. In their study, they found out that,

acculturative stress is positively associated with depression. It means that their results showed when international students come to the host country, they will experience stress that is related to the adjusting to the new country culture. It will cause them to experience more depression as well (Liu, Chen, Li, Yu, Wang, & Yan, 2016). Moreover, Hsiao (2016) in another study on international students in the United States explored the relationship between the acculturative stress and depression. In that study, the number of 789 international students from seventeen different campuses of the college participated and the result of the study revealed that the acculturative stress and depression are in a significant relationship and acculturative stress is a predictor for depression level in international students in their study (Hsiao, 2016).

In addition, the way that international students cope with their stress in the new country is very important for the level of anxiety that they are experiencing. In a study, Szabo, Ward, and Jose (2016) mentioned that international students are also suffering from anxiety because of different stressors and adjustment problems in the new country. They have explored that how the student coping style can affect their level of anxiety. In addition, they studied the importance and influence of the way that international students passive the stressors in their environment. They found that when international students think that one stressor in their life is uncontrollable and accept it as not being able to change it, such as being far from the family, their anxiety will be less compare to the time that they try to change an uncontrollable stressor in their environment. In addition, their anxiety will be less when they know that there are stressors in their environment that are controllable, which they try to change or control them. However, when they try to change the uncontrollable stressors or events they experience more anxiety (Szabo, Ward, & Jose, 2016).

Postgraduate students are also not immune to depression and anxiety. In a survey study conducted at a large western university, Hyun et al. (2006) reported that

almost half of postgraduate students experienced an emotional or stress-related problem that significantly affected their well-being and/or academic performance during the past year of their study. Untreated mental health problems have been significantly associated with postgraduate students' dropout and poor emotional well-being (Turner & Berry, 2000).

More than ever before, postgraduate students face a range of academic, financial, and personal stressors as they manage the inflexibilities of postgraduate education. The reality is that postgraduate students experience a wide spectrum of psychological problems, which two most common of them are depression and anxiety. (Brandes, 2008, as cited in Barton, 2011). Both of these are highly treatable, but because postgraduate students generally do not recognize their symptoms or seek help, they go undiagnosed and untreated, placing them at greater risk for academic failure, substance abuse and other risky health behaviors, relationship failure and even suicide (National Institutes of Mental Health, 2009).

On the other hand, people who live in a foreign culture may face depression and anxiety and display maladaptive behaviors as an outcome of this acculturative stress (Furukawa, 1997). International students are also experiencing a foreign context in the country of their study. International students face unique sources of stress such as homesickness, culture shock, language barrier, financial difficulties, immigration requirements, racial discrimination, and strenuous academics. In addition to adjusting to a new educational system and a new social environment (Hyun et al., 2007), they often are struggling with language barriers, immigration difficulties, culture shock, social adjustment, and homesickness (Sümer et al., 2008). Because of the constant need for cultural adjustment and for coping with all these stresses, international students are at greater risk for various psychological problems (Misra & Castillo, 2004; Mori, 2000).

That is, international students are a defenseless group who are at risk for depressive symptoms and anxiety.

Several studies have shown that depression and anxiety are prevalent in international students from different nationalities all over the world (Poyrazli, 2015). Han, Han, Luo, Jacobs, and Jean-Baptiste (2013) examined the prevalence of depression and anxiety symptoms in Chinese international students in the US. Their study results showed that 45% of students reported symptoms of depression, and 29% reported symptoms of anxiety. In another study, Eisenberg, Gollust, Golberstein, and Hefner (2007) explored the prevalence of depression and anxiety among students. They found that depression and anxiety are reported in 15.6% of undergraduate students and it was reported 13% for postgraduate students in their participants. In their study, it was reported that in the last four weeks before the study the rate of suicide ideation was 2%. Moreover, it was reported that the most struggling problem in their life is the financial problem which makes them at risk of mental health issues.

In Malaysia, very few studies have been done on depression and anxiety in the university student context that will be mentioned accordingly. In one study, the correlation between depression, anxiety, and stress among Malaysian university students was explored and data analysis showed among all students, 27.5% had moderate, and 9.7% had severe or extremely severe depression; 34% had moderate, and 29% had severe or extremely severe anxiety. The results indicated that both depression and anxiety scores were significantly higher among older students (20 and above) and those born in rural areas in Malaysia (Shamsuddin, Fadzil, Ismail, Shah, Omar, Muhammad, & Mahadevan, 2013).

To estimate the prevalent of depression and anxiety in international students in Malaysia universities, a pilot study was carried out in another public university rather than the actual study selected university (Table 3.4). Data collection was done in

another public university rather than the selected university by permission and through referring from University of Malaya (See Appendix K). In this pilot study, students who are studying in Master or Ph.D. program were the target to be involved as the sample. Considering these postgraduate students are living in Malaysia, as they are residential full-time students. The pilot study also was carried out on international students in another public university rather than the actual study selected university and the results of the pilot study showed that they have significantly higher level of depression and anxiety comparing to normal population average score. According to PROMIS® Depression and Anxiety instruments, the mean score for depression and anxiety in the normal population is 50. As it is reported in Table 3.4 in the pilot study the mean score of depression and anxiety was significantly higher than the average of the normal population according to the instrument. It showed that conducting researches in international people in a country, specifically students that are struggling with study and academic difficulties in a foreign country is one of the important aspects of clinical and educational psychology and counseling researchers.

Although several studies show the prevalence of depression and anxiety among university students and especially among international and postgraduate students, other studies shows that fewer than half of students who are struggling with depression and anxiety have received any mental health services and also international students seek less help from mental health centers (Eisenberg, Golberstein, & Gollust, 2007; Hunt & Eisenberg, 2010).

It is a fact that depression and anxiety can be effectively diagnosed and treated in the primary care setting (Centers for Disease Control & Prevention, 2010). Hence, it is very valuable to help and coach individuals to manage their life effectively and care for their mental health in their own individual and personal life. In this regard, facts that allow professionals only to develop hypotheses about theoretical constructs and do not

link that information to the daily life is of little use to the person and families. Professionals must understand how to use information to ease an individual's efficient performance in everyday life in private and in the community. One of the noticeable facts that students are experiencing in their everyday life is the experience of their senses through their environmental stimuli.

As another fact, individuals have lots of sensory experiences in every moment. People live their lives through their senses. They process sensory information every moment as they receive it through their different senses from the environment. Sensory processing is referred to the ability that our nervous system is receiving and processing the sensory information and then we respond to the sensory stimuli based on the situation demands (Humphry, 2002). Although most people have balanced sensory processing abilities, 15% of the total population has more intense sensory processing patterns (Miller, Anzalone, Lane, Cermak, & Osten, 2007; Simeonsson, Leonardi, Lollar, Bjorck-Akesson, Hollenweger, & Martinuzzi, 2003).

Previous studies showed that there is a positive correlation between different sensory processing patterns and several variables of mental health or personality traits in normal or non-normal populations of children or adults (Schaaf, Cohn, Burke, Dumont, Miller, & Mailloux, 2015; Tomchek, Little, & Dunn, 2015). Findings of previous studies reveal the important role of sensory processing in our daily lives. Studies showed that people in psychological problems categories show different sensory processing patterns than the normal population. Correlation between certain sensory processing patterns and some mental issues and psychological problems raise this need to study this important on most common psychological problems, which are depression and anxiety. Ben-Avi, Almagor, and Engel-Yeger, (2012) stated that extreme sensory processing patterns are strongly related to psychological difficulties and distress.

There are several studies, which have been done in different groups of people and explored sensory processing from different aspects. Researchers have explored sensory processing in participants with different psychological issues such as Obsessive Compulsive Disorder (Dunn & Bennett, 2002; Kusunoki, Sato, Taga, Yoshida, Komori, Narita, & Ozaki, 2000; Rieke & Anderson, 2009), schizophrenia (Braff, 1993; Melle, Friis, Hauff, & Island, 1996; Muntaner, Pulver, McGrath, & Eaton, 1993), anxiety (Kinnealey & Fuiek, 1999), social anxiety (Hofmann & Bitran, 2007; Neal, Edelmann, & Glachan, 2002), avoidant personality disorder (Meyer & Carver, 2000), relationship anxiety (Jerome & Liss, 2005) and alexithymia (Liss, Mailloux, & Erchull, 2008; Nyklíček & Vingerhoets, 2000) and depression (Aron, Aron, & Davies, 2005; Dickens, McGowan, & Dale, 2003; Kimball, Birstler, Bosse, Nelson, & Woods, 2012; Liss et al., 2008; Rotenberg & Cholostoy, 2004).

When people come to another country for any reason, such as continuing their study for students, they need to adjust to the new environment as well. Every country has its own characteristics in terms of weather, humidity level, different kind of foods, different transportation systems, different communication culture, and many other different things which may be in contrast and totally different with the original country of the international students. For example, a student who is coming from a cold weather country may have difficulties to adjust himself to the hot and humid weather of the country that he came to. Another example is the new country food culture, which may be different from the student's home country. For example, a student who has no spicy food in their culture, when they come to a country that the common and local taste of food is very spicy, he will have difficulties to adjust to the new food culture and he will face a lot of problem in the tasting and eating term. In addition, a student who had his personal car in his home country, but when he came to another country for further study, he may not be able to buy a personal car, so he has to use public transportation in

the new country or to walk in short distances. For some people using the public transportation is very difficult because they do not feel comfortable when they are in close distance with other people bodies especially in very crowded public transportation systems. It may irritate them and may cause them distress and anxiety. On the other hand, if a student is not in the type of people who can walk to short distances, they will also be irritated to walk, as they may not have their personal cars in the new country and studentship lifestyle.

By considering that every moment, we are receiving and experiencing different sensory inputs from our environment, students will have difficulties in experiencing the different sensory inputs in the new country. They may receive different sensory inputs such as different food tastes, different smells, different sorts of activities and movement levels, different weather, and humidity, and any other kind of touch sensory inputs. Students will find themselves in an environment that needs them to receive many sensory inputs from their visual, auditory, taste, smell, and touch senses and have different movement and activity level compare to the time that they were in their home country. This fact may affect their adjustment to the new country. It may cause them psychological difficulties, as this adjustment difficulty is very important for people life satisfactions, happiness, and therefore their psychological health.

According to previous studies in the field of sensory processing, it can be realized that many aspects of the individual's life may be affected by the person's sensory processing characteristics. However, most of them only investigated some concepts of sensory processing. It seems that exploring sensory processing pattern and its relationship with depression and anxiety is a gap in the studies. Despite very careful search on literature review and previous studies, a study that had done with a focus on depression and anxiety in a normal population and specifically international students was not found. Therefore, this study aimed at exploring the relationship between

sensory processing patterns and depression and anxiety to fill this gap. Besides that, the lack of studies on the effectiveness of sensory processing interventions on depression and anxiety was obvious and this study specifically aimed to explore this effectiveness to fill this literature and practical gap as well. Considering all these matters, the current study was designed to explore the new possible findings in the field of mental health in an educational setting of postgraduate international students to increase the level of mental health and help individuals and professionals to achieve a better understandings of their sensory processing to improve their abilities and achievements and increase their mental health level by decreasing the depression and anxiety level.

1.4 Purpose of the Study

The purpose of this study was to explore the effectiveness of intervention based on sensory processing approach on reducing the level of depression and anxiety in international postgraduate students. For this aim, the study was designed to explore the relationship between the sensory processing patterns, depression, and anxiety in the first phase and then it studied the effectiveness of sensory processing intervention on these variables in the second phase of the research.

1.5 Research Objectives

1. To investigate the relationship between sensory processing pattern and depression.

2. To investigate the relationship between sensory processing pattern and anxiety.

3. To study the effects of sensory processing intervention on depression.

4. To study the effects of sensory processing intervention on anxiety.

1.6 Research Questions

This study contained four main questions that were answered:

1. Is there any significant relationship between sensory processing pattern and depression?

2. Is there any significant relationship between sensory processing pattern and anxiety?

3. Does sensory processing intervention have significant effects on depression?

4. Does sensory processing intervention have significant effects on anxiety?

1.7 Hypothesis of the Study

The study investigated the effects of interventions based on sensory processing approach on depression and anxiety. The hypothesis of this study was:

1. There is a significant relationship between sensory processing pattern and the level of depression.

2. There is a significant relationship between sensory processing pattern and the level of anxiety.

3. Sensory processing intervention has significant effects on depression.

4. Sensory processing intervention has significant effects on anxiety.

1.8 Significance of the Study

The role of mental health in all aspects of life shows that studying the effect of different variables on mental health and different causes of psychological problems is one of the main aims of many fields of psychology. For this goal, considering new approaches for prevention, intervention, and therapy of psychological problems and promotion of mental health would be necessary and beneficial. Therefore, the objective of this research was investigating the relationship between sensory processing pattern

and depression and anxiety and also exploring the effectiveness of intervention based on sensory processing approach on them. Results of this study helped to open a new way for providing new aspects to promote mental health in the individual and community. In vast perspective, studies on mental health issues would provide and protect well-being in people. In addition, the results had considerable findings to raise a new prevention strategy and effective treatment of depression and anxiety.

Dunn's (1997) Model of Sensory Processing offers a wider set of possible interpretations of an individual's behavior by encouraging professionals to consider neurological and behavioral features of performance as these affect each other. Sensory processing knowledge can provide a link between the information in the temperament literature and information about how an individual's nervous system functions. The neurological threshold and behavioral response/self-regulation continua can help professionals understand a person's performance. However, neither continuum provides sufficient information to understand the complexity of an individual's responses. Following this line of thinking, sensory processing knowledge may provide extra insights about why people show some of their personality features, and how a person's mood may be affected by his or her pattern of sensory processing.

Generally, the significance of this study from the theoretical point of view was a contribution to the development of new intervention in psychotherapy regarding decreasing the level of depression and anxiety affecting many individuals, and also to create new strategies to interfere with and manage mood changes. Individuals, families and all society benefit from the findings of this research in their daily life and as mental health professionals.

1.9 Definition of Terms

For the purpose of the study, some of the related terms need to be clarified. The definitions are as follows:

1.9.1 Sensory Processing Pattern

Miller and Lane (2000) describe sensory processing as "*the way in which the CNS and the peripheral nervous system manage incoming sensory information from the seven peripheral sensory systems. The reception, modulation, integration, and organization of sensory stimuli, including the behavioral responses to sensory input*" (Miller & Lane, 2000, p.2).

Conceptual definition: As a definition for Sensory Processing Pattern, we can refer to Dunn's Model of Sensory Processing, which suggests that the perceptual process can be described by four sensory processing patterns. These sensory processing patterns are emerged based on individuals' differences in their nervous system neurological thresholds, which can be low to a high threshold, and according to the way that the person is responding to stimuli, which can be active to passive behavioral responses. By interaction of these two components in the kind of continuum, four different sensory processing patterns will emerge, which are categorized as sensation seeking, sensation avoiding, sensory sensitivity, and low registration pattern.

Operational definition: In this study, sensory processing pattern was assessed through the Adolescent/Adult Sensory Profile®. This profile defines four categories of sensory processing patterns considering the two concepts of behavioral response/self-regulation and neurological thresholds. These four sensory processing patterns, which are sensation seeking, sensation avoiding, sensory sensitivity, and low registration, can be investigated in six sensory processing categories (taste/smell, movement, visual, touch, activity level, and auditory (Brown & Dunn, 2002).

1.9.1.1 Sensation Seeking

Conceptual definition: According to Brown and Dunn (2002), "*sensory seekers want and enjoy high levels of stimulation. They create extra input for themselves. They are engaging, active and excitable. They place a high innovation, which can be troublesome in cases where they do not persist in useful activities*" (Brown & Dunn, 2002, p.36).

Operational definition: In this study, sensation seeking sensory processing pattern was assessed through the Adolescent/Adult Sensory Profile®. Items that relates to the sensation seeking quadrant measure active behavioral responses and characteristics such as enjoyment, creativity, and the pursuit of sensory stimuli (for example, "I like how feels to get my hair cut", "I do things on the spur of the moment", "I add spice to my food") (Brown & Dunn, 2002).

1.9.1.2 Sensation Avoiding

Conceptual definition: According to Brown and Dunn (2002), "*avoidant people attempt to limit the input. Unfamiliar input is stressful to comprehend, so avoiders regularize their experience through routines and familiar inputs. The threatening nature of change can make sensory avoiders uncooperative, inflexible, and withdrawn*" (Brown & Dunn, 2002, p. 39).

Operational definition: In this study, sensation avoiding sensory processing pattern was assessed through the Adolescent/Adult Sensory Profile®. The items that relate to the sensation avoiding quadrant measure active behavioral responses associated with a low neurological threshold. Sensation avoiding items identify responses and behaviors such as deliberate acts to reduce or prevent exposure to sensory stimuli, and efforts to make exposure more predictable (for example, "I wear gloves or avoid

activities that will make my hands messy", "I only eat familiar foods") (Brown & Dunn, 2002).

1.9.1.3 Sensory Sensitivity

Conceptual definition: According to Brown and Dunn (2002), "*sensitive people become aware of more input and notice more sensory events than others do, and comment on them regularly rather than trying to ward them off. They are distractible and can be complainers*" (Brown & Dunn, 2002, p. 39)

Operational definition: In this study, sensory sensitivity sensory processing pattern was assessed through the Adolescent/Adult Sensory Profile®. The items that correspond to the sensory sensitivity quadrant measure passive behavioral responses associated with a low neurological threshold. Sensory sensitivity items identify responses such as noticing behaviors, distractibility, and discomfort with sensory stimuli (for example, "I stare easily to unexpected or loud noise", "I become frustrated when trying to find something in a crowd drawer or messy room", "I'm afraid of heights") (Brown & Dunn, 2002).

1.9.1.4 Low Registration

Conceptual definition: According to Brown and Dunn (2002), low Registering is one of the sensory processing patterns that are defined with a high neurological threshold and passive self-regulation strategies in response to environmental sensory stimuli. People with low registration sensory pattern might be defined as unresponsive or detached. "*They do not notice environmental signals and need clear commands. Most happenings of daily life are not strong enough to stimulate processing for them, and their passive-reactive behavior makes them unconscious to ongoing activity that is not explicitly engaging them*" (Brown & Dunn, 2002, p. 35).

Operational definition: In this study, low registration sensory processing pattern was assessed through the Adolescent/Adult Sensory Profile®. Items that correspond to the low registration pattern measure passive behavioral responses associated with a high neurological threshold. Low registration items identify behaviors such as missing stimuli or responding slowly (for example, "I don't smell things that other people say they smell", "I don't get jokes as quickly as others" (Brown & Dunn, 2002).

1.9.2 Depression

Conceptual definition: In the Diagnostic and Statistical Manual of Mental Disorders 5th edition (DSM-5), American Psychiatric Association (2013) describes depressed symptoms to consist of but not restricted to the following:

Depressed mood most of the day, nearly every day, as indicated by either subjective report (for example, feels sad or empty) or observation made by others (for example , appears tearful). Markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day (as indicated by either subjective account or observation made by others). Significant weight loss when not dieting or weight gain, or decrease or increase in appetite nearly every day. Insomnia or hypersomnia nearly every day. Psychomotor agitation or retardation nearly every day (observable by others, not merely subjective feelings of restlessness or being slowed down). Fatigue or loss of energy nearly every day. Feelings of worthlessness or excessive or inappropriate guilt nearly every da. Diminished ability to think or concentrate, or indecisiveness, nearly every day. Recurrent thoughts of death, recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide. The symptoms cause clinically significant distress or impairment in social, occupational or other important areas of functioning. The symptoms are not due to the direct physiological effects of a substance or a general medical condition.

Operational definition: In this study, depression was the score that a person gains from the PROMIS® Depression Item Bank.

1.9.3 Anxiety

Conceptual definition: The Diagnostic and Statistical Manual of Mental Disorders 5th edition (DSM-5), American Psychiatric Association (2013) describes general anxiety symptoms to consist of but not restricted to the following:

The presence of excessive anxiety and worry about a variety of topics, events, or activities, excessive worry means worrying even when there is nothing wrong, or in a manner that is disproportionate to the actual risk. This typically involves spending a high percentage of waking hours worrying about something. In adults, the worry can be about job responsibilities or performance, one's own health or the health of family members, financial matters, and other everyday, typical life circumstances. The worry is experienced as very challenging to control. Worry may shift from one topic to another. The anxiety and worry is associated with some physical or cognitive symptoms such as edginess or restlessness, tiring easily; more fatigued than usual, impaired concentration or feeling as though the mind goes blank, irritability (which may or may not be observable to others), increased muscle aches or soreness, difficulty sleeping, sweating, nausea or diarrhea, having difficulty in carrying out daily activities and responsibilities, having problems in relationships, at work, or in other important areas.

Operational definition: In this study, anxiety was the score that an individual gains from the PROMIS® Anxiety Item Bank.

1.9.4 International Student

Conceptual definition: An international student is who has left his or her country, or territory of origin, and moved to another country or territory with the singular objective of studying (OECD Indicators, 2008).

Operational definition: In the present study, students from outside Malaysia were regarded as international students. In addition, postgraduate students were considered as students who were enrolled in one of the Master or Ph.D. Full-time programs in a public university.

1.10 Summary

This chapter provided the information on the research problem and its significance. It also mentioned the importance of mental health and pointed to a new approach that formed the research objectives. In this chapter, a brief definition of variables of this study was described and the framework of the study was shaped. The research investigated the relationship between sensory processing patterns and depression and anxiety and to study the effects of sensory processing interventions on mental health issues with the focus on the level of depression and anxiety. In addition, this study aimed at providing new methods to improve individual's mental health.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter is organized into five sections. The first section describes the theoretical framework of the study, which includes the explanation of Dunn's model of sensory processing and Beck's cognitive model of psychopathology. In the second section, sensory processing concept is discussed. The third section includes mental health literature by focusing on depression and anxiety and their effects on student life and their academic performance. In the fourth section, the conceptual framework is illustrated and the fifth section is a summary of this chapter.

2.2 Related Theories and Models

In this study, two models related to the study variables and structure was reviewed. Dunn's sensory processing model is one of the remarkable models in sensory processing field and Beck' s cognitive model is one of the main theories of psychopathology especially in view of depression and anxiety. In the following two sections, these two models are reviewed.

2.2.1 Dunn's Sensory Processing Model

Findings of previous researches led to a conceptual model, known as Dunn's (1997) model of sensory processing which have received substantial attention in the area of occupational therapy.

Dunn's sensory processing model indicates an interaction between neurological thresholds (for example, an individual's responsivity) and behavioral responses (for example, an individual's responding, or self-regulation strategies) (Dunn, 1997, as cited in Dunn, 2001). Figure 2.1 shows Dunn's Sensory Processing Framework.

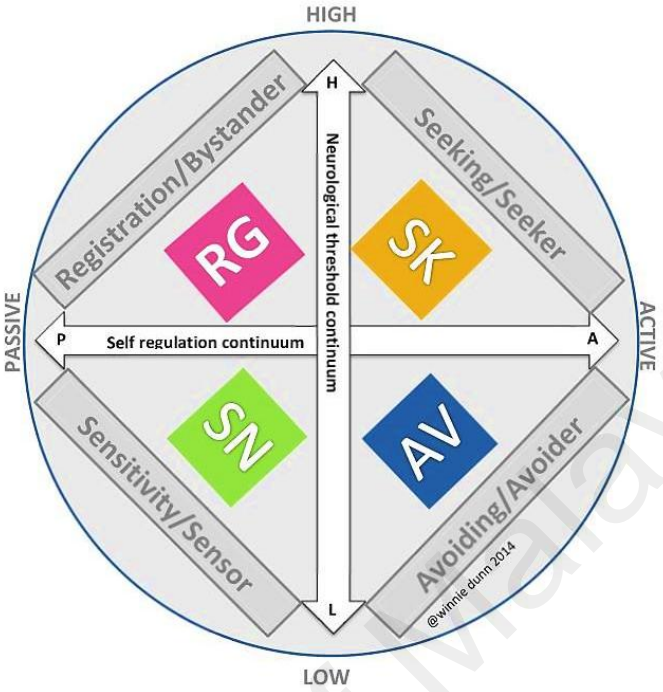

Figure 2.1: Dunn's Sensory Processing Framework
From Dunn (2014) Sensory Profile™ 2. Copyright © 2014 NCS Pearson, Inc. Reproduced with permission. All rights reserved.

The required amount of stimuli for a neuron or neuron system that can make it respond is called neurological threshold. At one end of this continuum, thresholds are very high; this means it needs a high level of stimulus or many stimuli to reach the threshold and fire the neurons. At the other end of this continuum, thresholds are very low; this means it needs a low level of stimulus or very little stimuli to reach the threshold and fire the neurons. Those with higher thresholds would not notice stimuli, while those with lower thresholds would notice many stimuli. At the other end of the behavioral continuum, people use active strategies to counteract their thresholds. Behavioral response/ self-regulation refers to the mode that people make their response strategies related to their thresholds. At one end of this continuum, people use passive strategies that are acting in accordance with a threshold to deal with sensory input. This

means they would have a tendency to respond consistently with their own neural activity. This means they use a method that is against their natural thresholds (for example, avoiding or seeking stimuli) as a way to reach homeostasis. In this model, the neurological thresholds and behavioral response/self-regulation are presented as continua interacting with each other. A method for indicating how a person processes sensory information can be provided by the interaction of the two continua, and provides guidance for intervention planning (Brown & Dunn, 2002).

In Dunn's (1997) model, the behavioral patterns are described as the outcome of interactions between neuroscience and behavioral concepts. The neuroscience concepts are described on the vertical axis as the neurological threshold continuum, which talks about how readily the nervous system becomes aware of the stimuli and responses to them. When the neurological threshold is low the nervous system will receive the stimuli more possible and it will notice the stimuli easier so that the respond to stimuli will happen as well. However, if the neurological threshold is high the nervous system will receive the stimuli by less possibility and it will not notice the stimuli, and as a result, the respond to stimuli will not happen sometimes. In this model, it is also stated that the behavioral concepts of Dunn's (1997) model are categorized on the model's horizontal axis as the behavioral response continuum, which characterizes how individuals perform in reaction to stimuli with respect to their neurological thresholds. In passive responses, no efforts are made to control stimuli, and active responses are defined by involving to the environment to make a change or to control stimuli (Brown & Dunn, 2002).

The interactions between the two continua generate four behavioral designs as an individual's situations transfer along the continua the strength of the behavioral pattern will designate changes. As the positions move nearer to the outmost ends of a behavioral pattern's corresponding continua, the pattern is expressed more strongly, and

vice versa. These behavioral patterns, identified as the sensory processing patterns, are the concepts that describe sensory processing within Dunn's (1997) model and are known as sensation seeking, sensation avoiding, sensory sensitivity, and low registration. It is stated that responding to counteract high thresholds outcomes in sensation seeking, in which stimuli are pleasurable and the person actively generates additional stimuli. In addition, responding to counteract low thresholds outcomes in sensation avoiding, in which stimuli are overwhelming and the person actively bounds contact to them. It is also mentioned that responding in accordance with high thresholds outcomes in low registration, which involves a passive disregard of stimuli, meaning an individual have a tendency to miss and have delayed responses to stimuli. Moreover, responding in accordance to low thresholds outcomes in sensory sensitivity, which involves a passive discomfort with stimuli in which the person has difficulty disregarding stimuli and readily responds to them (Brown & Dunn, 2002).

2.2.1.1 Sensation Seeking

In definition of sensation seeking pattern Dunn (2007) described it as when persons have a sensation seeking sensory processing pattern, they derive pleasure from sensations in everyday life. Although they have high sensory thresholds, their interest in creating sensory experiences for themselves enables them to meet their own high thresholds. In addition, it is easy to determine which sensations are of interest by watching behavior; children interested in the tactile input will touch everything as if they are mapping the world around them with their hands and skin. It is stated that adults who have seeking pattern may want to participate with the children in physical play rather than direct children to play areas, or may be verbal in describing objects and activities to the children (Dunn, 2007, p.86).

2.2.1.2 Sensation Avoiding

Dunn (2007) described sensation avoiding pattern as when persons have sensation avoiding pattern, they tend to withdraw from situations very quickly. This person's thresholds are met very quickly with very little input, and more input can be overwhelming as if the nervous system cannot handle more information. Also, it stated that sensation avoiding is an active self-regulation strategy for controlling input; but since these persons have low sensory thresholds, their withdrawal strategy serves to limit sensory input rather than get more input like a person with sensation seeking would. It is mentioned that withdrawing is an adaptive strategy the person uses to handle too much input. Avoiders may create independent play options with toys that interact with the child, or design more contained areas for play to restrict sound and visible clutter (Dunn, 2007, pp. 86-87).

2.2.1.3 Sensory Sensitivity

Dunn (2007) described sensory sensitivity pattern as when persons have a sensory sensitivity pattern, they tend to be reactive in situations. They have high detection skills (due to low thresholds), and so they notice many things in the environment. Also, rather than withdraw from all these stimuli (as a person who avoids sensation would), persons with sensitivity take the more passive self-regulation approach of staying in situations and reacting to what is happening. It is stated that they may ask other's aide to set up the materials for activities that are messy (for example , finger painting). They may lead these activities but keep a damp cloth handy to keep hands from accumulating the foods (Dunn, 2007, p.87).

2.2.1.4 Low Registration

In definition of low registration pattern Dunn (2007) described that when persons have a low registration pattern of sensory processing, they fail to notice what others notice readily because of their high thresholds. Because they also use passive self-regulation strategies, they miss things, and do nothing to capture additional input. It is stated that they may find themselves in a more chaotic situation because they are not aware of all things going on during activities. They may appear to be more easy-going, but may also miss early signs of distress or danger (Dunn, 2007, p.87).

Dunn hypothesized that there is a relationship between the model of sensory processing and an individual's temperament, where the categories of sensory processing are associated with features reported in the literature. Dunn parallels the quadrant categories of her model of sensory processing with four features. Sensation seeking is allied with positive effect; both of these contracts show an individual's pleasure with sensation and with life events. Sensation avoiding is allied with negative affect; both of these constructs show an individual's need to stay away from occasions and bound experiences. Sensory sensitivity is allied with irritability; both constructs show the individual's attentiveness when noticing stimuli in his or her surroundings. Low registration, finally, is allied with conscientiousness; however, although both of these constructs report the person's ability to stay on task. Low registration reports a lack of noticing and conscientiousness reports suppressing input to complete task performance. Dunn hypothesizes that these two constructs express different features that make an individual able to stay on task (Dunn, 2001).

From a sensory integrative viewpoint, learning happens when the individual receives accurate sensory information, processes it, and uses it to form performances. When people obtain inaccurate or undependable sensory input, then their capability to

process the information and generate responses is disturbed (Dunn, 1997; Dunn, 2001). Atypical sensory processing can take many forms (Ayres, 1972) and must be inferred from observations of people's behavior and performance. Poor sensory processing can be a form of overresponsivity (for example, becoming nervous when someone brushes against him or her [tactile defensiveness]) or lack of responsivity (for example, must be tapped on the shoulder several times to gain his or her attention).

Most children and adults have more moderate reactions to sensory events in ordinary daily life, so sensory processing patterns support their contribution. When reactions are more risky or uncommon, then sensory processing is more likely to interfere with everyday life (Brown & Dunn, 2002). Researchers tested these hypotheses about basic patterns of sensory processing with other age groups and in groups with and without specific disabilities. They found that patterns of sensory processing happen in each age group from infancy to older adulthood, and that people with disabilities including attention-deficit/hyperactivity disorder (ADHD), autism, Asperger syndrome, schizophrenia, and learning and developmental disabilities have both distinctive and more intense patterns of sensory processing than do their peers without disabilities (Brown, Tollefson, Dunn, Cromwell, & Filion, 2001; Dunn & Bennett, 2002; Dunn & Daniels, 2002; Dunn, Myles, & Orr, 2002; McIntosh, Miller, Shyu, & Hagerman, 1999).

2.2.2 Beck's Cognitive Model of Psychopathology

Beck's cognitive model of psychopathology describes how people's perceptions of, or spontaneous thoughts about situations influence their emotional, behavioral (and often physiological) reactions. Individuals' perceptions are often distorted and dysfunctional when they are distressed. They can learn to identify and evaluate their "automatic thoughts" (spontaneously occurring verbal or imaginal cognitions), and to

correct their thinking so that it more closely resembles reality. When they do so, their distress usually decreases, they are able to behave more functionally, and (especially in anxiety cases), their physiological arousal decreases. Individuals also learn to identify and modify their distorted beliefs: their basic understanding of themselves, their worlds, and other people. These distorted beliefs influence their processing of information and give rise to their distorted thoughts. Thus, the cognitive model explains individuals' emotional, physiological, and behavioral responses as mediated by their perceptions of experience, which are influenced by their beliefs and by their characteristic ways of interacting with the world, as well as by the experiences themselves (Beck, 1979).

Initially, this theory only focused on explaining and treating emotional problems, but gradually it broadened to explain psychological problems other than depression (Beck, Rush, Shaw, & Emery, 1979) and anxiety (Beck, Emery, & Greenberg, 1985); such as personality disorders (Beck, Freeman, & Davis, 2006), substance abuse (Beck, Wright, Newman, & Liese, 2011), bipolar disorders (Newman, Leahy, Beck, Reilly-Harrington, & Gyulai, 2002), and schizophrenia (Rector, Stolar, & Grant, 2011).

Beck's cognitive model is based upon three constructs: the cognitive triad, cognitive distortions, (or faulty information processing), and cognitive schemas (Wong, 2011).

Cognitive triad: The negative triad was an important construct in the Beck cognitive model. Beck postulated that the cognitive triad consisted of three negative thinking patterns which included the negative representations of the self, the personal world, and the future in an idiosyncratic negative way (Beck, 2005). First, depressed patients tend to view themselves negatively. They see themselves as defective, deficient, inadequate, undesirable, deprived, or unworthy because of their presumed defects, and tend to reject themselves because of this. They have the propensity to attribute their

unpleasant experiences to mental, physical, or moral defects in themselves and have a tendency to underestimate or criticize themselves because of their defects. Consequently, they believe they lack the attributes or abilities they consider essential to attain happiness and contentment (Beck et al., 1979). These negative thoughts are believed to be pervasive, resulting in the partial exclusion of positive thoughts (Wong, 2011).

The second component of the triad is the depressed persons' tendency to interpret or construe their ongoing experiences in a negative way. Depressed individuals see the world as making very high demands on them and/or presenting them with overwhelming obstacles to achieve their life goals. They consistently interpret their interactions with their environment as representing defeat, deprivation or disparagement, despite other more plausible, alternative interpretations being available (Beck et al., 1979).

The third component consists of a negative view of the future. As depressed persons make long-range projections, they anticipate that their current difficulties or suffering will continue endlessly. They expect incessant hardship, frustration, and deprivation.

According to Beck, depression is caused by the activation and the progressive dominance of these three cognitive patterns. Beck stated that the defenselessness of the depression-prone person is related to the constellation of enduring negative attitudes about himself, about the world, and about his future (Beck, 1979).

Cognitive distortions: Beck (1963, as cited in Wong, 2011) observed that depressed patients distorted reality in a systematic manner and the resultant cognitive distortions maintained their negative cognitions (i.e., faulty information processing). There is a variety of such distorted information processing, such as:

(a) Arbitrary inference (i.e., drawing a specific conclusion in the absence of evidence to support the conclusions or in the face of contradictory evidence);

(b) Selective abstraction (i.e., looking only at a small portion of the available information and basing conclusions on the negative details while ignoring other more salient features of the situation);

(c) Overgeneralization (i.e., drawing general negative prediction of the future on the basis of one fact or isolated incident);

(d) Magnification/minimization (i.e., exaggerating the importance of negative experiences or underemphasizing the significance of positive events);

(e) Personalization (i.e., a tendency to relate external events to oneself and take excessive responsibility for negative events); and

(f) Dichotomous thinking (i.e., a tendency to think or judge oneself, personal experiences, or others in extreme terms).

Beck believed that these cognitive distortions produce and maintain the negative cognitive triad seen in psychopathological states.

Cognitive schemas: Beck's theory goes beyond cognitive distortions or cognitive triad and suggests a "deeper cognitive structures" (i.e., schemas) (Beck, 1964). Schemas are conceptualized as the cognitive structures, which influence a person's perceptions, interpretations, and memories. A particular person will have similar reactions or show consistencies in reacting to similar types of events, although other persons may conceptualize the same situation differently (Beck et al., 1979). Such consistent or repetitive patterns of conceptualization are regarded as the manifestation of cognitive organizations or mental structures, which are termed as "schema" (Beck, 1964).

In Beck's theory, the schemas are related to the underlying cognitive structures of our information-processing system. They constitute the basis and essential structures for screening out, differentiating, and coding the incoming stimuli of an individual and are the basis for molding data into cognitions. They are the basic elements or building blocks for the internal mental representation of meaning (Beck, 1967, as cited in Wong, 2011).

The contents of the schemas are the enduring mental representations of experiences of individual and correspond to their attitudes, goals, values, and conceptions, which are believed categorically and hierarchically organized (Beck et al., 2006). Schemas influence information processing by selecting what information to extract from both internal and external sources and by affecting information encoding as well as the retrieval. It is hypothesized that the activation of schemas in large part determines how we think, feel, and behave (Beck, 1964). When people encounter a particular incident, schemas related to that situation or event will be activated. The activated schema, in turn, will determine how they structure their diverse experiences and directly determine how they perceive, interpret and respond to such a situation. Cognitive triad and cognitive distortions, which have been described in previous sections, are conceptualized as the cognitive products that resulting from the operation of the cognitive schemas.

2.2.2.1 Schema and Psychopathology

The emotional problems are characterized by schemas (Beck, 2005). As described before, the cognitive model specifies that the processing of external or internal stimuli or events is biased and therefore systematically distorted the individual's interpretation of his or her experiences, leading to cognitive distortions and thus maladaptive emotions and behaviors. These distorted interpretations are based

upon dysfunctional beliefs integrated into relatively enduring cognitive structures or schemas. When these dysfunctional schemas are generated by external events, they will bias the information processing and create maladaptive emotions and behaviors typical of psychopathological states (Beck, 2005).

Schema and Depression: According to Beck cognitive model, the core difference between different psychological problems are related to the maladaptive schemas involved. In depression, Beck postulates that depressed individuals have the outstanding "depressogenic schemas" which involve negative beliefs and attitudes toward the self, the world, and the future, as well as losses within the personal domains. The schemas involving themes of personal deficiency, self-blame, failure, worthlessness, loss, and negative expectations dominated (Beck et al., 1979). A specific situation or stressor, such as an event relating to losses or failure may activate the depressive schemas in vulnerable individuals. Once activated, the person's conceptualizations of specific situations are distorted to fit those dysfunctional schemas. Depressed individuals will bias toward selectively processing negative self-referent information, minimizing or ignoring positive materials, and making appraisals about personally relevant events as negative, pervasive, global, and absolutistic (Beck & Clark, 1988). This leads to automatic negative thoughts and eventual depression. In other words, schemas are serving as the underlying predispositions that guide the selectively biased information processing, thereby maintaining the characteristic negative views of the self, the world, and the future.

Schema and Anxiety: In anxiety, cognitive schemas related to danger and harm to personal well-being is believed to play a critical role in its etiology and maintenance. At the core of anxiety is a sense of defenselessness. Anxious individuals mentally focus on threat as a result of the activation of the maladaptive cognitive schemas, leading them to indiscriminately interpret any environmental events as being dangerous (Beck

et al., 1985). In addition, they have a tendency to magnify the amount of risk and degree of harm in fearful situations because of activation of fear schemas.

2.2.3 Theoretical Framework

According to Beck's cognitive model of psychopathology, people mental health is affected by their cognitive triad, cognitive distortions, and cognitive schemas (Wong, 2011). People process information based on these components and faulty processing is caused by faulty cognitive errors. In other words, when the processing of external or internal stimuli or events is biased and distorted, the individual's interpretation of his or her experiences, leading to maladaptive emotions and behaviors. These distorted interpretations are based upon dysfunctional beliefs integrated into schemas. When these dysfunctional schemas are generated by external events, they will bias the information processing and create maladaptive emotions and behaviors (Beck, 2005).

On the other hand, the person's perceptions about himself, the world, and future, is also another component they may affect psychological difficulties such as depression and anxiety. People who tend to view themselves negatively are experiencing more depression. They believe they lack the abilities they consider necessary to attain happiness (Beck et al., 1979). Therefore, these negative thoughts are believed to be inescapable, resulting in the barring of positive thoughts (Wong, 2011). In addition, people who experience a higher level of depression see the world as making very high demands on them and/or presenting them with overwhelming difficulties to accomplish their life goals. In summary, individual's cognitive schemas and perceptions affect the way that their process information and may lead them to psychological difficulties such as depression and anxiety (Beck et al., 1979).

According to previous studies in the field of sensory processing, it can be realized that many aspects of the individual's life may be affected by the person's

sensory processing characteristics. The way that individuals receive, process and react to sensory inputs from their environments may affect the level of depression and anxiety that they experience. As Ben-Avi, Almagor and Engel-Yeger (2012) stated extreme sensory processing patterns are strongly related to psychological difficulties and distress. In this research, I focused on Dunn's sensory processing model to explain sensory processing. This model indicates an interaction between neurological thresholds (high and low neurological thresholds) and behavioral responses (active and passive responses). From the interaction of these components, four sensory processing patterns emerge. These sensory processing patterns are the concepts that describe sensory processing within Dunn's (1997) model and are known as sensation seeking, sensation avoiding, sensory sensitivity, and low registration. Each of these patterns includes either low or high neurological thresholds and active or passive behavioral responses to sensory stimuli.

The researcher believes that the way that individual process all receiving information based on their cognitive schemas and their sensory processing patterns are influencing the level of depression and anxiety that they experience. They may interpret their sensory experiences negatively and it may cause their cognitive distortions and trial. Being aware of the sensory processing patterns is as effective as awareness about cognitive distortions and the treatment may benefit both concepts.

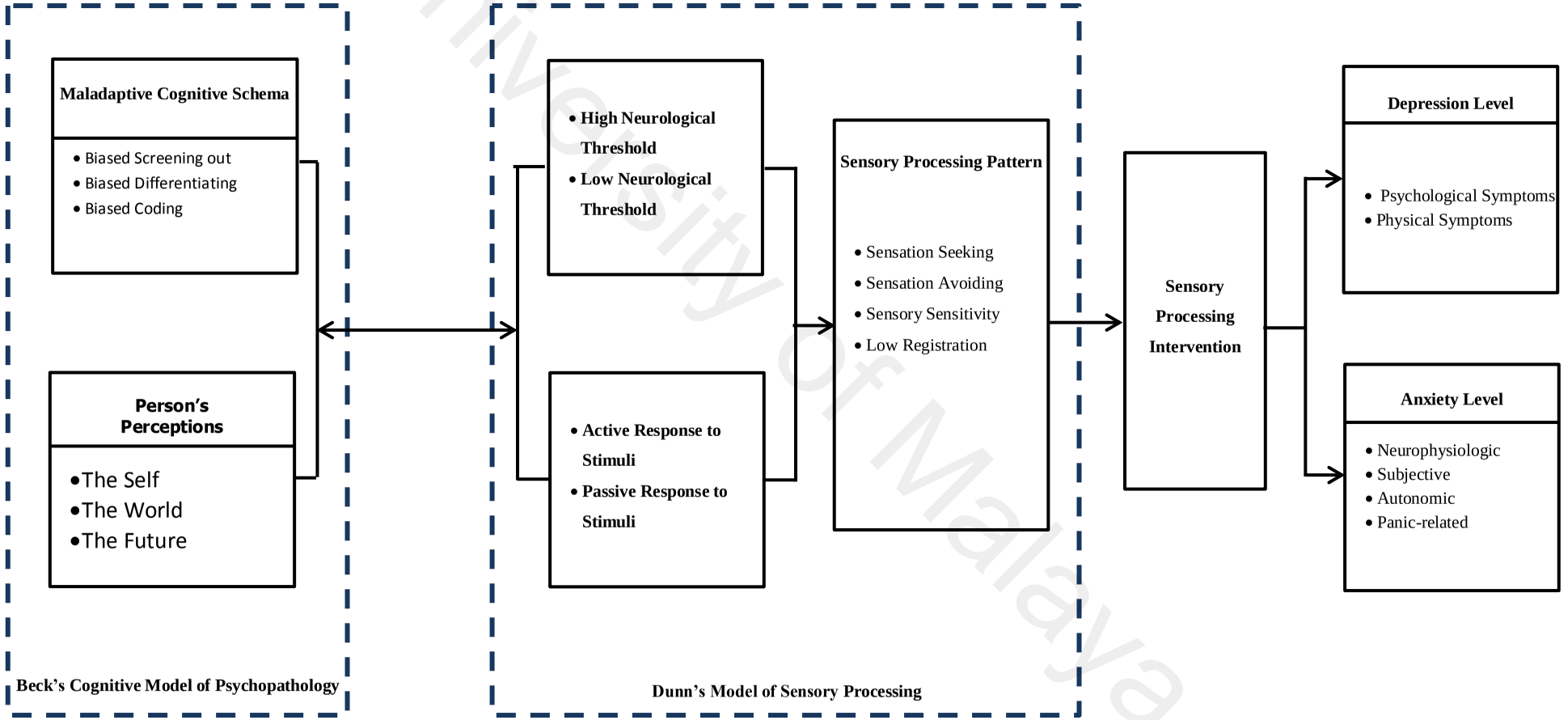

Figure 2.2: Theoretical Framework of the Study

2.3 Sensory Processing

Sensory processing has been defined as the method in which the nervous system receives, organizes, and understands sensory stimuli from inside and outside the body to make a person able to decide how to react to environmental demands (Miller & Lane, 2000). People may process sensory information in different ways (Aron & Aron, 1997; Dunn, 2001). Sensory processing has wide-ranging effects on health, and as an integral factor it can be considerable in the practice of many therapists and a principal source for creating research and theory in many fields of psychology.

2.3.1 Sensory Processing in Everyday Life

People have specific methods of replying to sensory events in daily life. Sensory input from the surroundings and from the body itself make available data that the brain uses to understand experiences and shape responses. People's responses to sensory experiences in daily life are spread along a bell curve continuum, with most people reacting moderately to sensory experiences, and a few people reacting intensely (Brown & Dunn, 2002). The bell curve distribution is based on the mean and standard deviation of a population, and places about 2% to 4% of people more than 2 standard deviations from the mean. This means that of 100 people, about 2 to 4 of them will significantly react more intensely to sensory experiences than do their peers (Portney & Watkins, 2000). Few people in the typical population are responding more intensely to sensory experiences in daily life. A considerable matter is how the sensory processing pattern affects the individual's ability to participate in routine life. For example, a person may have intense responses to sounds that make it problematic to focus on a conversation when other activities are going on in the home. This person may make a quiet home space for conversation, so the person can exit from the bustle of the kitchen or play zones. Family members will know and they will learn that this quiet space is exactly the

place that they need to go to if they want to have this family member's attention and consideration. When people realize their own and their children's, partners and friend's sensory processing patterns, they can make life routines that are consistent with sensory processing patterns, and in that way, they can support successful contribution. As a perspective of mental health services, it is important to link sensory processing patterns to everyday life behaviors as part of assessment; also, the relationship between sensory processing and everyday life can advise intervention possibilities (Dunn, 2001).

Cox found that occupational therapists identified relationships between the functional tasks of eating lunch at school and sensory processing. The study provided the initial evidence of a link between sensory processing and functional performance in common environments (Cox, 1996, as cited in Brown & Dunn, 2002).

In another viewpoint, the Ecology of Human Performance (EHP) framework emphasizes an individual's context as a critical variable in his or her ability to perform functional tasks in life. This framework suggests that professionals must broaden the focus of data gathering to include not only information about the person's skills, but also to identify clearly what the person wants or needs to do (for example, functional performance needs) and where the person needs to perform the task (for example, the context). Washing one's hands before a meal, for example, presents one set of performance challenges when the individual does this at home in the bathroom sink and another when he or she does it at the sink in the restroom of a restaurant where many others also are washing (Dunn, Brown, & McGuigan, 1994, as cited in Brown & Dunn, 2002).

2.3.2 Neuroscience and Sensory Processing

The literature on sensory integrative theory and neuroscience indicates a very good source of evidence as we evaluate, design, and offer intervention for individuals.

Neuroscience literature highlights modulation of input as a critical function of the central nervous system (CNS) (Brown & Dunn, 2002). The literature on sensory integration emphasizes strongly on processing sensory information as a key factor in the ability to show adaptive responses (Ayres, 1972; Bundy, Lane, & Murray, 2002).

From a neuroscience viewpoint, modulation of input is very important to the Central Nervous System functioning. Modulation is the capability of the CNS to screen and adjust information for generating suitable responses (Dunn, 1997, as cited in Dunn, 2001). Modulation happens by regulating habituation and sensitization responses. Habituation happens when the CNS identifies stimuli; in this case, the CNS reduces transmission among the cells. Sensitization happens when the CNS recognizes sensations as potentially harmful or unfamiliar and creates a heightened response. Both of these actions are considered as part of learning in the CNS (Brown & Dunn, 2002).

Habituation, sensitization, and modulation are neurophysiological processes that make the neurological threshold vary along the continuum. Habituation creates higher thresholds, and sensitization creates lower thresholds. Modulation administrates a continuous interchange that occurs between habituation and sensitization, which describes the threshold's location along the continuum (for example, if modulation lets habituation to overcome, higher thresholds result; if it lets sensitization to overcome, lower thresholds result) (Brown & Dunn, 2002).

Another feature of modulation is the progress of thresholds for reacting. CNS thresholds are formed by personal life experiences and genetic endowment (Kandel Schwartz, & Jessell, 2000). People with unusual sensory processing may show extremely high thresholds (for example, hyposensitivity or habituation) or extremely low thresholds (for example, hypersensitivity or sensitization). When thresholds are too high, people take an extended time to react, respond less readily to stimuli and seem lethargic. When thresholds are very low, people respond very rapidly and repeatedly to

stimuli, and seem to be excessively excitable or hyperactive (Dunn, 1997, as cited in Dunn, 2001).

Research has shown that adults with very low sensory thresholds have experienced difficulties in coping strategies in their daily lives. The individuals in their study described that once they understood the stimuli that bothered them, they could form actions to decrease these inputs, and therefore function more productively (Kinnealey, Oliver, & Wilbarger, 1995).

2.3.3 Previous Researches about Sensory Processing

2.3.3.1 Studies about Sensory Processing and Daily Life Issues

Reviewing the previous studies related to sensory processing showed that the concept of sensory processing as a general factor was explored in the normal population and also in the different groups of people with psychological difficulties. One of the earlier studies was done by Carton, Morand, Bungenera, and Jouvant (1995). They studied sensation seeking as a psychological trait and its relationship with other personality traits by using the Minnesota Multiphasic Personality Inventory. Their study showed that there is a relationship between the high level of sensation seeking and the mania scale of MMPI. According to Diagnostic and Statistical Manual of mental disorders (American Psychiatric Association, 2013), mania episode symptoms is opposite the depressive episode symptoms. Therefore, it can be said that when a person has a high level of sensation seeking he will have a high score in mania and lower score in depression scale. In their study, the participants were hospitalized depressed subjects who were in diagnosed by psychiatrists as major depression. There is a possibility to have different findings if the study was done in a normal population. According to Aron and Aron (1997), sensitive sensory processing pattern may be one of the main factors in

individual's personality development and emotionality and introversion are possible behavioral appearances of sensitive sensory processing pattern (Aron & Aron, 1997).

Researchers studying fatigue also have reported relationships to sensory processing primarily related to balancing internal and external information processing. Researchers have reported evidence of fatigue when persons are experiencing low internal and external information processing demands (Gijsbers van Wijk & Kolk, 1997, as cited in Dunn, 2001) and when persons have both very high and very low external demands (Bensing, Hulsman, & Schreurs, 1999; Rijk, Schreurs, & Bensing, 1999). For example, Rijk et al. (1999) explored the complaints of fatigue on 777 general-practice patients. they wanted to find out whether the complaint of fatigue is related to too much as well as too little external stimulation. In their study fatigue was high when the person experienced an overload of external stimuli and decreased when the person found their external stimulation attractive. In both of the studies (Rijk et al. 1999; Gijsbers van Wijk & Kolk, 1997, as cited in Dunn, 2001) they recommended changes in daily life to reestablish the balance between internal and external information processing demands to reduce fatigue and therefore improve performance and satisfaction.

In another study, Raine, Reynolds, Venables, and Mednick (2002) state that sensory seeking pattern may not be a maladaptive pattern of sensory processing, and stimulation seeking can be known as a potentially adaptive trait. Seeking behavior, for example, may be related to improved intelligence in children. In addition, sensory seeking may be adaptive because seekers apply control over their surroundings, both in regard to sensory stimulation and in emotional relationships.

A research was conducted to study the relationships between sensory processing patterns, adult attachment, and coping. The results of the study show that sensory sensitivity relates to relationship anxiety, and this relationship is partially mediated by a coping style of focusing on and venting emotions. Sensory avoidance is related to

relationship avoidance that supported the hypothesis that individuals who avoid sensory stimulation also have a tendency to be avoidant in romantic relationships. Their study also shows that low registration correlates with both relationship anxiety and relationship avoidance and the relationship between low registration and relationship anxiety are partially mediated by a coping style of denial and disengagement. In their study, they stated that sensory seeking relates to secure attachment (Jerome & Liss, 2005). In their study, they also considered the four patterns of sensory processing based on Dunn's model of sensory processing. Their study can be more related to the current study from the point that they have also conducted their research on the normal population of adults and they used Adolescent/Adult Sensory Profile® to explore the four sensory processing patterns in the participants.

Benham (2006) examined the relationship between a person's sensory processing sensitivity, self-perceived stress, and physical symptom reports. In their study, the sensory processing sensitivity was measured by using the Highly Sensitive Person (HSP) scale. The HSP is a measure of sensory-processing sensitivity, which is conceptualized as involving both high levels of sensitivity to subtle stimuli and being easily over-aroused by external stimuli. The results of the study indicated that sensory processing sensitivity is positively interrelated with levels of stress and symptoms of ill-health. In their study, they only explored one of the sensory processing patterns,which is sensory sensitivity and the relationship between other sensory patterns and stress and ill-health were not investigated.

One of the other studies done based on Dunn's sensory processing approach was a research that aimed at investigating the relationship between sensory processing patterns and parenting stress, and a preliminary evaluation of the effectiveness of reducing their stress. The study showed the importance and the role of sensory processing, especially mothers sensory processing in their parenting stress. They used

Dunn's sensory processing model to indicate the four sensory patterns in their participates by using infant sensory profile as their subjects were infants below 6-month-old. The result of their study showed that the training based on Dunn's sensory processing model reduced the parenting stress (Adlparvar, 2009). Although they have done the training for parents based on the infant's sensory pattern and the appropriate interventions for infants, but it is very important to know that considering sensory processing strategies training is beneficial to reduce the parental anxiety as well. It can show the impact of interventions and training as general.

In a study, Engel-Yeger and Dunn (2011a) explored the relationship between adults' sensory processing patterns and their affect on daily life. The result of their study showed that negative affect correlated positively with sensory sensitivity, sensation avoiding, and low registration. In addition, positive affect correlated with sensation seeking. In their study, they defined negative effect as a general dimension of subjective distress and unpleasurable engagement that subsumes a variety of aversive mood states, including anger, contempt, disgust, guilt, fear, and nervousness. They also defined positive effect as it reflects the extent to which a person feels enthusiastic, active, and alert. High positive affect is a state of high energy, full concentration, and pleasurable engagement.

Kimball et al. (2012) explored the relationships between sensory processing patterns, personality traits, and body mass index. In their study, fifty female in the age range of 19 to 59 were recruited. The results showed a positive correlation between depression and sensory sensitivity, low registration, and sensation avoiding. Sensory sensitivity and sensation avoiding had a positive correlation with hypochondriasis. In addition, there was a positive correlation between sensation avoiding and thinking disorder. Sensation seeking had positive correlation only with impulse expression (Kimball et al., 2012). In their study, they used the Adolescent/Adult Sensory Profile®

to explore the participants sensory processing patterns. Their study was consistent with the earlier study (Carton et al.,1995) which found the positive relationship between sensation seeking and mania. According to Diagnostic and Statistical Manual of mental disorders (American Psychiatric Association, 2013) impulsivity is one of the criteria for mania.

In a study, the correlation between quality of sleep in adults and their sensory processing pattern was explored. In their study, Engel-Yeger and Shochat (2012) recruited 185 participants, aged 21 to 60, and used the Adolescent/Adult Sensory Profile® to explore the participant's sensory patterns. Their study showed that sleep quality significantly correlated with sensory processing patterns characterized by hypersensitivity. These patterns were manifested in specific modalities (tactile, visual, and auditory), which significantly predicted sleep quality. They mentioned that their research finding may assist in implementing the optimal intervention based on the person's specific needs and contribute to performance and quality of life (Engel-Yeger & Shochat, 2012).

From the viewpoint of the quality of life, Engel-Yeger and Shochat (2012), explored the sleep quality as one of the factors in the quality of life. After their research, another study was conducted to explore another important factor of quality of life which is marital satisfaction. Adlparvar, Mazaheri, Sadeghi, Adlparvar, and Khodabakhsh, (2013) explored the relationship between sensory processing patterns base on Dunn's sensory processing approach and marital satisfaction. The findings of the study indicate that there is positive significant relationship between couple's sensation seeking and marital satisfaction of themselves or their partners, and there is negative significant relationship between couple's low registration, sensation avoiding and sensory sensitivity patterns and marital satisfaction of themselves or their partners (Adlparvar et al., 2013).

According to the mentioned studies, the sensory processing pattern is one of the factors that have a relationship with different issues in individual's life and personality. In another study, it was mentioned that individual differences in sensory processing through multiple tasks and senses drive individual differences in cognitive processing in adults. They mentioned that people, regardless of age, have different sensory threshold sensitivity which causes them to be different in cognitive processing (Humes, 2014). These findings were supported by a later study (Humes, 2015), which found that sensory processing is correlated with cognitive processing. They mentioned that sensory processing, but not age, was significantly correlated with cognitive processing when analyses were restricted to just the young and middle-aged adults (Humes, 2015).

2.3.3.2 Studies about Sensory Processing and Psychological Problems

Several studies have shown that sensory processing sensitivity is accompanying with negative clinical outcomes. Braff (1993) mentioned that individuals with schizophrenia process information in a different way that those without schizophrenia. The studies that mainly use laboratory measures, suggest that people with schizophrenia have a tendency to be more sensitive to stimuli (Braff, 1993).

Brown et al. (2001) conducted a research to compare the quadrant scores of people with schizophrenia and bipolar disorder, as well as mentally healthy persons. Results of the study showed that individuals with schizophrenia when compared with mentally healthy persons, have higher scores in sensation avoiding, sensory sensitivity, and low registration, and lower scores in sensation seeking in the study. People with bipolar disorder were included as a psychiatric condition control group. Persons with schizophrenia did not have higher mean on sensory sensitivity than the mentally healthy group. A possible explanation for these findings was the variability of schizophrenia. The standard deviation of the sensory sensitivity scores for the schizophrenia group was

10.5, while it was 5.4 for the mentally healthy group. The result of their study shows that some individuals in the schizophrenia group have high scores on sensory sensitivity and they experience sensory sensitivity, while other individuals have low scores, resulting in a mean that is similar to that of the mentally healthy group. Another possible reason that little difference was found between the mentally healthy and the schizophrenia groups on sensory sensitivity could be that both groups display similar frequencies of sensitivity behaviors when presented with bothersome stimuli. (Brown et al., 2001).

Moreover, it has been found to be correlated to avoidant personality disorder (Meyer & Carver, 2000), social phobia (Neal et al., 2002), anxiety and depression (Liss, Timmel, Baxley, & Killingsworth, 2005), agoraphobic avoidance (Hofmann & Bitran, 2007), stress (Khodabakhsh, 2012), fears of intimacy (Engel-Yeger, Palgy-Levin, & Lev-Wiesel, 2015), perceived stress and ill health (Benham, 2006), and Williams Syndrome (Janes, Riby, & Rodgers, 2014). In addition, sensory processing sensitivity may interrelate with other variables and produce negative clinical outcomes. For example, Aron et al. (2005) stated that highly sensitive people were more likely to experience depression and anxiety but just in the context of poor parental settings. Also, in another research (Liss et al., 2005), the findings showed that low levels of parental care were correlated to depression among highly sensitive people in particular. However, sensory processing sensitivity has also been presented to produce negative clinical outcomes directly. For example, sensory processing sensitivity correlated to anxiety without interacting with parental variables (Liss et al., 2005).

Hofmann and Bitran (2007) studied sensory processing sensitivity among people with social anxiety. The results of their study indicated that sensory processing sensitivity is separate from social anxiety, but it is highly related to agoraphobic avoidance and harm avoidance. People with a generalized subtype of social anxiety

disorder informed higher levels of sensory processing sensitivity than people with a non-generalized subtype. These initial results suggest that sensory processing sensitivity is exclusively related with the generalized subtype of social anxiety disorder.

Engel-Yeger and Dunn (2011b) studied the relationship between sensory processing and anxiety level in a sample of healthy adults. The result of their study showed that men and women that have hypersensitivity or low registration sensory processing pattern show elevated state anxiety and trait anxiety. In low registration pattern, men with lower score showed more elevated trait anxiety comparing to women. The study indicated that sensation avoiding was a significant predictor for the state of anxiety.

Avoidant personality disorder, which can be conceptualized as extreme anxiety in relationships and subsequent avoidance of relationships, has been specifically related to sensory processing sensitivity (Meyer & Carver, 2000). Social phobia, also relating an avoidance of social relationships, has also been recently linked to sensory processing sensitivity (Neal et al., 2002). Moreover, Pfeiffer and Kinnealey (2003) found that there is a significant correlation between anxiety and sensory defensiveness. It means that people have more sensory defensiveness, their anxiety is also high. In addition, Ahadi and Basharpoor (2010) investigated the relationship between sensory processing sensitivity, personality dimensions, and mental health. The results of their study indicated that low sensory threshold was positively related to neuroticism, physical problems, anxiety, and mental health.

Few studies were done to study sensory processing in people with Obsessive Compulsive Disorder. The American Psychiatric Association (2000) defined OCD in the Diagnostic and Statistical Manual of Mental Disorders (DSM–IV–TR) as an anxiety disorder described by obsessions and compulsions severe enough to be very time-consuming, to cause noticeable distress, or to cause significant damage in different parts

of life functioning. Anxiety is an attached experience in OCD in DSM-5 as well (American Psychiatric Association, 2013). Outcomes from the OCD literature indicate that adults with OCD express sensory sensitivity and sensation avoiding to a higher degree than the common people. Sensory sensitivity causes difficulty ignoring and readily replying to stimuli (Brown & Dunn, 2002). Studies examining neuropsychological tasks calling for the inhibition of behavioral responses to stimuli have found that adults with OCD fail to prevent their responses more often than do adults from the general population (Martinot et al., 1990). In addition, Studies investigating the electrophysiological measures that signify the efficiency of the inhibitory processes involved in those types of tasks found that adults with OCD exhibited less efficient processes than adults from the general population (Herrmann, Jacob, Unterecker, & Fallgatter, 2003). Sensation avoiding includes engaging with the environment to restrict contact with stimuli (Brown & Dunn, 2002).

In addition, studies examining temperament indicated that adults with OCD showed stronger tendencies than the general population to carry out constant structure and routine on the environment. These are strategies related to sensation avoiding that rise the predictability of the sensory environment, letting individuals limit their exposure to their environmental stimuli (Kusunoki et al., 2000).

Reviewing of functional neuroimaging studies defined how contact with stimuli in adults with OCD could leave them with psychic distress (Baxter, 1990). The review of studies about sensory processing in people with OCD defined how subcortical areas in the brain are dis-functioning to direct attention to sensations. Attention is continuously directed to the intrusive sensations unless cortical areas are activated to consciously suppress them. The increasing neuronal work of this cortical activation is what then produces psychic distress (Brown & Dunn, 2002).

In line with the OCD literature, results of studies on sensation avoiding and sensory sensitivity indicated that adults with OCD express these two sensory processing patterns to a stronger degree than the general population, which makes it tempting to have the conclusion that OCD was accountable for these outcomes. However, comorbid anxiety disorders and attention deficit disorders were also prevalent in the OCD group, both of which involve conditions that may be associated with lower neurological thresholds and greater expressions of sensation avoiding or sensory sensitivity (Dunn & Bennett, 2002; Neal et al., 2002).

In addition to previous studies on OCD and sensory processing, other studies showed that other confounding variables even more prevalent within the OCD groups were comorbid depressive disorders and antidepressant medication use. Depressive disorders may be associated with higher expressions of low registration and lower expressions of sensation seeking (Dickens et al., 2003; Rotenberg & Cholostoy, 2004), and certain antidepressant medications may be associated with either increasing or lowering neurological thresholds (Quednow et al., 2004). Perhaps the OCD group's comorbid depressive disorders and use of antidepressant medication were accountable for the outcomes for sensation seeking and low registration, and perhaps these variables associated with the variables promoting sensation avoiding and sensory sensitivity (for example, OCD comorbid attention deficit disorders and anxiety) to somehow reduce their effects.

Moreover, in another study, sensory processing pattern in OCD group and normal population group were compared. In the results of the study, the OCD group's mean scores were higher for sensory sensitivity, sensation avoiding and low registration, and mean scores of their group was lower for sensation seeking (Rieke & Anderson, 2009).

In a study the relationships between the three factors of sensory processing sensitivity and autism symptoms, alexithymia, anxiety, and depression was explored. The ease of excitation (EOE) and low sensory threshold (LST) factors was related to depression and anxiety. EOE and LST seem to characterize the negative features of sensory processing. On the other hand, Aesthetic Sensitivity (AES) was related to anxiety but not depression. People who report a rich, complex inner life, appreciation for the arts and music and a high level of conscientiousness (all items signified by the AES factor) may spend more time thinking about their mental and physical actions, which may lead to anxiety. Remarkably, EOE interrelated with difficulty identifying feelings in predicting anxiety. It makes sense that a combination of being simply excited by external stimuli and not being capable of recognizing one's feelings properly would lead to anxiety. For persons who are highly sensitive, the ability to properly recognize feelings may serve as a protective factor against facing the anxiety that is frequently found to be related to sensory processing sensitivity. On the other hand, this interaction was not found for depression. Both being simply excited and having difficulty recognizing feelings were correlated with depression, but they did not work in interaction (Liss et al., 2008).

Moreover, Liss et al. (2008) stated that alexithymia is another construct that may be related to sensory processing sensitivity, the incapability to recognize, define, and understand emotional statuses. Alexithymia has been consistently correlated with depression (Zackheim, 2007) and seems to have a role in social anxiety (Evren & Evren, 2007). Physiologically, people high in alexithymia are hypersensitive to pain and touch (Nyklíček & Vingerhoets, 2000) and have an increased brain reaction to audio stimuli (Schäfer, Schneider, Tress, & Franz, 2007). On the other hand, people who are high in alexithymia do not certainly self-report increased stress in reply to physiological excitement. Alexithymia, particularly difficulty recognizing feelings, may work in

contact with sensory processing sensitivity to make negative clinical results. The mixture of being simply excited by sensory information or having a low threshold and having the disability to recognize those feelings properly may put a person at risk for depression or anxiety (Liss et al., 2008).

Different studies suggest that for individuals with autism sensory processing is very different and in some cases can be overwhelming. For people who have significant sensory processing differences, the world may be observed very differently, and in some cases, sensory experiences could be different to the point of being altered or confusing (Dunn, 2001). Boyd and Show (2010) studied autism in the classroom and their study results regarding the students' attention showed that when children have difficulties in sensory processing in the auditory sense, they may face some difficulties in splitting and filtering out different noises in the classroom and it can influence their ability to pay attention to classroom discussions.

In addition, Bontempo (2009) studied the role of sensory processing patterns in the workplace for adults with autism who had high ability. The study uncovered significant differences between sensory processing patterns of high-ability adults with autism and without autism. The score of sensation avoiding, low registration and sensory sensitivity in adults with autism was higher that scores of adults without autism. In addition, it was reported that roughly 50% of high-ability adults with autism were employed but most of them did not have experience of sustained employment. In the study, adults reported that they use the coping strategies of avoidance, prevention, or replacement for overcoming the sensations that make them feel overwhelmed in their workplace. In another study results showed that adolescents with autism preferred kinds of sensory inputs that they can predict and control. They showed that unpredicted and uncontrollable sensations are not pleasant for them in their life (Ashburner, Bennett, Rodger, & Ziviani, 2013).

The nature or the occurrence of abnormal sensory responses has been ignored in some research because it is not included in the diagnostic criteria for autism or pervasive developmental disorder (PDD) (Tadevosyan-Leyfer et al., 2003). Some studies have stated significant differences in both low and high thresholds on autism as compared to control groups (Baranek, Foster, & Berkson, 1997; Kern et al., 2006). A better understanding of sensory processing in autism, comprising threshold differences, will provide us a better understanding of what persons with autism experience every day and how their sensory experience may form their performance and their reaction to their world. Brockevelt, Nissen, Schweinle, Kurtz, and Larson (2013) also reported significant differences in sensory processing patterns of children with autism and typically developed children in ages 3 to 9 in their study. Zobel-Lachiusa (2013) reported a correlation between sensory processing difficulties and eating problem behaviors in children with autism. Even from the neurological point of view of sensory processing in autism, it is stated that the severity of symptoms in children and adolescents with autism were predicted by a combination of factors of visual and auditory sensory processing (Brandwein, 2014).

Some researchers have proposed that there is a relation between the sensory processing problems possessed by a person with autism and the difficulties in handling daily life (Ludlow et al., 2014). Tomchek, Huebner, and Dunn (2014) mentioned six factors describing patterns of sensory processing in children with autism spectrum including low energy/weak, tactile and movement sensitivity, taste/smell sensitivity, auditory and visual sensitivity, sensory seeking/distractibility, and hypo-responsivity. In addition, the result of a study showed that the most affected sensory modalities in the autism spectrum group of children are hearing and touch (Fernández-Andrés, Pastor-Cerezuela, Sanz-Cervera, & Tárraga-Mínguez, 2015). Besides that, another study on the sensory processing of people with autism showed that people with autism have more

atypical sensory patterns compared to normal participants. in their study, it was reported that the atypical sensory patterns in participants with autism are mostly in an auditory sense (Stewart et al. 2016).

Uljarevic, Prior, and Leekam (2014) studied sensory processing patterns of mothers of children with autism spectrum disorder by using the Adolescent/Adult Sensory Profile®. They stated that sensory processing disorder is highly prevalent in children with autism and on the other hand, parents of these children are suffering from affective disorders. In their study fifty mothers of ASD children and adolescents completed the sensory profile and their scores were compared with Adolescent/Adult Sensory Profile® norm scores. The result of their study shows that 44% of mothers had two or more standard deviation above the mean at least in one of the quadrants in sensory profile. In addition, 98% of mothers had at least one standard deviation above the normative mean. Their study shows the evidence of atypical sensory processing in parents of children with autism and it recommended more studies regarding parents' sensory processing pattern as an influence for autism spectrum disorder in children.

Pfeiffer, Brusilovskiy, Bauer, and Salzer (2014) stated that people with serious mental illnesses have different sensory processing patterns compared to the general population. They mentioned that assessment of sensory processing patterns in adults with serious mental illnesses can inform sensory-based interventions that might result in greater community participation and other recovery outcomes based on their research findings. In their study, they explore the relationship between different sensory processing patterns and community participation and recovery-oriented outcomes. Their research foundlings showed that extreme sensory processing patterns are in a significant relationship between the participation and recovery among people who had serious mental illnesses. In their study, participants that had a higher level of sensory sensitivity and also low registration sensory pattern, showed less participation compare to people

who show theses sensory processing patterns in the level of similar to the normal population in typical ranges. In their study, the results showed that participants who reported higher level in their sensory sensitivity pattern, according to their sensory profile, reported reduced quality of life as well (Pfeiffer et al., 2014).

In a study on sensory processing sensitivity and depression and anxiety, Brindle, Moulding, Bakker, and Nedeljkovic (2015) suggested that one path for the relationship found between processing sensitivity and depression is the tendency of individuals with sensory processing sensitivity to be exposed to negative, aversive internal states. Their study suggested that experiencing sensitivity to both internal and external stimuli leads to a level of learned helplessness regarding repeatedly and unavoidably experiencing negative internal states, which could potentially impact more widely on the person's use of emotional regulation strategies. Moreover, in another study, which explored the relationship between the temperament trait of sensory processing sensitivity and emotional reactivity, the findings showed that people with higher sensory sensitivity respond more strongly to emotional stimuli (Jagiellowicz, Aron, & Aron, 2016).

2.3.4 Studies about Sensory Processing Interventions

There are studies about providing sensory processing related intervention in natural contexts for children (for example , Dunst & Bruder, 2002; Dunst et al., 2001; Dunst, Hamby, Trivette, Raab, & Bruder, 2000; Dunst & Raab, 2004) but not much study on adults. There is further evidence to propose that applying sensory processing conceptions in natural settings is important (Baranek, 2002; Schneck, 2001). Baranek (2002) studied about sensory integrative interventions for children with autism and stated that for supporting generalization of abilities, interventions are required to be part of the natural setting.

Sensory experiences are surrounded with everyday life practices. In the sensory processing patterns paradigm, therapists consult with families and teachers to recognize the procedures that are stimulating and then make plans to regulate the routines so that the children can get their sensory processing desires encountered while continuing to contribute in their life activities. In this way, the emphasis of intervention remains on the children's life activities and the sensory processing information is a tool for creating operative strategies within the life routines. In addition, families can implement these strategies as part of their family routines with children who have intense sensory responses and who are not part of the early intervention service system (Brown & Dunn, 2002).

The negative effects of sensory processing patterns of adaptive behavior may go with everyday circumstances that include sensory stimuli and may interrupt everyday routines. Physical and mental status, abilities and capabilities, self-identity, or friendships and relationships thus have a negative impact on a child's functioning. These negative influences are likely to become more apparent once a child goes in daycare or school surroundings; and may, in turn, influence the child's level of participation (Ahn, Miller, Milberger, & McIntosh, 2004).

Dunn, Cox, Foster, Mische-Lawson, and Tanquary (2012) studied the effectiveness of an occupational therapy contextual intervention on increasing participation of children to activity setting in their life routines and to develop competence in parents in a group of children with autism and twenty parents. They applied their study in a repeated-measures design and their study results show that the level of children participation to their family daily life routines was significantly increased and parents felt more competent after interventions.

Hanft and Pilkington (2000) studied the profits of providing services in natural surroundings and proposed methods for creating effective therapy services in children

everyday life. Some studies emphasize applying sensory processing knowledge to expand children's attentive behavior in the everyday life context of school. Touch pressure (for example, strong touch on the surface of the skin) and proprioception (for example, sense of where joints and muscles are in space) are sensations that provide organized comforting input to the nervous system (Kandel et al., 2000). Using weighted vests as an application of touch pressure and proprioception, researchers offered that providing a strong amount of this input would help children to have more attention and organize themselves for work at school. In a research done in preschool children with prevalent developmental disabilities and another study of school-aged children with ADHD, investigators tried the use of weighted vests to expand children's attention, reducing their negative behaviors and raise their work efficiency (Fertel-Daly, Bedell, & Hinojosa, 2001; VandenBerg, 2001). They used a reversal design to display that children did better when they use the weighted vests. Schilling, Washington, Billingsley, and Deitz (2003), in another study, applied a similar model. In their research, they wanted children to sit on a ball chair as they completed seatwork in the classroom. The ball chair provides nonstop feedback for children's postural control systems because the ball adjusts with the children as they make even small adjustments in their bodies while working. An old-style chair does not run this feedback, so children can have a tendency to move their bodies more to activate themselves. Even though they were targeting children with ADHD, all the children in the classroom interchangeably (for 3 weeks each) sat on regular chairs and ball chairs (12 weeks total). The children with ADHD enhanced in their seating behavior and work efficiency, and the other children and the teacher specified they felt more creative when using the ball chairs. However, in a recent study on adolescents in a mental health hospital, the relationship between effects of yoga and the patients' sensory processing patterns, results showed that yoga sessions improved patient pulse and self-reported distress

ratings regardless of gender or sensory profile levels (Re, McConnell, Reidinger, Schweit, & Hendron, 2014).

In a pilot study on fifteen adults, Pfeiffer and Kinnealey (2003) explored the relationship between sensory defensiveness and anxiety, as well as the impact of a sensory integration treatment protocol on normal adults. The treatment protocol that they implemented in their study was included providing insight into sensory defensiveness, regular and daily sensory input, and engagement in activities of choice providing primarily proprioceptive, vestibular and tactile sensory input. Their study participants engaged in an individualized self-treatment protocol for one month. Their findings supported the use of a sensory treatment protocol to decrease sensory defensiveness and secondary anxiety.

Besides that, according to the published research, the studies of sensory processing interventions are very rare in adults. As it can be very beneficial to know how sensory processing interventions affect adults, conducting studies in this field is very essential. When therapists want to design, establish, and restore intervention strategies based on the sensory processing approach, Information from the Adult Sensory Profile is helpful. For example, someone with limited sensation avoiding behaviors could work on developing skills to adopt avoidance strategies, while someone with high sensitivity could receive graded exposure to a particular sensation in order to increase tolerance and habituation. On the other hand, sensory processing preferences are stable traits not easily changed. Dunn's model of sensory processing suggests that interventions that adapt the environment or find the best person-environment matches should be adopted in most situations. Intervention planning takes into account the ways in which the environment can be adapted or matched with an individual's sensory processing preferences. In using the Adolescent/Adult Sensory Profile®, which is a measure of sensory processing in daily life, it is essential to consider the unique

contextual features of the individual. This means taking into account the physical, social, cultural, and temporal characteristics of the daily life environments of people, as well as their wants and needs. For example, suppose two individuals obtain the same score on the Adolescent/Adult Sensory Profile®; however, one of them is a white, 26-year-old suburban divorced mother of two young children. She has very limited financial resources and no family support in the area, but she has two close friends who live in her neighborhood. She needs assistance with parenting skills. The other person is a recently retired 67-year-old African-American male living in a rural community. He is having trouble adjusting to retirement. Finding meaningful activity; given the difference in the environments and needs of these two people, the expert's interpretation and intervention planning for each should vary greatly (Brown & Dunn, 2002).

In Dunn's model of sensory processing, for each pattern of sensory processing, some interventions strategies are offered. Considering the individual's sensory processing patterns, specialists can design the best strategies for the best interventions. For the high or low level in each of sensory processing pattern intervention strategies are designed by considering different types of sensory stimuli.

For example in a person with a high score in low registration pattern, it is suggested to ask others to slow down, speak up, or repeat as needed as an intervention strategy in the auditory sense. For this person it is suggested to shop in stores with clearly marked areas or helpful workers, to write something down or talk it through with another person before executing a task in the activity level. For a person with a low score in low registration it is suggested to use non-scented products, or select comforting, low-intensity smells in the sense of smell; or to wear loose-fitting clothes as an intervention in the sense of touch (Brown & Dunn, 2002).

Different interventions are designed for a person with sensation seeking pattern. For example, if a person has a high score in this pattern it is suggested to look for group

activities and find opportunities for self-expression in the activity level. In the sense of smell and taste it is suggested to chew gum, eat mints when feeling restless, use scented soaps and cleaners in persons with low score in sensation seeking in the visual sense it is suggested to consider trying new colors in the clothes, living space, or workspace, to visit a museum or in meetings, classes, offices and other places find places to sit where they can easily change their visual perspective; or to go for a massage as an intervention for touch sense (Brown & Dunn, 2002).

For people with a high score in sensory sensitivity in movement, it is suggested to use rocking chairs for calming effects. In the sense of touch, it is suggested to wear clothes that are heavy or weighted or to wrap themselves in a blanket while sleeping. In the auditory sense, it is useful to participate in the discussion and answer questions to help maintain focus in group settings. In a person with a low score in sensory sensitivity in smell and taste sense it is suggested to add herbs or species to foods and try to distinguish the tastes when eating them; or add color or variation to written information as an intervention in the visual sense (Brown & Dunn, 2002).

As an example for interventions for the high score in sensation avoiding it can be suggested the person to establish routines that are comforting and supportive and to find quite places for time alone in the activity level. In the movement strategies, it is suggested the person place the most frequently used objects at arm level in cabinets and drawers to avoid having to bend over. In people with low level in sensation avoiding it is suggested to take breaks or rest during movement activities, or as an intervention in the auditory sense it is suggested to think about sounds that they typically hear in their work area to determine whether their productivity would be enhanced if some stimuli were reduced or eliminated (Brown & Dunn, 2002).

2.4 Mental Health

In the history of psychology, mental illness was referred to a condition that individuals suffer from the most severe symptoms and have extreme difficulties living with others. Since the beginning of the twentieth century, experts have tried to understand the reasons for mental illnesses; a few studies have focused on the certainty of the treatment. Moreover, a few studies focused on the impact of mental illness on the individuals' society. Changes have occurred in the study of mental illness. The evaluation and the diagnosis of neuropsychological conditions have faced significant changes due to technology and modern medicine. The result indicates that a greater number of the population suffers from psychological problems than previously suspected. These revelations have discovered that individuals with mental illness are living in society and try to continue to function as usual. In recent times, instead of only diagnosing the illness, great interest has emerged in treating the diseases. Moreover, psychologists are interested in assessing the effect of mental illness on society (Jones, 2008).

On the other hand, a condition of positive mental health makes the individuals understand and aware of their ability to deal with life difficulties and these individuals can influence their community for necessary changes. This is an optimal situation and every well-being society that enhances social relation, capital and provides a safe and secure condition in the environment (WHO, 2001).

Fortunately, in recent years, experts in sociology, biology, and neurology have contributed substantial insights in introducing the contributing factors in the development of curing mental diseases and eradicating poor mental health. Some improvement has already taken place in identifying these contributing factors. These factors either psychological, biological, social or risk and protective factors interact with individuals throughout their life since fetal life. Some of these factors expose the person

to an illness; therefore, they can be prevented or can potentially be measured. However, the alarming condition of high morbidity of people diagnosed with mental illnesses and the possible psychological problems that also suffer from physical ailments as a complication of mental illness calls for nationwide interventions in health policies. These potential programs can indicate the common determinants and problematic factors at early stages of emergence for the populations at multiple risks (WHO, 2004).

Another issue to consider is the enormous cost of mental care. Given its long-lasting and wide-ranging nature, it is estimated that about 3% and 4% gross national product is the cost of mental health (WHO, 2005). However, it is not easily measurable due to the high percentage of unemployment because of mental illnesses that affect families and caregivers. Other costly elements of society are the increased levels of crime and decreased public safety, and high incidence of premature death. Some negative impacts of discrimination and lost opportunity also influencing individuals and families that have not been taken into consideration (WHO, 2004).

It is obvious that public health would be jeopardized by a lack of positive mental health. Many cases of discrimination and marginalization are the results of direct and indirect consequences of psychological problems that cause a reduction in social relation and negative economic effects. In this case, treatment alone cannot guarantee positive mental health. According to publications by the World Health Organization (WHO, 2004), the promotion of mental health and prevention in mental illness can effectively lead to improvements in the health conditions as well as in the social and economic situation. Therefore, national policy concerning mental health should promote mental health and take consideration in the prevention, treatment, and rehabilitation of psychological problems. Furthermore, implementing any policy needs public support and consideration. Because an issue of mental or public health concerns everyone as well as public policy. It is a shared responsibility to take action for mental health and

economic gains; in order to do so, the support from all the organizations, public or private sectors is needed. Therefore, identifying and mobilizing this support and making coherence with other sectors, such as labor, education, and criminal justice is a great challenge.

It is an old saying "Prevention is better than cure!" thus; it is essential that countries and communities regard certain issues to reduce the burdens caused by the psychological problems to the health, social and economic status. And this could not be achieved unless the policy maker, legislation, decision-makers and other resource contribute their thoughts and energy, at the level of policy formulation, to the overall health care system (WHO, 2004).

2.4.1 Intervention and Prevention in Mental Health

Almost a century of prevention policy concerning mental health has been recorded. As early as the beginning of the 20th century, the innovative ideas on approaches to prevent behavior as well as mental problems in every age group have been under study. Schools, public clinics and most of the elementary health care units have partly implemented these experimental strategies. However, it was not until the 1980s that the reliable outcomes from that so-called scientific preventions and controlled studies revealed their effectiveness. Over the past 25 years, all the scientific fields that have something in common with mental health rapidly have developed to share the campaign of prevention. This movement was beneficial for scientists to have their knowledge increased on the risk factors of mental health. In this Summary Report, the rapidly increasing number of scientific publications was indicated by the evidence to prove the claim. Moreover, there are bodies of experts who can meticulously evaluate the condition, for instance: the prevention research centers, academic centers, program officials, and experts who have introduced proofs have indicated that programs similar

to these approaches can affect the risk factors and decrease the probability of occurrence of some kinds of mental diseases and to promote mental health (WHO, 2004)

Therefore, a great number of preventive interventions and approaches are ready for implementation. The criteria of these policies have been proven to decrease some negative factors, scaffold the positive factors, and reduce the prevalence of some symptoms and disability of some psychiatric psychological problems. The interventions are also targeted to promote positive mental health, physical health and can be beneficial to social and economic conditions. As far as prevention is concerned, these multi-dimensions of approaches surely are cost-effective. If these strategies are the evidence of proper implementation, we can conclude that the programs targeted at mental health promotion and psychological problems prevention are effective and lead to a range of positive health, social and economic outcomes (WHO, 2004)

Such programs include interventions that involve infants and preschoolers; school-age children; victims of child negligence, behavioral misconducts; whoever use illegal drugs in their lifetime; parental support; and whoever suffers from some form of psychological problems such as depression, anxiety, and stress. For instance, lack of family commitment, child abuse, and having parents who suffer from psychological problems at a young age can cause anxiety and depression later in life and even pass it to the next generations. Of course, in the presence of family warmth and attachment along with social support, this trend would decline. Moreover, positive parental commitment, experience, knowledge, and years of schooling have proven to improve children's mental well-being from the time of pregnancy. Thus, children's educational attainment and mental health are depending on the aforementioned factors that they can enjoy life without anxiety and depression in later life.

Furthermore, early interventions unrelated to health policy including transport, schooling, urbanization, nutrition and labor, could also lead to high rate of

improvements in the mental health sector. The quantity and quality of other elements could strongly impact on mental health factors, such as the amount of earnings, the networks of friends and peers, and self-esteem. Other factors that cause mental health problems and increase the risk of depression and anxiety can be named as follows: feeling unstable in their work, or being between jobs and the quality of jobs. Among these strategies for intervention, we can name the educational and vocational opportunities for high-risk individuals. Those strategies that can help them to get their jobs back or find better jobs and receive better payment would reduce the incidence of depression and mental strain among individuals. The government bodies responsible for the economy can play a role in reducing problems in business by improving policies at the workplace; sharing jobs, having to work shorter hours are just some instances. Also, the government should be held responsible for implementing those interventions that seriously consider the life of people, children and families to have secure healthy starts. In addition, the government must show responsibility to implement strategies in schools to enhance and promote healthy mental state for all age groups (WHO, 2005). To widen the domain of improved preventive programs requires extra efforts. Moreover, the issues of cost and strengthening the evidence-based factors in different situations require a constant evaluation of interventions and approaches and using different implementation methods. Moreover, they should transform effective strategies and other criteria into frameworks for a program that have positive impacts. Such guidelines should be introduced and implemented systematically (WHO, 2004).

In order to assess the state of mental health, there are certain approaches. One of the well-known approaches to identify and assess mental health is biopsychosocial (BPS). This approach consequently provides an effective framework for therapists to use in their assessment practices. The comprehensive and systemic nature of human development and functioning also are greatly emphasized in the BPS approach. In this

approach, the attention is on the biological, psychological, and socio-cultural factors to understand human psychology. As early as 1917, the BPS approach to mental health practice was introduced as part of the psychiatry curriculum at Johns Hopkins School of Medicine (Meyer, 1917). However, it was first fully articulated by Engel (1977) in reaction to the prevailing biomedical approach that dominated medicine at that time. Engel (1977) stated that by limiting their views to the only biological causes of patients' illnesses, physicians restricted their ability to treat patients thoroughly and effectively. Since the biomedical approach is likely to exclude important psychological and sociocultural factors, then it is unlikely to consider the number of causal impacts on psychological problems; thus, they favor the perspective of a single cause of each illness. This approach does not concentrate just on integrative approaches to psychotherapy. However, from this perspective, the process of development, functioning, personality, psychopathology, psychotherapy and other behavioral changes concerning human psychology, can only be understood by taking a comprehensive, integrative BPS approach. The BPS approach can be used in the treatment process, from the time of assessment then planning, implementation and evaluating of outcomes of treatment (Meyer & Melchert, 2011).

It is, however, the outcomes that can clearly distinguish between health promotion and disease prevention. On one hand, improving mental health means to promote effective mental health through improving psychological state that can be obtained through safe and secure housing condition and enhanced competence and resilience of an individual. On the other hand, reducing the symptoms of mental illnesses is the attempt of prevention approaches which consequently targeting to eradicate psychological problems. In order to do so, it utilizes promoting certain strategies to achieve these objectives. The proponents of promoting mental health believe that when the goal is improving effective mental health in the society; then,

there may be decreases in the cases of mental illnesses. Although mental health and mental illness are two completely different phenomena and they can be two ends of a continuum but these two are interrelated issues of health and even overlapping each other and can demonstrate a single concept of mental health (Detels et al., 2002, as cited in WHO, 2004).

The approach to preventing and promote either one can be determined together. The activities promoting mental health and preventing mental illness both investigate the factors for either alternative, so they require understanding them as separate and yet interrelated concepts (WHO, 2004). The main objectives in psychological problems prevention policy should be targeted at preventing or reducing incidence, and recurrence of psychological problems, decreasing the duration of symptoms and reducing the impact of illness in the affected person, their families, and the society as well (Marazek & Haggerty, 1994, as cited in WHO, 2004).

2.4.2 Mental Health Factors

Some approaches to prevent mental illnesses target the determinant factors that cause the psychological problem considering the time of problem manifestation. In this case, the degree of severity and length of time for some major physical problem are the risk factors that are linked to a high possibility of onset. On the other hand, the condition that makes people strong against the problematic factors refers to the environment. Thus, accordingly, these factors can change and alter the individual's reaction to certain environmental risk that makes them suffer unfavorable results (Rutter, 1985).

Most of the time, some similarities can be seen between the mentally ill person's reaction and a healthy person to deal with the problem; naming the degree of self-esteem, positive thinking, ability to solve problem and skill in socialization, how to

control their stress and feeling of superiority. Therefore, there is a wide overlap in the measures taken to prevent mental illness and promote mental health. Some studies show a link between risk factors and development of psychological problems (Ingram & Price, 2009). They categorize the factors as genetics, personal, economic environmental and social. Sometimes, it can be a combination of many factors together. Moreover, the presence of a risky condition and lack of protective measures can determine the chance of gradually changing from a totally healthy person to a person vulnerable to the psychological problem and then completely show a psychological problem. Therefore, approaches should be taken to prevent mental illness, stop the problematic factors, and promote positive factors all through the life of an individual. Hence, individual factors contributing to the development of psychological problems have a positive relationship with the protective factors that can be expected when they are diagnosed correctly. The process of diagnosing, it should take into consideration that the influence of certain factors on a mental problem is greater than the prevention of the problem and to detect the factors correctly and on its right time (WHO, 2004).

2.4.2.1 Environmental and Socioeconomic Causes of Mental Health

Some issues such as poverty, war, and inequity are considered major environmental and socioeconomic causes related to mental health. For example, living conditions of poor people deprive them of basic privileges of life such as freedom of choice and action and safe and secure life condition the rich take for granted. These underprivileged populations often have not enough food to eat, no proper housing to live in and lack basic education and are not physically healthy. Their condition deprives them of valued living condition (Bank, 2000). Some instances of having poor socioeconomic conditions can affect mental health that increases the probability of depression, low self-confidence and in general poor mental health (Jané-Llopis, Barry,

Hosman, & Patel, 2005). The increased levels of psychiatric symptomatology and psychiatric morbidity have been considered to have links with living in the outskirt of cities, experiencing conflicts between two countries and any form of apartheid and not enjoying a stable economy. According to Musisi, Mollica, and Weiss (2005) post-traumatic stress disorders (PTSD), are war-related psychiatric trauma along with anxiety, depression, and alcohol abuse. Moreover, children from families who experienced such trauma may become psychologically vulnerable.

2.4.2.2 Individual and Family Related Determinants of Mental Health

Studies have shown that some biological factors such as genetics, and some individual factors such as cognitive and interpersonal behavior and affective factors can determine the individual's mental state. In many cases, the mental health problem has occurred through the person's life span that would influence the person and the next generation. For instance, any mental illnesses detected in mothers may have impacts on the infants as well as on the children. These problems may be manifested in some form of child abuse that can lead to depression and anxiety later in life as well in next generations; however, strong family and social commitment have impacts on reducing such risks (WHO, 2004).

Physically ill elderly may also face some risk factors which have a psychological base; such as difficulty in sleeping, alcohol abuse, not being respected by younger family members, loss of personal control and grief. Some other factors may have been initiated from the person's history of behavioral and psychological problems such as earlier depressive episodes. Anxiety disorders are related to depression, while depression increases the incidence of some severe heart diseases. Sometimes such causal factors can initiate attention deficit and hyperactivity disorder (ADHD) and misbehavior in children, misconducts among adolescents, and substance abuse

especially alcoholism in young people. The examples mentioned are among the different factors present among the family members or within individuals (WHO, 2004).

Some of the main evidence-based factors within individuals and families that can be related to the initiation of mental illness are illustrated in Figure 2.3. It is showing a model that resembles a process of mental health related factors, but actually is a complex system with feedback loops and reciprocal interactions, as indicated by arrows going in both directions (Lehtinen, 2008).

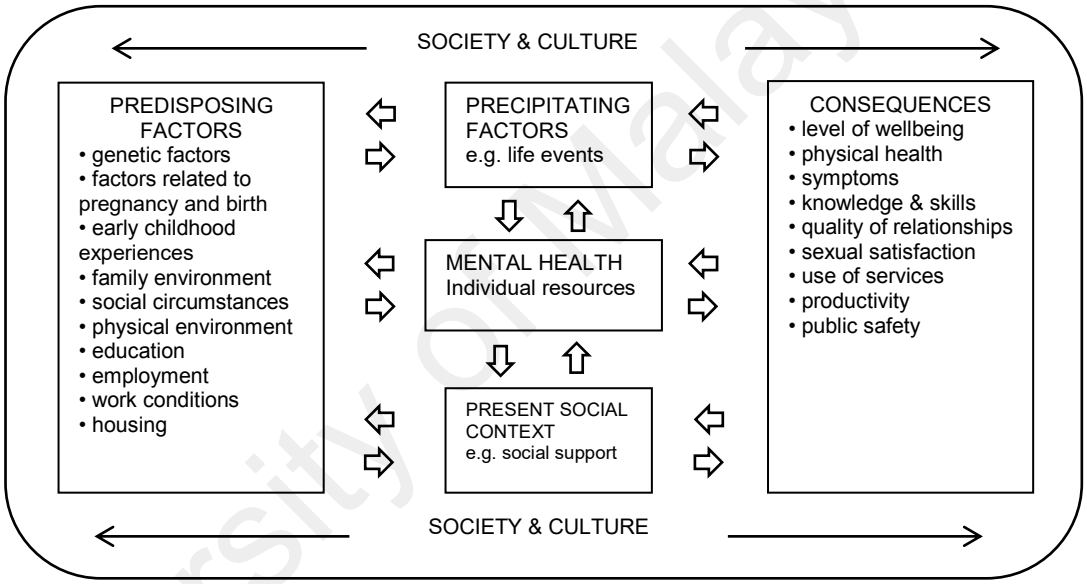

Figure 2.3: The functional model of mental health
Adapted from "Framework for promoting mental health in Europe." By Stakes 1999 as cited in Lehtinen, 2008, p. 28

2.4.3 Depression

2.4.3.1 Symptomatology of Depression

The most common psychological problem is depression that is manifested by severe unhappiness, lack of interest, showing o pleasure in life and a constant feeling of guilt, sleeplessness, loss of appetite, fatigue, and inability to focus on the task. These symptoms can be chronic or acute. In any case, they could stop the persons from living

an ordinary life. In the most severe cases, a depressed person has suicide attempt (Kessler & Wang, 2002).

Depression can be seen in all age groups and it even is diagnosed in young children. The factors contributing to depression could have biological or psychological causes or other causes such as genetics, social factors, or individuals' styles of socialization are the determinants of depression in some individuals. These factors, however, vary among different groups of people especially some who are not at risk. The studies on depression make the identifying of the causal factors possible. Some have concentrated on depression-specific risk factors, the factors that are initiated from parental depression or depressogenic cognitions. Others concentrate on genetic factors such as unfavorable parenting, abuse, and negligence, have past experience of unpleasant life events. While some other studies have listed out the protective factors including a sense of power and control, self-esteem, and self-efficacy. Responsible communities must initiate multiple actions and general or selected interventions. Some studies have revealed that a small, yet significant, 11% reduction has been seen after intervention for depression; however, great variation in numbers has been detected between the different approaches (Jane-Llopis, Hosman, Jenkins, & Anderson, 2003).

Persons suffering from depression may seek medical advice for somatic features, which often include symptoms of fatigue, insomnia, mood swings, or unexplainable physical pain. It is one of the main healthcare conditions causing the utilization of healthcare and healthcare expenditure. Most of the budget is not for the treatment of depression but rather for the physical ailments indirectly related to depression (Donohue & Pincus, 2007).

The stress of international travel or some living conditions overseas, being away from family and their support along with experiencing culture shock and learning different languages are mostly resulted in depression, if not for all but for those who are

particularly vulnerable. Suicide, although it is not common, is a serious problem; and the presence of any psychotic symptoms in certain individuals has depression as a major cause. These sudden changes in a new unfamiliar culture worsen the condition particularly if the individual feels alienated. The situation of having been forced to make lifestyle changes and adopting new ones may cause conflict in individuals. These conditions are hard for middle-aged and harder for elderly immigrants but for the younger generation are relatively easy, to learn the new culture and language in which they are growing up. The symptoms of reaction toward a new culture are understandable. Being depressed, anxious, isolated and fearful, and experiencing an identity crisis are the symptoms of the adjustment process. Some elements can reduce these symptoms including time, self-control, friends and family support. Distressed individuals adapting to new cultures and unfamiliar situation who go to health professionals should be told that these feelings are common and natural and adapting to the new culture will reduce these symptoms. If the act of transition has been planned and it is positive, the individuals experience lower stress (Behrens, 1990).

People diagnosed with depression should be the possibility of having any plan, access to any toxic substance. Their intention must be examined for the levels of seriousness, particularly if they have made suicide attempts before. Having any previous suicide or suicide attempts among the family members, having the history of substance misuse, having experienced any undesirable circumstances in life and other details of individuality such as factors of gender, age, and marital and employment status can be the reasons for suicide attempts (WHO, 2010). Interventions at the beginning stage of depression are also the best time for preventing the risk of suicide behavior that is one of the common symptoms of major depression. Thus, any kind of approach to this matter is useful and essential.

2.4.3.2 Depression and Interventions

Interventions for depression can be mentioned in three categories, which are universal interventions, selective interventions and indicated interventions. Universal intervention can be identified as an intervention that reduces depressive symptomatology by strengthening protective factors among populations. The activities at school that make children solve the problems, teach them social skills and programs that strengthening the children's and adolescents' cognitive ability, and physical activity in a form of regular exercise for the elderly are examples of some interventions. The reduction in high depressive symptom levels of 50% or more is anticipated in some school programs, for a period of one year following initiation of the intervention (Shochet et al., 2001).

Aronen and Kurkela (1996) have conducted a controlled study to examine the outcome of early home-based family counseling programs. They have found the problem of internalization has reduced for 10 -15 years later in the person's life around their adolescence or early adulthood. Some ground-breaking interventions indicated some risk and protective factors for the depression to start.

Selective interventions for depression are some interventions that concern parents of those children with behavioral problems, which target to improve the parents' psychosocial status. These approaches are carried out by providing information and training to modify their behavior and strategies on how to raise children. These interventions have reduced 30% depression symptoms among parents and their children. Some of these selected approaches concern dealing with unexpected life events that play important roles in high levels of depressive symptoms. Interventions concerning children, teenagers and other family members of depressed parents have proven reliable. Furthermore, altruistic social and economic supports are significant interventions to reduce depression among victims of war, refugees and those experiencing post-war

traumas or those still living in traumatic communities and situation. However, the greater decrease in the incidence of depression lies in preventive and human rights policy to avoid such conflicts and traumas (WHO, 2004).

Indicated interventions are certain programs considered upon criteria mainly to educate people who are mostly at risk. Doing so would help people who have positive think would know how to avoid negative thinking and develop skills that help problem-solving. In addition, some critically depressed patients, adolescents, and similar groups can get the advantage of these programs. Clarke et al. (2001) have conducted a study with a randomized selection of adolescents. They have concluded that a great reduction in onset and drops in recurrence of 40-70% can be seen after the first year of intervention. Furthermore, some approaches investigated larger population by analyzing self-help written diaries, through TV and other electronic media. Other studies suggest light therapy for winter depression as a preventive measure. These people may manifest some form of sub-syndrome depressive symptoms (Avery, Kizer, Bolte, & Hellekson, 2001).

Some experts believe that the onset of depression is a byproduct of anxiety, so they have concentrated on prevention programs that point to the potential anxiety; an approach to reduce the incidence of depression especially for children and adolescents. Findings from another controlled study indicate a strong decrease in depressive symptoms among children who particularly had diagnosed with a high level of anxiety before the program started (Lowry-Webster, Barrett, & Dadds, 2001).

In short, we can conclude that preventive programs can be applied all through the life of an individual, to achieve the reduction of elevated levels of depressive symptoms. A few programs that have already been proven effective were those that have an impact on preventing the onset of depression. Programs that mainly concentrate on depressive symptoms in order to reduce or prevent them are also significant for the

person because of the possibility of major depressive cases that have roots in the high levels of depressive symptoms. The person's life is directly influenced by these symptoms; such as feeling less productive and unable to take care of family members, experiencing low energy levels, and not enjoying life, and feeling unhappy (WHO, 2004).

2.4.4 Anxiety

2.4.4.1 Symptomology of Anxiety

One of the psychological problems is anxiety, which, like depression, is the most common psychological problem that affects every individual regardless of culture or race. Every individual experiences the symptoms of anxiety differently in different situations and from time to time. Anxiety has different kinds and types according to the symptoms. The general symptoms of anxiety are troubling feelings of panic and fear, uncontrollable obsessive thoughts, painful and disturbing memories, repeated nightmares. Some physical symptoms are also associated with anxiety disorders such as a continuous feeling of worry, feeling uneasiness to your stomach, palpitations, being in the state of shock, and muscle tension. Anxiety is known as having unidentified causes, although a significant number of research has offered several clues. Some findings have shown that some parts of the brain that control fear responses in individuals have the main role in some anxiety disorders. Some other findings have proposed family history, a genetic tendency and stress from the environment can inflame anxiety. In some studies, the investigation of brain biochemistry has made anxiety syndromes (American Psychiatric Association, 2000).

The physical and mental symptoms of anxiety may prevent the person from leading a normal everyday life. According to some studies, low to reasonable levels of anxiety can be beneficial for the person and actually improved performance requires

certain levels of anxiety. Under mild to moderate levels of anxiety, a person could perform better than anyone without anxiety or an extreme level of anxiety. Furthermore, it is believed that sometimes increased levels of motivation and concentration on the task are the reason for the mild degree of anxiety (Barlow, 2004).

Johnson (1975) stated that brain malfunctioning can cause anxiety; for example, incorrect information processing, hypersensitivity to received information, and environmental stimuli can cause anxiety. Ayres (1972) similarly indicated that inability to modulate incoming sensory stimuli might manifest some form of anxiety, loss of attention, and other stress-related behaviors. Sensory over-responsivity (SOR) or other biological brain related disorder call sensory modulation disorder. When responses to sensory stimuli are faster, longer and more intense and higher than ordinary sensory responsivity, it refers to sensory hypersensitivity (Miller et al., 2007). Some form of SOR, for instance, any response from an individual to ordinary sensory stimuli like movement, sound, or touch and behavioral responses can cause adverse behavior such as aggression, fear, denial, isolation, vulnerability, or mood changes (Raine et al., 2002). In another study, a positive relationship was found between anxiety and environmental stimuli in individuals between ages 17 to 75. They reported their anxiety related to their sensitivity to environmental stimuli (Neal et al., 2002).

2.4.4.2 Anxiety and Interventions

Although psychotherapy and medications are two most well-known types of treatments for anxiety; they are considered unique in their places. These two types of interventions have proven to be effective either provided alone or in combination. However, treatments are not always a complete cure; for the relief of some symptoms, psychotherapies and medications must be applied. Due to the time of receiving results from medication, a psychiatrist's follow-up procedures is necessary to see the progress

in the patients and make necessary changes if the need arises. Unfortunately, it is not common that people with anxiety seek medical help. The obvious reasons behind being unwilling are their fearfulness toward other's reaction for knowing their problem. Moreover, they are unaware of well-established causes and effective treatments of their psychological problem. Others are afraid of being criticized by friends or co-workers and their family. However, it has been seen that they eventually seek treatment when the anxiety has created troubles in their normal everyday life. Fortunately, under appropriate, professional licensed psychologists most cases of anxiety can be successfully treated. Research has demonstrated, a form of psychotherapy called "cognitive behavioral therapy" or (CBT), which is considered highly effective in treating anxiety. Therefore, people can identify and learn about factors causing their anxiety through CBT. In addition, psychologists can use techniques in behavioral therapy to reduce or stop the unfavorable behaviors caused by these psychological problems. For example, one approach is to train patients to relax and take deep breaths to overcome the anxiety and agitation and to counteract rapid, shallow breathing that accompany certain anxiety disorders. Patients should be aware of what they can do to reduce the occurrences of anxiety and their intensity. Patients can help themselves through cognitive awareness along with other techniques where they could confront the frightening situations in a safe and controlled environment. Sometimes, psychotherapy is not enough; there may be a need to use appropriate medications for the treatment. In these cases, the patient may need multi- approaches treatment (American Psychiatric Association, 2000).

In addition to all previous studies about treatments for preventing or reducing the level of anxiety in individuals, it is essential to study and take into practice the effects of new approaches and new strategies on decreasing anxiety level in people who

are suffering from that. Each new treatment as an individual or complementary therapy intervention is beneficial to take into study and practice.

2.4.5 Mental Health and Student Academic Performance

Several studies have investigated the effect of psychological problems on academic achievement. According to one study that was done in a school-based health center (SBHC) in government high school, which had a large population of students with low income, they have found that there is a higher rate of absence in the class among the students who had psychological problems. Moreover, these students with mental disorders had a higher rate of lateness. The academic performance of them was also low and they had lower grades compare to the students who had not mental disorders or any kind of psychological issues (Gall, Pagano, Desmond, Perrin, & Murphy, 2000).

Another study was conducted in Americans in the age range of 15 to 54 years old that had preexisting psychological problems. The results showed that those who give up high school and who left colleges incomplete have expressed early-onset psychological problems. Moreover, it was found out that psychological problems are present in 14.2% of those who dropped out from high school, 5% of those who did not enter college after had graduated from high school, and 4.7% of college dropouts. It can be concluded that people with early-onset psychological problems have roughly a 10% lower possibility of college graduation than do people with no psychological problem. Of the four types of psychological problems studied in the research, mood disorders play significant roles in predicting failure to enter college, and mood disorders had a significantly larger odds ratio than the other psychological problems for the prediction of failure to graduate from college. The study revealed unexpectedly high numbers of Americans whose educational accomplishment was interrupted due to early-onset

psychological problems was considerable. However, some disbelieve these figures because the sample probably did not contain a representative number of people with early-onset psychological problems (Kessler, Foster, Saunders, & Stang, 1995).

Depressive psychological problems put students at risk for unsuccessful academic achievement, if not failure. A significant number of students who experience depression would suffer from lack of academic achievement. Neuropsychological, neuropsychiatric, and neuro-imaging studies have recognized depressive cognitive damage characterized as attention deficit, memory, high-level functioning, and problem-solving. To clarify the importance of these phenomena one study carried out and attempted to identify executive dysfunction in students who had clinically significant scores on a depression scale, and the relationship of that dysfunction to their academic performance as well as social adjustment in the academic environment. The executive functioning of attention, organization and inhibition were examined. The findings of the study suggested that depression of higher levels were related to more damage in an executive functioning component of inhibition, lower GPAs, and poorer social adjustment in the academic environment. Damaged inhibition was also associated with lower GPAs (Fletcher, 2011).

Haines, Norris, and Kashy (1996) determined a negative relationship existed between measures of depression and academic performance. In their study, they examined particularly the relationship of depression to cognitive tasks requiring constant attention, such as is required for academic performance over an extended period, as opposed to examining attention during an isolated task. Heiligenstein and Guenther (1996) stated that the cognitive problems caused by depression have more influence on academic performance and following deficiency than the work performance and damage. It appears that depression can interfere with the cognitive processes involved with learning more than those involving non-academic activities.

Another study aimed to study depression, concentration, and academic performance of the college students. In addition, by using a model that controls for age, sex, education, and verbal and abstract reasoning skills, they determined that negative relationship exists between GPA and depressive symptoms (Jones, 2008).

Drozd, Robinson and Saarnio (1994, as cited in Brandy, 2011) also researched to find a cause for the negative relationship between depression and academic achievement. Their study released that, college students who report more depressive symptoms show poorer study skills than do students with less depressive symptoms. Their study's results showed the relationship between depression and study habits and between depressive symptoms and off-task study behaviors, for example skipping classes, daydreaming, and doodling. Students with depression also reported that it is not easy for them to concentrate and that they were easily distracted. Generally, effective study skills need an extensive range of behaviors, from the essential scheduling and gathering of materials to actual concentration and remaining focused on the topic.

However, some studies refute the idea that depression is a predictor of academic failure. A study by Svanum and Zody (2001) attempted to find an association between the Beck Depression Inventory, which defines depression, and lower grade averages in college students. Their study found no correlation. Although much of the literature recognized the damaging effects of depression on student achievement, there was a rareness of literature to state otherwise. Haines et al. (1996) in a study tried to connect concentration, depression, and academic achievement found no relationship with the variable of concentration using a brief, immediate concentration measure. Moreover, to refute the relation of depression and academic failure, another study was conducted in New York. In that research of exploring healthy habits effect on performing better in academics, the results revealed that state of mind like depression has no effect on student's GPA (Paul, Panton, & Marzigliano, 2008).

Other studies attempting to find a relationship between psychological problems and academic achievement have recognized the effect of anxiety on academic achievement. Talib (2011) stated that there is a significant difference between students with high and low GPA in terms of perceived stress followed by test anxiety. Moreover, perceived stress and test anxiety had significant negative correlation with student academic performance in students. Also, the major reason of stress affecting students' academic achievement was the course load.

Negative correlation between academic achievement and stress and anxiety was stated in different other studies; a relationship between stress and poor academic performance has been found by other studies (Struthers, Perry, & Menec, 2000; Woods, 2006).

2.5 Conceptual Framework

The conceptual framework of this study comprises four areas, including participants' neurological threshold and their responses to stimuli. Based on their high or low thresholds and active or passive way that they have in regard of responding to environmental stimuli, they will have different sensory processing patterns (sensation seeking, sensation avoiding, sensory sensitivity, and low registration). Based on their sensory processing pattern the appropriate intervention strategies will be offered for them and after the intervention the level of their depression and anxiety will be investigated to indicates the effectiveness of the intervention on the level of depression and anxiety that they experience (Figure 2.4).

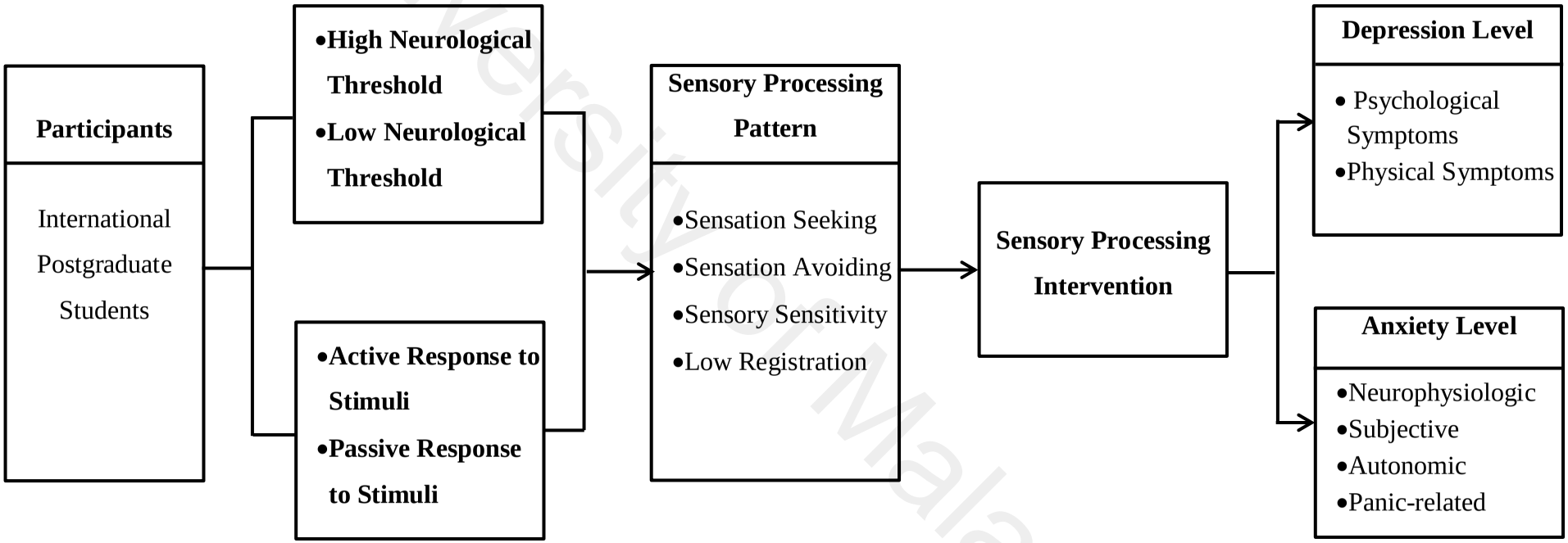

Figure 2.4: Conceptual Framework of the Study

2.6 Summary

In chapter two the related literature of the study was reviewed. Dunn's model of sensory processing was explained and the importance of sensory processing in daily life was mentioned. In addition, Beck's cognitive model of psychopathology was discussed. It was also described that how mental health can improve individuals' life and being in poor mental health status or struggling with psychological problems can affect the quality of a person's life and performance in different situations of study and work. Depression and anxiety as two more common psychological problems were discussed and their symptomology was mentioned briefly. It was stated that different factors may cause the high level of depression and anxiety in individuals. Some of the most important of them were mentioned. In addition, several studies in the field of predictors or factors of depression and anxiety were mentioned which were more related to the environmental factors or sensory factors related to the current study aim. With a very important and vital view of point, it was considered to describe the role of intervention for depression and anxiety in general and it was mentioned different interventions for some different psychological problems in adults and children as findings of the effectiveness and importance of sensory processing intervention in the treatment of different psychological problems or to improve and enhance mental health. The role of mental health in student academic life was discussed and the effects of mental health issues especially depression and anxiety in students' academic performance and achievements were reviewed thorough background studies. At the end, the conceptual framework of this study was illustrated.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

Based on the objectives of the study, this research had two phases. The first phase investigated the relationship between sensory processing patterns and depression and anxiety among international postgraduate students. The second phase was aimed at determining the effect of intervention based on sensory processing approach on the level of depression and anxiety in participants.

This chapter focuses on the description of the research design, participants, and procedure of the research, instruments, intervention programs, data collection, and data analysis method.

3.2 Research Design

This research consisted of two phases:

Phase 1. The first phase of this study adopted the quantitative approach, non-experimental study, to investigate the relationship between sensory processing patterns (sensation seeking, sensation avoiding, sensory sensitivity, and low registration) and the level of depression and anxiety in the subjects.

Phase 2. The second phase of the study was also a quantitative approach. It was a quasi-experimental design, using the repeated-measures design to investigate the effects of sensory processing intervention on depression and anxiety on the subjects involved in the intervention.

A quasi-experiment is designed very similar to true experiment except that in the quasi-experimental design the participants are not randomly assigned to the experimental group. In a true experiment, research participants have an equal chance of

being assigned to any condition of the independent variable involved in the study (Creswell, 2012).

In this study, one group participants were assigned to the experimental group. As it was one-group repeated measures design, there was no control group in this study. The study group was assigned based on the level of depression, anxiety and the sensory processing pattern of participants. Therefore, it was a quasi-experimental design as there was no random assign for the participants.

Repeated-measures design is one of the experimental designs that allow multiple measurements on the same subject. It is an ideal advantage to use a single group participant where it is difficult to find a control group same as the experimental group of study. In a repeated-measures design, the researcher compares a group performance under one experimental intervention with its own performance under another experimental intervention or during several observations or same measures. In fact, the single group became its own control (Creswell, 2012).

Repeated-measures design arises in many different fields. The term “repeated” is the measurements, which are done in a single group but on more than one occasion. A single group of participants may be monitored over a period to measure the changing of their observed values. The repeated measurements often correspond to outcomes measured over time for each subject, but they can also correspond to different measurements of the same treatment or measurements of different treatments. The key point is that multiple measurements are made on the same subject. What makes repeated-measures designs more powerful is using each subject as his or her own control reduces subject-to-subject variability that is explained by anything other than the effect of the treatment under study (Crowder & Hand, 1990; Vonesh & Chinchilli, 1996).

3.3 Population and Sample

The target population for this study consisted of international students enrolled in a public residential university in Malaysia in the full-time Master or Ph.D. program. A large Malaysian university was utilized due to the potential for a large sample size and the prospect of the results generalization to many other educational settings and possibly the non-student population.

Phase 1: According to the selected University International Graduate Studies (IGS) Centre, the population of all active International Postgraduate Students, including all Master and Ph.D. students in the selected university in 2014 was 2293 students (See Appendix L). As proposed by Krejcie and Morgan (1970) the appropriate sample size for this population is minimum 331 participants. Therefore, the number of 360 students was determined for this study. From this sample, two of the questionnaires package were not returned to me by students in class, and four participants had not completed all the items in the questionnaires. Therefore, the total number of 354 participants was the final sample for phase one of the study.

Phase 2: To investigate the effects of sensory processing interventions on depression and anxiety, one-group repeated-measure design was considered. According to sample size calculation reference, for the repeated-measure design 36 participants is an appropriate effective sample size (Faul, Erdfelder, Buchner, & Lang, 2009). In this study, researcher aimed for 40 subjects to have a sufficient number of participants for this design. During the data collecting and interventions for phase 2 of the study, two of the participants dropped from the research. One of the participants left Malaysia to her home country. She could participate only in pretest 1 and 2 of the research and was not available to attend to all four of the intervention sessions. Another participant refused to continue the interventions after the interview session. According to her explanation, her

drop was due to difficulties to attend for sessions in terms of time and interest. Therefore, the final total number of sample for phase 2 of the study was 38 participants.

3.4 Sampling Procedure

Phase 1. For the first phase of the study, which was investigating, the relationship between sensory processing pattern and depression and anxiety, multistage random sampling was applied (Figure 3.1). From the selected University, five Faculties were chosen randomly. From each Faculty the schedule of postgraduate program classes and laboratories for each department was requested from the office of the department. Classes and laboratories were selected randomly from the list and students in those classes or laboratories were the sample of phase 1 of the study.

Phase 2. For the second phase of the study, which was investigating effects of sensory processing intervention on depression and anxiety, one-group repeated-measure design was considered. For this aim, forty students from the first phase of the study were invited to attend to the study. From the first phase of the study, participants who obtained the high scores in depression and anxiety scales and also had a remarkable score in at least one of the four subscales of Sensory Profile were sorted in a list; That is, those scores falling within the "more than most people" and "much more than most people" categories set by the Adolescent/Adult Sensory Profile® classifications. I did not include students who their score was in the range of "similar to most people" category in this study. For depression and anxiety level, according to PROMIS® depression and anxiety questionnaires, the mean t-score for both variables is 50 in the normal population. In this study, students who have higher scores than 50 in depression and anxiety were considered as the population sample in the second phase of the study.

From the total participants in the first phase of the study, the number of 240 students were as meeting these three factors, which were t-scores above 50 in depression and anxiety scales and a remarkable score in at least one of the four subscales of the sensory profile. From these 240 students, forty students were randomly selected and were invited for the interventions. Two of the participants dropped from the interventions and 38 participants attended to all sessions and tests for phase 2 of the study. As exclusion criteria, students who were under any kind of medication, history of psychiatric diagnoses, on any kind of psychotherapy or psychiatric services were excluded from the sample.

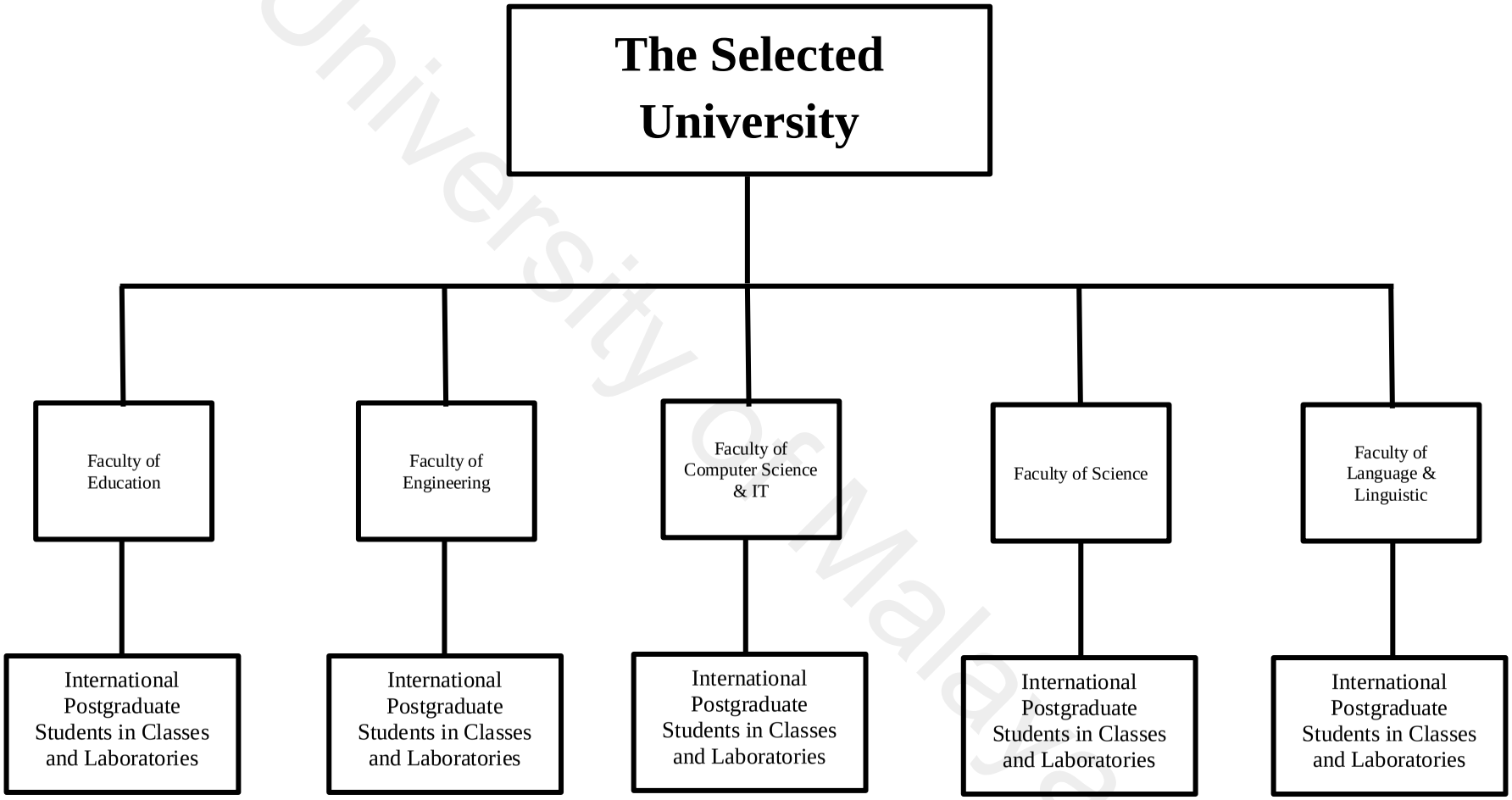

Figure 3.1: Multi-Stage Sampling Procedure of the Study

3.5 Location of Study

This study was conducted in the selected University campus. Data collection for the first phase of the study was administrated in the classrooms, laboratories, and postgraduate rooms of each department according to the sampling multistage method. For this purpose, the permission was requested from the lectures or coordinators through the email or phone contact. For the second phase of study, interview, and intervention sessions was held in the Counseling Room of Faculty of Education. The permission to conduct the intervention sessions in counseling room was obtained from Faculty of Education (See Appendix M).

3.6 Instruments

Instruments in this study included the Demographic Questionnaire, Adolescent/Adult Sensory Profile®, PROMIS® Depression Item Bank and PROMIS® Anxiety Item Bank.

Permission for using Adolescent/Adult Sensory Profile® was obtained from the instrument publisher, which is the copy-write holder for Adolescent/Adult Sensory Profile® (See Appendix G). PROMIS® Depression Item Bank and PROMIS® Anxiety Item Bank are the free instruments for academic and professional research. Requesting for PROMIS® instruments was done through University of Malaya official email address to get the instrument packages.

3.6.1 Demographic Questionnaire

The questionnaire included questions concerning age, gender, marital status, nationality, medical history, psychiatric history, and using psychiatric medicine, the course of study, the number of his or her semester in the program and the participant CGPA.

3.6.2 Adolescent/Adult Sensory Profile®

The Adolescent/Adult Sensory Profile® (Brown & Dunn, 2002) provides a tool for recording an individual's responses to sensory events in daily life, thereby combining a sensory processing framework perspective with daily life performance. Additionally, the Adolescent/Adult Sensory Profile® provides a method for individuals to provide their own perspective about their performance, and in doing so, to have the opportunity for insight about the impact of their own sensory processing patterns on the activities and interests in their lives.

The Behavioral Response/Self-Regulation continuum is illustrated on the horizontal axis. Figure 2.1 shows the relationships between Neurological Thresholds and Behavioral Responses/Self-Regulation. The Neurological Threshold continuum is anchored by low thresholds and high thresholds. A nervous system with a low threshold is easily activated. The individual with a nervous system that has a low threshold requires a lower amount or intensity of stimuli to initiate awareness of and responses to a stimulus. Conversely, a high threshold requires a more intense stimulus for the nervous system to respond. An individual's particular response can fall anywhere on the Neurological Threshold continuum. Functional performance relies on a balance of nervous system activation so that the individual can be alert to selected stimuli while screening out distracting stimuli (Brown & Dunn, 2002).

Passive and active anchors define the Behavioral Response/Self-Regulation continuum. Passive behaviors, which are steady with the neurological response, occur when the individual's response is compatible with the nervous system response. Active behaviors, on the other hand, respond the threshold and are in opposition to the neurological response. These continua (Neurological Threshold and Behavioral Response/Self-Regulation) interact with each other to create the quadrants of sensory processing patterns.

3.6.2.1 Description of item groupings in Adolescent/Adult Sensory Profile®

The items on the Adolescent/Adult Sensory Profile® are organized and presented in the self-questionnaire according to the sensory processing categories. The items on the Adolescent/Adult Sensory Profile® incorporate several theoretical components provide information on the quadrants, which are based on Dunn's (1997) model of sensory processing as sensation seeking, sensation avoiding, sensory sensitivity, and low registration, in addition, the sensory processing categories including taste/smell, movement, visual, touch, activity level, and auditory, and also the neurological threshold continuum as low to high level, and the behavioral response/ self-regulation continuum as passive to active respond (Brown & Dunn, 2002).

a) Items that relate to each quadrant

Low Registration: Items that correspond to the low registration quadrant measure passive behavioral responses associated with a high neurological threshold. Low registration items identify behaviors such as missing stimuli or responding slowly. For example items such as "I don't smell things that other people say they smell", "I don't get jokes as quickly as others" (Brown & Dunn, 2002).

Sensation Seeking: Items that relates to the sensation seeking quadrant measure active behavioral responses and characteristics such as enjoyment, creativity, and the pursuit of sensory stimuli. For example items such as “I like how feels to get my hair cut”, “I do things on the spur of the moment”, “I add spice to my food” (Brown & Dunn, 2002).

Sensory sensitivity: The items that correspond to the sensory sensitivity quadrant measure passive behavioral responses associated with a low neurological threshold. Sensory sensitivity items identify responses such as noticing behaviors, distractibility, and discomfort with sensory stimuli. For example items such as “I stare easily to unexpected or loud noise”, “I become frustrated when trying to find something in a crowd drawer or messy room,” “I’m afraid of heights” (Brown & Dunn, 2002).

Sensation avoiding: The items that relate to the sensation avoiding quadrant measure active behavioral responses associated with a low neurological threshold. Sensation avoiding items identify responses such as deliberate acts to reduce or prevent exposure to sensory stimuli, and efforts to make exposure more predictable. For example items such as “I wear gloves or avoid activities that will make my hands messy” or “I only eat familiar foods” (Brown & Dunn, 2002).

b) Items that relate to the sensory processing categories

Taste/ smell processing: The taste/smell section includes items that measure the individual’s response o odors and tastes. For example items such as “many foods taste bland to me”

Movement processing: The items in the movement section measure the person’s response to vestibular and proprioceptive stimuli. For example items such as “I am unsure of footing when walking on stairs”

Visual processing: The visual section included in the touch section measure the person's response to stimuli that touch the skin. For example items such as "I like to go to places that have bright lights and are colorful"

Touch processing: The items included in the touch section measure the person's response to stimuli that touch the skin. For example items such as "I stay away from standing in line or close to other people because I don't like to get close to others"

Activity level: The activity level section includes items that measure the individual's disposition toward involvement in daily activities. For example items such as "I work on two or more tasks at the same time"

Auditory processing: The items included in the auditory section measure the person's response to things that he or she hears. For example items such as "I am distracted if there is a lot of noise around" (Brown & Dunn, 2002).

c) Items that relate to the neurological threshold continuum

High threshold: The high threshold items measure an individual's lack of response or need for more intense sensory stimuli. For example, I hum, whistle, sing, or make other noises. The high threshold component combines low registration and sensation seeking items (Brown & Dunn, 2002, p. 15).

Low threshold: The low threshold items measure a person's notice of or annoyance with sensory stimuli. For example, I don't like strong tasting mints or candies. The low threshold component combines sensory sensitivity and sensation avoiding items (Brown & Dunn, 2002, p. 15).

d) Items that relate to the behavioral response/ self-regulation continuum

Passive behavior: The passive behavior items measure an individual's tendency to respond in accordance with his or her neurological threshold. For example, items

such as “I do not notice when my name is called”. It is stated that the passive behavior component combines sensory sensitivity and low registration items (Brown & Dunn, 2002, p. 16).

Active behavior: The active behavior items measure a person’s tendency to respond, to counteract his or her neurological threshold. For example items such as “when others get too close, I move away”. It is stated that the active behavior component combines sensation avoiding and sensation seeking items (Brown & Dunn, 2002, p. 16).

3.6.2.2 Administration procedures of Adolescent/Adult Sensory Profile®

Before giving the self-questionnaire to the respondent, I explained the purpose of the Adolescent/Adult Sensory Profile® or provides this information in a written form. The researcher asks the participant to read the items and check the box that describes the frequency with which he or she engages in the following behaviors. Researcher instructs the individual to use the following key to make the responses:

Almost never: When presented with the opportunity, you almost never respond in this manner (about 5% or less of the time.)

Seldom: When presented with the opportunity, you seldom respond in this manner (about 25% of the time).

Occasionally: When presented with the opportunity, you occasionally respond in this manner (about 50% of the time).

Frequently: When presented with the opportunity, you frequently respond in this manner (about 75% of the time).

Almost always: When presented with the opportunity, you almost always respond in this manner (about 95% or more of the time).

The researcher should emphasize the importance of completing all the items. The researcher may encourage the respondent to provide additional comments in the comments sections. For examples, he or she may want to provide information that clarifies a particular response (Brown & Dunn, 2002).

Although it may not be necessary to compute sensory processing category (taste/smell, movement, visual, touch activity level auditory) score total, but the self-questionnaire is designed to make it easy for a researcher to look at individual items within a sensory processing category. Each item in each category is coded with an icon to indicate the corresponding quadrant; sensation seeking, sensation avoiding, sensory sensitivity, and low registration.

For intervention planning purposes, it may be helpful to look at each category and note the items with particularly high or low scores. For example, the researcher may want to gather additional information from an individual about items with scores of 1 (almost never) or 5 (almost always) by asking him or her to tell more about his or her experiences related to these situations. Additionally, the researcher can perform a more specific analysis of the sensory processing categories by looking at neurological threshold (high/low) individual item scores as well as behavioral response/ self-regulation (active and passive) individual item scores (Brown & Dunn, 2002).

3.6.2.3 Reliability and Validity of Adolescent/Adult Sensory Profile®

An examination of the reliability and validity of the Adolescent/Adult Sensory Profile® guided changes in items and allowed for increased confidence in the instrument as a measure of sensory processing in adults. The remarkable agreement among the expert judges' sorting of items according to the four quadrants of Dunn's Model of Sensory Processing indicated that the items could be categorized according to the extant theory. An examination of the relationship between scores on the Adolescent/Adult

Sensory Profile® and skin conductance measures supported the construct validity of the instrument. Responsivity and habituation to stimuli were examined for participants with high scores on each of the four quadrants. This analysis yielded unique patterns for each group consistent with Dunn's model. Participants with high scores on sensory sensitivity were more responsive and took longer to habituate. Participants with high scores on sensation avoiding were also more responsive but quick to habituate. Participants with high scores on low registration were less responsive and quick to habituate, whereas participants with high scores on sensation seeking were less responsive but slow to habituate. Content validity was determined for the Adolescent/Adult Sensory Profile® by a review of pilot studies completed by an expert panel. Convergent and discriminant validity was determined by comparing the Adolescent/Adult Sensory Profile® quadrants to the NYLS Adults Temperament Questionnaire subscales. Correlations of moderate strength scoring of .30 and above are as follows: sensation seeking to approach/withdrawal and mood, sensory sensitivity to mood and sensory threshold, and sensation avoiding to adaptability, approach/withdrawal, and mood (Brown & Dunn, 2002).

In terms of validity of the concepts from Dunn's model, Dunn (2007) stated that to evaluate the validity of the concepts from Dunn's model of sensory processing, researchers tested national samples of infants and toddlers (n = 589) (Dunn, 2002; Dunn & Daniels, 2001), children (n = 1115) (Dunn, 1999; Dunn & Westman, 1997), and adolescents and adults (n = 950) (Brown & Dunn, 2002; Brown et al., 2001), and in every age group, researchers verified the existence of the 4 patterns of sensory processing hypothesized in Dunn's model of sensory processing. The data from the national samples of children and adults without disabilities are distributed on the bell curve, suggesting that although most people have moderate responses to sensory events

in everyday life, some people without disabilities have intense responses just like cohorts with disabilities (Dunn, 2007, p.88).

Regarding the Internal Consistency of Adolescent/Adult Sensory Profile®, few studies' result is mentioned in Table 3.1.

Table 3.1: Internal Consistency (α) for Adolescent/Adult Sensory Profile®

	Internal Consistency (α)
Brown et al. (2001)	From .66 to .82 in a pilot study
Brown & Dunn (2002)	From .64 to .78 in a standardization study
Pearson Education, Inc. (2008)	From .63 to .77
In Current Pilot Study	From .71 to .83
In Current Actual Study	From .66 to .83

In this study, the internal consistency for Adolescent/Adult Sensory Profile® was investigated by the sample of 354 participants and it is reported for each of sensory processing patterns in Table 3.2.

Table 3.2: Internal Consistency (α) for Adolescent/Adult Sensory Profile® in Current Study

	Number of Items	Internal Consistency (α)
Sensation Seeking Scale	15	.67
Sensation Avoiding Scale	15	.66
Sensory Sensitivity Scale	15	.74
Low Registration Scale	15	.67
Total Adolescent/Adult Sensory Profile®	60	.83

3.6.2.4 General consideration about Adolescent/Adult Sensory Profile®

It is important to bear in mind the following general considerations when interpreting the Adolescent/Adult Sensory Profile®:

-In the Adolescent/Adult Sensory Profile®, a high score of five (Almost Always) means the individual exhibits more of the attribute. For example, the higher the score on Sensory Sensitivity, the more the person engages in sensory sensitive behaviors.

-All sensory processing preferences have advantages and disadvantages.

-There are no inherently good or bad sensory processing preferences. The context of the environment and the task at hand determine whether an individual's sensory processing preferences are an advantage or a disadvantage.

-An individual's sensory profile is the entire pattern of scores across all the quadrants. There is a tendency to characterize an individual's sensory processing preferences in terms of the quadrant in which he or she scores the highest (i.e., he or she is a sensation seeker). However, the individual's unique combination of scores across the quadrants more fully describes his or her sensory processing preferences.

-Low scores are as meaningful as high scores. When interpreting quadrant scores, it is important to think about the implications of low scores as well as those of high scores. Particular behaviors that are rarely demonstrated are just as meaningful as those that dominate a person's repertoire.

-Any combination of scores is possible. Each quadrant is independent; this makes any combination of scores possible, even when certain patterns of scores seem incompatible. For example, although Sensation Seeking and Sensation Avoiding describe contrasting behaviors, some individuals have high scores in the Sensation Seeking and Sensation Avoiding quadrants. When this occurs, it is useful to think of these patterns as they relate to the passive/active components of the Behavioral Response/Self-Regulation continuum.

3.6.3 PROMIS® Depression and Anxiety Item Bank

The Patient-Reported Outcome Measurement Information System (PROMIS®), funded by the National Institutes of Health, aims to provide clinicians and researchers access to efficient, precise, valid, and responsive adult- and child-reported measures of health and well-being. PROMIS® instruments are based on modern measurement theory and include the rigorous application of quantitative, qualitative, and mixed methods approaches for instrument development (Pilkonis et al., 2011).

PROMIS® items are intended to be appropriate for use across a broad range of individuals. As such, items should have the lowest demand on reading skills as possible while retaining the item's meaning. PROMIS® items are intended to be appropriate for culturally diverse populations. Adapting the World Health Organization's (2007) tripartite framework of physical, mental, and social health, PROMIS® has developed and calibrated item banks assessing emotional distress, pain, fatigue, sleep disturbance, physical functioning, and social participation (Buysse et al., 2010; Cella et al., 2010; Cella et al., 2007; Fries, Cella, Rose, Krishnan, & Bruce, 2009; Choi, Schalet, Cook, & Cella, 2014).

For most PROMIS® instruments, a score of 50 is the average for the United States general population with a standard deviation of 10 because calibration testing was performed on a large sample of the general population. The t-score is provided with an error term (Standard Error or SE). The Standard Error is a statistical measure of variance and represents the "margin of error" for the t-score. A higher PROMIS® t-score represents more of the concept being measured. For negatively-worded concepts like Depression, the t-score of 60 is one SD worse than average. By comparison, a Depression t-score of 40 is one SD better than average (Pilkonis et al., 2011).

PROMIS® instruments are changed for various reasons. For example, the original PROMIS® Bank version 1.0 – Physical Function included 124 items after being

tested in a diverse sample. Later, during an effort to translate instrument items into multiple languages, translation challenges were identified. Therefore, minor modifications to the English source items were required (for example metric equivalents to measurements such as "Over 10 pounds/ 5 kg" were added). These modifications (19 in total) resulted in the creation of a version 1.1 item bank. Later, version 1.2 was created by eliminating two items due to restrictions on their use (Pilkonis et al., 2011).

PROMIS® instruments were developed with the intent of making them freely available to clinicians and researchers. Items from existing instruments required permission from the instrument author for inclusion in PROMIS® with the understanding that 1) PROMIS® would label all measures as PROMIS® Health Organization and PROMIS® Cooperative Group; 2) PROMIS® would not collect royalties on behalf of itself or any other investigator; 3) all publications and presentations of results from studies using these instruments should include a statement that PROMIS® version x instruments were used; and 4) permission to use PROMIS® instruments does not include permission to modify wording or layout of items, distribute to others for a fee, or translate items into another language (Pilkonis et al., 2011).

3.6.3.1 PROMIS® Depression Item Bank

The PROMIS® Depression instruments assess self-reported negative mood (sadness, guilt), views of self (self-criticism, worthlessness), and social cognition (loneliness, interpersonal alienation), as well as decreased positive affect and engagement (loss of interest, meaning, and purpose) (Pilkonis et al., 2011). The Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013) has adopted PROMIS® Depression as a recommended specific

assessment that may be triggered by a more general "review of systems" assessment (Kuhl, Kupfer, & Regier, 2011, p. 877).

The item bank was developed using comprehensive, mixed (qualitative and quantitative) methods (DeWalt, Rothrock, Yount, & Stone, 2007; Kelly et al., 2011). Item content focuses on emotional, cognitive, and behavioral manifestations of depression, rather than somatic symptoms such as appetite, fatigue, and sleep. Item Response Theory was applied to increase the precision of scoring and brevity of test administration; the final item parameters for each measure were calibrated using subsamples of the approximately 15,000 total respondents. The PROMIS® Depression item bank provides more statistical information than conventional measures across a wider range of severity, ranging from normal to severely depressed. According to PROMIS® Depression manual, to analyze data of PROMIS® Depression, the t-score for each participant should be used instead of raw scores (Pilkonis et al., 2011).

In this study, the PROMIS® Depression item bank was used. This questionnaire consists of 28 items with a 7-day period and a 5-point scale that ranges from 1 (Never) to 5 (Always).

3.6.3.2 PROMIS® Anxiety Item Bank

The PROMIS® Anxiety instruments measure self-reported fear (fearfulness, panic), anxious misery (worry, dread), hyper-arousal (tension, nervousness, restlessness), and somatic symptoms related to arousal (racing heart, dizziness). Anxiety is best differentiated by symptoms that reflect autonomic arousal and experience of threat. Only one behavioral avoidance item is included in the item bank; therefore, behavioral fear avoidance is not fully evaluated. The Anxiety short forms are universal rather than disease-specific. Each assesses anxiety over the past seven days. According

to PROMIS® Anxiety manual, to analyze data of PROMIS® Anxiety, the t-score for each participant should be used instead of raw scores (Pilkonis et al., 2011).

In this study, the PROMIS® Anxiety item bank that consists of 29 items with a 7-day time frame and a 5-point scale that ranges from 1 (Never) to 5 (Always) was used.

3.6.3.3 Validity Evidence for PROMIS® Depression and Anxiety Item Bank

Pilkonis et al. (2011) studied the PROMIS® item banks psychometric properties. In their study, the item response data for the depression and anxiety item banks were scored based on the GRM item parameter estimates using the expected a posteriori estimator. The expected a posteriori theta estimates were correlated with a legacy instrument designed to measure a similar construct (convergent measure) and with another measure of a different construct (divergent measure). For depression, the CES-D was used as the convergent measure (r = .83) and the general distress (anxiety) scale from the MASQ was used as the divergent measure (r = .72). Conversely, for anxiety, the general distress (anxiety) scale from the MASQ was used as the convergent measure (r = .80) and the CES-D was used as the divergent measure (r = .75). Each item was also correlated with its corresponding legacy measure, and the median correlation between the depression items and the CES-D was .72; between the anxiety items and the MASQ general distress (anxiety) subscale, .65. During the item pooling and standardization process, the content validity of our item banks was established in several ways- through comprehensive literature reviews, patient feedback, and expert consensus. Together with subsequent psychometric analyses, the process resulted in the considerable pruning of the original item pool and changes in the relative representation of content from different domains (affective, cognitive, behavioral, and somatic).

To provide a further assessment of content validity at the end of the process, Pilkonis et al (2011) invited nine content experts (not affiliated with the PROMIS® network) to review the items in the three emotional distress item banks (blind to the domain names) and to offer a name and brief definition describing what each bank measured. This review provided further confirmation of content validity. In all cases, the outside reviewers provided names and definitions that were matches or close derivatives of the original labels (depression and anxiety), and their mean ratings of the fit between the domain names and definitions and the final content of the banks ranged from 4.3 to 4.9, using a 5-point scale where 4 = quite a bit and 5 = very much.

In this study, the internal consistency (Cronbach's Alpha) for PROMIS® Depression and Anxiety instruments was investigated through the sample of 354 participants that is reported in Table 3.3.

Table 3.3: Internal Consistency (α) for PROMIS® instruments in Current Study

	Number of Items	(α) Main Study (N=354)	(α) Pilot Study (N=30)
PROMIS® Depression Item Bank	28	.94	.76
PROMIS® Anxiety Item Bank	29	.94	.85

3.7 Ethical Considerations

Ethical approval for this study was received from the selected university to conduct the research and to do the data collection (See Appendix I and Appendix J). Permissions to collect data from classes and laboratories were requested from lecturers and it was done by permission and arrangement of the date and time by each lecturer. As a proof of considering ethics and permissions, each lecturer signed the data

collection confirmation letter from their class (See Appendix C). The goal of ethics in any research is to avoid hurting anyone or causing anyone to experience unpleasant outcomes due to the research actions. In addition, the researcher must observe the rights, confidentiality, and well-being of the participants under study (Israel & Hay, 2006).

In this study participants in both phases of study signed the consent forms (Appendix A and B). The study was conducted in an ethical and responsible manner by first explaining the research process to the participants so that they had a clear understanding of the topic of study and the research interest before signing the consent form. In phase 1 of the study, it was explained verbally and in written form that they may be invited to the second phase of study based on their scores in questionnaires of the first phase of the study. So, participants were informed about the possible invitation for the interventions. Participants of the second phase of the study were invited to the intervention sessions through their personal emails, which they were provided in their contact information in the first phase consent form. In case they did not reply the invitation email, I contacted them through their phone numbers. Before inviting them to interventions, they were asked to confirm their information to make sure that it is the same person and no other person answering his or her phone calls.

All the interventions were conducted in the same location and even in the same room to prevent difficulties and any possible harm for participants in terms of finding location and feeling comfortable and relax during the study. They were informed that the session would be audio-recorded and if they were not pleased with that, we stopped recording for those specific participants.

Anonymity was maintained by using numeric codes instead of participants' names in the process of data entry to data analysis software. For considering the confidentiality of participants' info, the audio records of intervention sessions were uploaded into my personal computer and secured by a password. All papers including

research questionnaires, self-report forms, and attendance forms were held in a locked filing cabinet in a safe and locked location. In the last session of the study, the feedback about the participants' profile was disseminated to them.

3.8 Data Collection Procedure

After approval of the proposal and receiving the permission from the selected university to conduct the research (See Appendix I), the postgraduate students' classes and laboratories was randomly selected. I contacted with each of the lecturers of classes and also laboratories coordinators or technicians through email or phone call from the university database and asked their permission and arrangement to conduct the research in the class schedule or laboratory working hours. In the email, it was explained that what the aim of the research is and mentioned that the sample of the study is international students. By this clarification, few of the lecturers replied that they do not have international students in their class during the current semester. For the other classes, lecturers let the researcher to conduct the research in the beginning time of the class, or in the break time, and some at the end of the class time. In the laboratories, it was arranged to conduct the research any time in the working hours of the laboratories and other postgraduate rooms, but considering meeting or experiments hours.

All participants signed the consent form for phase 1 of the study (See Appendix A). A package containing the Demographic Questionnaire (See Appendix D), Adolescent/Adult Sensory Profile® (See Appendix N), PROMIS® Depression Item Bank (See Appendix E), and PROMIS® Anxiety Item Bank (See Appendix F) were passed to each participant to complete individually. The instruction of each questionnaire was written in the beginning of each questionnaire. However, researcher verbally explained it to them as well. Participants were asked to answer all the items in the questionnaires and do not miss any of them. In order to minimize any potential

reporting bias, it was explained to participants that their data would be used only for research purposes and it will be anonymous and confidential. Participants' privacy was fully protected. During the answering the questionnaires, I was present there in the class or laboratory to answer any question of the participants regarding the clarification of the instruction or items meaning if asked. The number of 354 participants was the final total sample for this phase of the study and it was considered as Pretest 1 of the participants in the second phase of the research.

Test 1 (Pretest1)	Wait 4Weeks Baseline	Test 2 (Pretest2)	Intervention 4 Sessions	Test 3 (Posttest)	Wait 4Weeks Sustainability	Test 4 (Follow-up)

Figure 3.2: Timeline for Data Collection in Repeated-Measures Design

3.8.1 Pretest 1

According to the study design, which is repeated-measures design, there were two pretests in this study. Pretest 1 is the data collected in the first phase of study through all of the questionnaires conducted in the study including Demographic Questionnaire, Adolescent/Adult Sensory Profile®, PROMIS® Depression Item Bank, and PROMIS® Anxiety Item Bank. Pretest 1 was conducted among all the participants who were in the sample of phase 1 of the study. Based on sampling method for the second phase of the study, participants who obtained the high scores in PROMIS® Depression Item Bank and PROMIS® Anxiety Item Bank, also had a remarkable score in at least one of the four subscales of Adolescent/Adult Sensory Profile® were considered for the interview and intervention sessions. For depression and anxiety level,

according to PROMIS® depression and anxiety questionnaires, the mean t-score for both variables is 50 in the normal population. Therefore, students who have higher t-scores than 50 in depression and anxiety were considered as the population sample in the second phase of the study.

3.8.2 Pretest 2

After preceding the sampling procedure for the second phase of the study, the participants for the second phase of the study were invited to attend the first session of interview and interventions. For this phase of the study, forty participants who confirm their participations in the study were involved. From the first to the second phase of the study there baseline was considered for 4 weeks, which the participants did not receive any interventions and in general, I did not have any contact and communication with them. After the four weeks of the baseline, the participants attended the first session of interventions, which began with a short interview. In the beginning of the session, the informed consent was provided again. In the beginning of the first session of phase 2 of the study, participants completed PROMIS® Depression Item Bank and PROMIS® Anxiety Item Bank. This was considered as Pretest 2. After the participants completed the two questionnaires, I did explain to the participants about a general view of the procedure of the intervention sessions. They get informed that how many sessions and in what length we will conduct our sessions. The participants were asked about the feasibility and conformability of their transportation to the intervention location, which was the counseling room in the selected university. If any of the participants has transportation difficulties, I arranged transportation for them according to their intervention sessions in each week. After the briefing interview and completing the two questionnaires of PROMIS® Depression Item Bank and PROMIS® Anxiety Item Bank, we started the intervention. During the intervention sessions, two of the participants

dropped from the study as it was mentioned earlier, one of the participants left Malaysia to her home country. She could participate only in pretest 1 and 2 of the research and was not available to continue participating the study. Another participant refused to continue the interventions after the interview session. According to her explanation, her drop was due to difficulties to attend the sessions in terms of time and interest. She also mentioned that it is not possible for her to apply the intervention strategies as she is very busy with other things in her personal life and she is not interested in applying the interventions in her environment. Therefore, the final total number of sample for phase 2 of the study was 38 participants.

3.8.3 Intervention

Brown and Dunn (2002) recommended some examples of sensory processing intervention strategies based on individuals' daily life routines. They have suggested that people should make some changes in their daily routines in terms of their sensor experiences to receive more satisfaction in their sensory needs. The intervention strategies that they recommended in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002) are according to each of the sensory patterns (sensation seeking, sensation avoiding, sensory sensitivity, and low registration) and it is divided to strategies for different senses including taste/smell, movement, visual, touch, activity level, and auditory. According to Dunn's sensory model, when people receive the appropriate amount and variety of sensory stimuli from their environment, based on their sensory pattern, they will feel less overwhelmed and more satisfied. It is also very considerable for international students as they come to another country rather than their own home country, they will face a different variety of sensory stimuli in the new environment, such as the new taste of foods, different temperature and sense of touch, different auditory inputs and so on. All these changes in the environment may cause

difficulty for students to adjust to the new country and feel satisfied in terms of their sensory experiences based on their sensory stimuli in the environment. Any kind of satisfaction and un-adjustment may cause different psychological issues for the students such as anxiety and depression. If the individuals know what kind of sensory needs they have based on their nervous system needs and their neurological thresholds, according to Dunn's sensory model they can apply some changes and strategies to make the sensory experiences as is more appropriate to their sensory processing pattern, which will decrease their ill-health, stress, discomfort, and irritation and will increase their satisfaction, health, performance level, attention, etc. (Dunn et al., 2012; Dunn, 2007; Brown & Dunn, 2002; Dunn & Bennett, 2002; Dunn, 2001; Dunn, 1997). When students also apply these recommended strategies based on their sensory needs they may experience more satisfaction, concentration, attention, and in addition experiencing less psychological difficulties such as adjustment issue, depression, stress, anxiety, and other psychological issues. By considering all these facts, this study links Dunn's sensory processing model to educational psychology, which aimed to look to students' mental health as a very important factor that can affect students' academic performances. The educational psychologist should consider that Dunn's sensory processing model is about the everyday life sensory experiences which is exactly one of the factors that students also dealing with. Moreover, international students need to have more attention to their sensory experiences in the new environment. By exploring the possibility that whether the sensory processing intervention has an impact on international students, the findings of the study can enhance the knowledge about the important factors in educational psychology field as well.

In this study, the intervention for each sensory processing pattern was carried on based on Dunn's (1997) model and according to intervention strategies suggested in Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002). In this study, there

were four sessions for each participant in the individual format. Based on the Dunn's model of interventions, the length of each session was based on reaching the objective of the session. In this study, I considered 40 to 60 minutes for each session of intervention for each participant. In this study, the total hour of intervention for the total number of 38 participants in phase 2 of the study was 132 hours.

In each session, the pre-printed form was given to the participants where they insert the sensory routines in their everyday life. The self-report forms were designed by me to ask the participants to notice and mention their sensory experiences during the time of research from the first session to the last session. Each session's form contains different tables based on the context of each intervention sessions and the strategies for each sense. These self-report forms were working as a self-observation tool to increase the participant's awareness of the sensory stimuli in their everyday environments and settings. In addition, at the beginning of each intervention session, these forms were passed to me and it can provide complementary data and help more to offer more intervention strategies based on each participant's sensory difficulties. In each session, two of the senses were focused on providing intervention strategies for participants.

Session 1 of the intervention. The first session beginning was an interview to know the participants' life-style and living, studying, and working environments. In addition, I did ask more in details about their everyday life activities and routines. Also, I explained to the participants about their sensory processing pattern to increase their self-awareness about their neurological thresholds in different senses and also their respond patterns to the sensory stimuli in their environment. We identified the details about participant's sensation difficulties by referring to their sensory profile and explanation was asked for more clarification. Making links between participant's sensory processing pattern and their life routines and setting in their personal

environment and in the public, such as in classes, colleges, offices, and in society was done.

At the first session the effective intervention strategies for the senses of "Auditory" and "Visual" was offered and explained in details based on the participant's sensory processing pattern and individual routines. I trained the participant how to notice his or her sensory experiences during the day in different context and environments in these two senses, and how to do the self-report form for further consideration in intervention strategies.

Intervention strategies for auditory sense for four sensory processing patterns.

Recommended strategies were given based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002). For example, for the auditory sense, I recommended the strategies or changes according to the manual and based on the person's everyday life and routines. If the participant showed that he or she is most likely in the sensation seeking pattern, I recommended him or her incorporating into daily activities- hum/sing or play the radio while studying or working on their projects. I asked the participant to use background noise while he or she is doing his or her work or studying. I recommended that the participant finds or create work and leisure activities where it is acceptable to make noise. Being in the environment, which is filled with interesting auditory stimuli, is another recommendation for this group of people. They may go to gatherings, restaurants, or any event, which is providing live music as well. For example, these students may spend their lunchtime in the crowded cafeterias in the university, which gives them the chance to listen to the music and talk to other people as well. I asked them to experience live music more often. I recommended that they try to use your headphones and listen to music during the activities that do not need concentration for

example while they are doing exercise or while they are walking or even in their coffee time in the laboratories when they are working on their projects and in their study breaks. Attending to any kind of concerts or events that provide sounds is recommended to this participant. They could ask the university events schedules for in-campus musical events to attend. I asked them to listen to books on tape and not only read the books.

If the participant showed that he or she is most likely in the sensory sensitivity pattern, for the auditory sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she limit the amount of information that is provided at any one time. They are suggested receiving auditory information step by step. I asked them to reduce the volume or amount of auditory stimuli in their environment. I recommended that they try to provide handouts to supplement verbal information regarding their study or work on their projects. I asked them to try to participate in the discussion and to answer questions to help to maintain their focus in the group settings. It was recommended to this group of participants to ask another person to give them cues when it looks as if they are losing focus on doing their study or working on their projects. Listening to only one source of sound at one time was another strategy that they need to do especially while they are studying. It was asked them to turn off unnecessary sound sources in their environment especially for students who were working on laboratories on their projects. If they have home mates in their living place or if they are studying in the library or working in the labs, it was recommended to this group of participants to use ear plugs if needed.

Regarding the auditory sense strategies, if the participant's sensory profile indicated that he or she is most likely in the sensation avoiding pattern, for the auditory sense, based on Dunn's sensory processing model, which was provided in the

Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she reduce background noise while they are working on their projects or while they are studying. Also when they are having a conversation with their classmates or their project partners, it is recommended to turn off the radio or any other source of background noise. I asked them to go to a quiet area when they really need to focus on their study or projects. Sometimes they can use repetitive sounds to drown out distracting noises such as fan noise. When they are studying at their home, class, laboratories, or other areas that they are doing their study or working on their projects it is recommended to close the door to prevent any noise from outside and to have a quiet place and to prevent any kind of distraction for their concentration. While studying they can use earplugs as well. During the lunchtime and for coming to university and going back to their home, it is recommended that they attend outings during non-peak times. I asked them to choose a place with minimum auditory stimuli to seat for studying or working on their projects in laboratories or libraries. It is asked them to limit unstructured time and unscheduled talks as well.

If the participant showed that he or she is most likely in the low registration sensory pattern, for the auditory sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that they ask others to slow down, speak up, or repeat as needed. When they are having any meeting with their supervisors or lecturers, they may not receive all the information or comments that their supervisors may give them. Therefore, they can request their supervisors to repeat the part that the student has missed. In the group dissections also the may ask other members to slow down when they are talking and speak loudly to prevent any missing info. Another strategy for these participants was to record important information when they attend to meetings, discussions, or classes. Therefore, they can listen to the audio later to make sure that

they have not missed any part of the information. I recommended that these participants ask for verbal information to be in written form if it is very important. For example, if they are told to do a part of the project, which has very detail instruction to proceed, they can ask their supervisors or group mates to send it through email or write it on a paper while explaining verbally. If the student cannot comprehensively get the knowledge, it is recommended to ask for lots of examples to make it clearer for the student. I recommended that these participants explain or repeat information back to the speaker to make sure you processed what was said. For example, if their supervisors, project leaders, lecturers, classmates, group members, and project partners comment them or want them to do something, it is better the student repeat the information back to them to make sure that he or she processed what was said and it was completely understood by the student. For these participants, I recommended that they use an alarm for reminders, especially for their meetings with their supervisors and their class schedules if they have. When they are attending any class, meeting, group discussions, conferences, and other events, I recommended that they try to sit in a place that they can hear the speaker or presenter voice easily and clearly.

Intervention strategies for visual sense for four sensory processing patterns.

Regarding the visual sense strategies, if the participant's sensory profile indicated that he or she is most likely in the sensation seeking pattern, for the visual sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she select bright colors in different things. For example in the clothes that they wear, in their home as their personal room stuff, in their stationaries in their studentship materials, and so on. It is recommended to this group of participants to use bright lighting. When they are choosing the place for their study in the library, it is

recommended to this group of participants to choose a desk, which has a brighter light on it. It is recommended to this group of participants to not study in the poor light areas. I also asked them to look for environments with lots of visual interest and activity to provide more visual sensory inputs for them. For example, if they are choosing their place in the library or classrooms, it is suggested this group of participants seat in a place that they can face other people or environmental interiors that can give them a variety of visual stimuli. It was asked them to not seat in a corner, which there is a wall in front of them without any visual attraction. I recommended that they consider in meetings, classes, offices, etc., to find places to sit where they can easily change their visual perspective so that they can receive more visual stimuli from their environment. It was highly recommended to this group of participants to use shapes and forms when they are summarizing the content of their study. Using different diagrams and forms instead of texts can be more effective for them to help them to learn and memorize the lecture better. I suggested this group of participants uses colorful markers and pens and even papers while they are studying or in different parts of their project writings. Using highlighters also suggested them. I did ask them to highlight the important parts of their notes as well. I asked them to use colorful sticky notes as well to take small notes for their studies and also as reminders. I recommended that they consider trying new colors in their wardrobe, living space, work space, and study room. If possible for them, they can change a part of their environment in terms of colors and design, or even to rearrange their furniture in their study rooms or in the laboratories of working on their projects.

If the participant showed that he or she is most likely in the sensory sensitivity pattern, for the visual sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she use systematic methods of visual scanning when they are

studying or doing their projects. For example, if they are searching in the library for a particular book or article they should scan the shelves in the left to right or top to the bottom method. Moreover, if they are searching in online databases, they should consider the same strategies as well. The systematic search will help the student to not feel overwhelmed in terms of visual sense. I recommended that the student chooses the seat with the limited and narrow view that provides less visual stimuli for him or her in the classes, library, laboratory, and even conference. It was recommended that the participant should organize drawers closets at home, book shelf, personal belongings in the study room, project room, laboratory, etc. so that it is easy to pick out what he or she is looking for. I asked them to try to remove background visual stimuli. For example, if they are sitting in the place that is in front of entrance door in the study room, it is advised to this group of participants to change their place to a location that has limited visual stimuli to prevent any possible distractions. I recommended that they try not to mix different things together which may cause them to have messy and overloaded visual input. For example, do not mix different foods in one plate or to not mix different papers on their desks of study. I asked them to reduce light sources in their study place, resting area and room.

If the participant showed that he or she is most likely in the sensation avoiding pattern, for the visual sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she periodically close his or her eyes to decrease visual stimulation. I recommended that they wear sunglasses when they are out of study room in the bright daylight. It is advisable for them to use blurred or natural lightening or even the dark. I asked them to give some rest to their eyes during their study hours or when they are working on their projects. It was also recommended to this group of participants to use anti-reflex screen protectors for their computers while using them. I

asked them to try to provide a neat and organized study place for them and to get rid of a mess in their living area as well. It was recommended that they try to have limited visual inputs. For example, if they are sitting in the library to study, it is better for them to sit in the place that has less visual inputs such as the desks that are faced with the wall, which cannot be distracted by every passenger from their front. I asked them to try to keep their work and study desk organized. I recommended them to organize their books, notes, study materials, stationeries, and so on. I asked them to try to limit colors around their study and workplace. While they are studying in the bright daylight time, it is recommended they keep shades drawn to prevent extra light and extra visual stimuli. I asked them to select one color pen at a time when they are studying or working on their projects. It was also suggested this group of participants put only one food on their plate at a time to prevent different visual inputs. It is advised to this group of participants to avoid watching sides when they are in taxi, car, or bus as well. This will help them to reduce their visual sense input.

Regarding the visual sense strategies, if the participant's sensory profile indicated that he or she is most likely in the low registration sensory pattern, for the visual sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she make some visual cues for the study that can be more noticeable. For example, I recommended that these participants underline, bold, highlight, and use any other kind of noticeable visual cues while they are studying. I asked them to use color to make the important parts of the notes much more noticeable as well. I recommended that they label drawers, cabinets, paper holders, bookshelves, and other things which may need them to search something in them. I asked them to take notes so that information can be reviewed and processed later. For example, they have to use a notebook all the time to write down important information such as meetings schedules with their supervisors,

group discussions, and class timetables. Therefore, they can refer to their notes immediately anytime. It is advisable to these participants to use mirrors to check personal appearance as well. I recommended that they place important objects such as their keys, bills to be paid, books borrowed from the library, purchased books related to their study and projects in an obvious location. Therefore, they can find them easily anytime later. I asked them to change colors, fonts, placement of objects, to decrease familiarity and habituation as well. It was suggested that they select bright and contrasting clothing or stuff to provide some visual input for themselves to help their nervous system more satisfied in terms of their visual sense needs according to the sensory model. I recommended that they turn on a bright light when they are studying or at the workplace. I asked them to try to sit in a place that they can see the presenter or speaker more easily and with a wider view in the class, meeting, discussion, conference, and so on.

Session 2 of the intervention. In the second intervention session, the participant was asked about his or her experience of applied "Visual and Auditory" strategies from the first session during the last week and the self-report form was reviewed for more information and discussion of applied strategies. Then the effective intervention strategies for two other senses that were the senses of "Taste/Smell" and "Touch" was offered and explained in details based on the participant's sensory processing pattern. I trained the participant how to notice his or her sensory experiences during the daily life in different context and environments, such as class, study room, laboratories of research, and home in these senses in detail.

Intervention strategies for taste/smell sense for four sensory processing patterns.

Regarding the taste/smell sense strategies, if the participant's sensory profile indicated that he or she is most likely in the sensation seeking pattern, for the taste/smell sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she chew gum, eat mints when feeling restless or during his or her study time, before presentation, prior to meeting, or any time that they need to feel more relax. It is recommended they use scented soaps, cleaners, etc., in their home and using of air freshener in their study or workplace. I recommended that they make spices, hot sauce, etc., available at meals to receive more sensory input in their taste/smell sense. It is advised to this group of participants to select restaurants that serve foods they have never eaten. In the university campus, there are several cafeterias, which serve different nationalities foods that are in a variety of tastes and smells. I suggested this group of participants explores new foods that they have never tried by asking their friends to introduce them to restaurants or foods. These participants were asked to try different foods in their lunchtime between their study times. I did recommend that they use scented lotions or use perfumes more often, especially during their study time or while they are working on their projects. This will provide more stimuli in their smell sense.

If the participant showed that he or she is most likely in the sensory sensitivity pattern, for the taste/smell sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she find scented products that they like and use them regularly. It was suggested this group of participants identify flavors and ingredients that they prefer, and find ways to incorporate them into daily meals. I asked them to introduce new foods and smells step by step. If they want to try new food, they should take it gradually and not in a very sudden change. I did recommend that they do not use air

fresheners in their study area, working place, and their home while resting. It was advised to this group of participants to use unscented washing products to reduce the smell sense input. It was also recommended that they use unscented locations for their study, work, lunchtime, and so on. According to Dunn's sensory model, these people can concentrate more on their study if there are fewer amounts of smell stimuli in their study place.

If the participant showed that he or she is most likely in the sensation avoiding pattern, for the taste/smell sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I did recommend that he or she ask for sauces and dressings on the side of his or her food. I suggested this group of participants uses unscented cleaners, soaps, etc., which can provide fewer smell stimuli for them. It was also recommended that when they go out for eating, they request their friends to choose the restaurant. For example, in the lunchtime, when they want to go to university cafeteria, they ask their friends to let them choose the café that they are familiar with and interested in eating their lunch there. It is recommended that they use unscented lotions. I also suggested this group of participants does not use air freshener in their study place, working area, and also resting place. It is advisable to them to avoid stores with scented products to prevent extreme smell inputs to their smell sense. In addition, I recommended that they choose their food in advance before eating time. For example, when they want to go for lunch during their study time in the university, it is better for them to know and decide in prior what kind of food they are going to eat.

If the participant showed that he or she is most likely in the low registration sensory pattern, for the taste/smell sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she to make meals more interesting in terms of the

menu and ingredients. I also recommended that they incorporate unfamiliar foods. It was recommended to this group of participants to try unusual combinations of foods. These participants were asked to try new foods from different cultures and nationalities. I asked them to try foods and drinks with intense tastes or smells. For example, it was suggested that they try a very strong taste of mint or lemon in their drinks. As these participants have low registration pattern of sensory processing, they may have a delay on receiving or noticing the temperature of the drink or food that they are trying. Therefore, I asked them to use extra care when drinking hot liquids. It was also suggested this group of participants adds new aromas and tastes to foods to provide more sensory stimuli for their taste/smell sense. I asked them to use scented bath products, scented hand washing liquids, scented dishwashing liquid, and scented shampoo. It was also recommended to use scented lotions. I recommended to these group of participants to make sure smoke detectors are present and working in their study place, in laboratories as their project running the place, in their home and as general in their environment while they are doing any activity. It can help the participants to reduce the probability of being in danger because of late noticing the fire in their study or working place.

Intervention strategies for touch sense for four sensory processing patterns.

Regarding the touch sense strategies, if the participant's sensory profile indicated that he or she is most likely in the sensation seeking pattern, for the touch sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she choose activities that incorporate touch with others, for example, joining the dancing classes in the university or out of university as their free time or going for massage. It is also recommended to this group of participants to select clothes with a

variety of textures. Also, they can walk barefoot in the safe areas to receive some stimuli for their sense of touch. These participants can use varying textures of carpets, towels, blankets, and seat fabrics as well. It is recommended that they use textured lotions, creams, and scrubs. I recommended them to choose activities that incorporate touch with the environment. For example, they can spend time for cooking and they can use their hands without gloves while mixing vegetables or ingredients of their food for preparing for cooking. In the classes, study rooms, library, laboratories, and at home, they can choose the furniture with textures as well to provide more sense of touch for themselves.

If the participant showed that he or she is most likely in the sensory sensitivity pattern, for the touch sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she use deep-pressure touch rather than light touch. It is recommended that they wear clothes that are heavy or weighted. I suggested this group of participants wraps themselves in a blanket when they want to sleep, or even when they are studying they can use a jacket that they can wrap themselves in it. It is advised to this group of participants to select tight and natural fiber clothing, and to select firm underwear. I recommended that they choose a seat without texture in the library or study room when they are studying, or in the laboratories while they are working on their projects. It helps them to not get overwhelmed by the sense of touch.

If the participant showed that he or she is most likely in the sensation avoiding pattern, for the touch sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she explain his or her need for personal distance to others. For example, if their friends are sitting beside them in a very near distance, or even when they are walking or standing up and talking, they should inform to their friends to keep

a bit of distance with them, as they will get uncomfortable to be very near and close to other people. They should inform politely to their friends in the university and to their home mates at home, to not touch them so much as they will get annoyed of being touch as well. I recommended that they select fabrics that don't irritate when purchasing clothing, also to not purchase or wear the styles that are very tight. I recommended that in their study place and their home, they adjust the position of fans or air conditioners in a way that they are not blowing directly at the participant. If they are in the library or any other common area that they do not have any control to adjust the direction of the fan, they are recommended to choose their seat in a place of the library or class that the fan is not blowing directly on them. I suggested this group of participants wears gloves when cooking, gardening, etc. In addition, if they are working on an experiment in laboratories because of a part of their research and study project, they should remember to wear gloves as well. It is recommended that when these participants go for eating, the use one food temperature and also use food with limited texture. I suggested this group of participants that do not go to crowded places to avoid body contact with other people. For example, if they are using public transportation to transport to university, I recommended that they choose the time that the train or bus is not crowded.

If the participant showed that he or she is most likely in the low registration sensory pattern, for the touch sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she try to have varied and textured food options. I suggested this group of participants asks others to let you know if you are getting too close. These participants may fail to know exactly how other people will feel of being too close to them. Therefore, it is suggested these participants ask other peoples, especially their friends, supervisors, classmates, group members, and home mates to inform them if they have not considered the suitable and comfortable distance with them. Regarding

the safety that may be one of the issues for these participants, I asked them to set water heaters at a lower temperature to prevent burns. It was recommended to this group of participants to pay attention to weather reports and temperature to determine appropriate dress. I recommended that they add texture to some of the objects to help with detection, for example, they can use puffy paint on appliance knobs to know when on or off. It is recommended to this group of participants to try to use textured clothes and other personal stuff. For example, I suggested this group of participants uses big keychain with texture on it to make it easier to find their keys inside their bags.

Session 3 of the intervention. In the third intervention session, the participant was asked about his or her experience of previous sessions strategies in the senses of "Visual, Auditory, Taste/Smell, and Touch" during the last weeks and the self-report form was reviewed for more information and details. In the Adolescent/Adult Sensory Profile®, "Movement" and "Activity Level" are also considered as two of the senses and effective intervention strategies for the senses of "Movement" and "Activity Level" is provided for them in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002). In the third session of intervention, the effective strategies for movement and activity level sense were offered and explained in detail based on the participant's sensory processing pattern. I trained the participant how to notice his or her sensory experiences during the day in different context and environments in these senses.

Intervention strategies for movement sense for four sensory processing patterns.

Regarding the movement sense strategies, if the participant's sensory profile indicated that he or she is most likely in the sensation seeking pattern, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), for the movement sense, I recommended that

he or she incorporate movement in activities. It is recommended that these participants engage in physical activity before a thinking task. For example, before starting their everyday study schedule, it is asked from them to do some simple exercise, such as stretching, jumping, and any kind of another small exercise, which can be done in their study place. Also for students who are working on their projects, it was recommended that they do the same and have some movements and exercise before starting their concentration on their projects. I suggested this group of participants select activities that incorporate bending over as well. I asked them to try to change speeds more often in their exercises. These kinds of activities will help their sensory satisfaction in terms of their movement sense to a pleasant level. I advised to these group of participants to be the active person in the group activities, in classes, and any other group work. For example, in a group, these participants can be the one who passes out things to other people or they can be the one who can put the chairs away in necessary for any class, group meeting, or group discussions. It is suggested this group of participants uses rolling chair sometimes when they are studying or working on their projects. They can use the rolling when they want to rest for few minutes between their study times. I recommended that they pursue a new physical activity. For example, they can join a bowling league, take an aerobics class, join any sports team in the university, run in the running area of the university campus after their study time, or if possible taking a dance class.

If the participant showed that he or she is most likely in the sensory sensitivity pattern, for the movement sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she use rocking chairs for calming effects. I recommended to this group of participants to limit the number of steps when learning a new movement activity. It was also suggested them select movement activities that allow them to keep

their head upright and/ or maintain a consistent speed. For example, they can choose bike riding instead of aerobic exercising. I recommended that they do not engage in the activities that are changing speed during the movements. Any kind of activity or exercise which can be done at a consistent speed and without any extreme changes in body alignment is suggested this group of participants. I also asked them to choose a fix and stable chair instead of an unsteady one. Especially when they are studying, doing their research, working on their projects, or any other activity that needs more concentration, it is recommended that they make sure their chairs and tables are very stable and it is not unsteady. According to Dunn's sensory model, this group of participants will be annoyed by any extra stimuli from their environment. Therefore, if their chairs or tables are unsteady, they will get annoyed and they will not be able to concentrate on their study or work.

If the participant showed that he or she is most likely in the sensation avoiding pattern, for the movement sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she may use stairs instead of elevators when reasonable. For this group of participants, elevators, escalators, and high places may be uncomfortable. Therefore, it is suggested that they avoid any high place if possible. I recommended that they make arrangements to take a break when they are involved in physical activities. For example, they may take a break to sit down as needed and then again continue their activity. In this group of participants, the ones who are working in laboratories can benefit from this suggested strategy. I suggested to them to not do their experiments on their projects if it is needed to be in stand-up position for a long time. It is suggested to them particularly to take a break sometimes to sit down as well. I recommended that this group of participants incorporates routine and repetition in movement activities. For example, if they are interested in doing any exercises, they are asked to try to avoid new

movements. It is better for them to choose a repeating kind of exercise such as jogging slightly every day. I recommended that they place the most frequently used objects at arm level in cabinets and drawers to avoid having to bend over so much. This group of people, according to Dunn's sensory model, needs less movement. Engaging a lot of movements in daily life will irritate them in terms of their movement sense. I asked them to choose a seat with minimum passing people around them. Especially when they are in the class, library, or study room to do their study, it is very important to receive fewer stimuli from people moving or passing around them. It is recommended that this group of participants creates exact routines before getting into bed or after waking up. If they know in advance what kind of routines they will get through before going to bed or after waking up in the morning and also during the day in the university and study time, they will get irritated less, due to their nerves system preference of experiencing routines instead of unpredicted happenings in their everyday life. I asked them to rest during movement activities.

If the participant showed that he or she is most likely in the low registration sensory pattern, for the movement sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she make sure they have not put their drink glass on their work desk near to papers or other stuff. This group of participants may suddenly hit their water glass and make it fall on their desk and cause their books or papers get wet and waste. Because of their sensory processing pattern, they may not notice the objects in their environments very immediately and they may seem to be very careless in this regard. I recommended that they watch carefully the pathway they are walking. Especially when they are walking to university or going back home, also during their break times, they may be careless and hit the floor. Therefore, I asked them to make sure pathways are clear of objects that could be tripped over as well. It is recommended

that this group of participants uses or add stair rails, bars, and other cues to mark steps, doorways, etc. I suggested that they put anti-skid bath mats in the tub or shower. It is recommended that they wear non-skid shoe soles to prevent any tripping or falling. I asked this group of participants be extra aware of safety when they are moving. Especially when they are working in the laboratories on their projects, it is very advisable to them to make sure that they are moving very carefully and watching their steps and hands to not hit any object which may cause trouble for their experiment, project and also to the laboratory equipment. Moreover, if they are using the library, I asked them to be very careful while taking any book from the bookshelves to prevent any books from falling down.

Intervention strategies for activity level sense for four sensory processing patterns.

Regarding the activity level sense strategies, if the participant's sensory profile indicated that he or she is most likely in the sensation seeking pattern, for the activity level sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she look for group activities instead of individual activities. It is recommended that this group of participants involves in events, student clubs, communities in the university or the faculty, or any other kind of activities, which can be considered as a group instead of individual activity. This group of participants needs to have more communication with other students. They should socialize more which is possible through involving in different group activities and event organizing. I recommended that they find opportunities for self-expression. If they are in class, it is suggested that they be a volunteer to express their ideas and opinions in the class discussions. Also, if they do not have any classes, they can self-express in their group and community of

friends that they are joined. I recommended that this group of participants incorporates newness into their daily routine. They need to experience new things and new activities every day. For this group of participants, if they do not have any new experience in their daily activities they will be very unsatisfied in term of their sensory satisfaction, due to unfulfillment of their sensory need of activity level. If they are doing any repeating task for their project or study, I asked them to try to do the task in a new way to avoid feeling that the task is a very repeating job. If they are studying about their project, for example reviewing the literature, they can change the routine of task such as shifting between online database searching and library hard copy searching. As a general suggestion to this group of participants, I asked them to try to have new activity experiences that they have not done before and provided a variety of activity experiences to the daily life.

If the participant showed that he or she is most likely in the sensory sensitivity pattern, for the activity level sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she incorporate breaks and time-outs during doing different activities that they have to do every day. For example, this group of participants is advised to have some breaks during their study time in the library or study rooms. It is not appropriate for them to continue studying, reading, writing or any other continues activity with no break between. Therefore, they have to break their study into parts and take some rest between their study schedules. It is applicable same to the students who are doing their research in the laboratories. They also need to take a break between taking measurements and doing the experiments. Another strategy of daily life for this group of participants is to look for smaller, less crowded, more organized stores in which to do their shopping. It is recommended that they use self-cues to stay focused on their activity that they are doing. For example, they can write down a study timetable

for their daily study and go through it and check it frequently to see whether they are reaching their set target. I recommended that they break tasks down into smaller parts. For example, if they are studying, they should break it into topics and give concentration to one topic at a time. In addition, students that are doing experiments in laboratories should break the assessment and experiment into smaller parts and record each part and then move on to the other section of the experiment and do the assessments. It is recommended that they do their exercise in one clear order. These participants should provide one order for their daily exercise as well. They have to plan for that and prevent any sudden change in their exercise type or order. I asked this group of participants write out steps to a task and check them off as they complete each one. I recommended that they write out their daily schedule for their study and work into several steps and after completing each step they should cross it and move on to the other step. I explained to them that, according to their sensory pattern, it is more appropriate for them to do their daily study progress according to pre-scheduled steps and orders. Therefore they should make a plan before starting a task. In addition, I suggested that they identify the steps and important features that need their attention when they are studying or working. I asked them to pair up with a partner to help them maintain focus. If they are studying in the library or doing the projects in study rooms or laboratories, it is recommended that they find a classmate or university friend to pair up. Therefore, they can have more concentration and focus on their study, especially if they go through same steps in their study schedule.

If the participant showed that he or she is most likely in the sensation avoiding pattern, for the activity level sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she avoid traffic congested areas, crowds, busy times when going out to home, university, or other places. I suggested that they maintain

consistency and try to reduce disturbances especially while they are studying. I recommended that this group of participants establishes routines that are comforting and supportive for them. For example, if they are comfortable to take the train to come to the university, it is suggested that they always take the train to transport and do not shift between taking the train, bus, or walking some distance to the university. In addition, if it is easier for them to eat their lunch in one of the cafeterias on the campus, it is suggested that they do not go to different places out of the campus to take their lunch. It is more appropriate for them, according to their sensory pattern, to avoid new activities, which they are not familiar with. Therefore if they find any routines that they are comfortable with, it is suggested they continue that routine. I suggested that this group of participants finds quite places for time alone. Especially if they are working in laboratories or studying in group study room, it is recommended that they try to find a quiet place that they can have their time alone for a while during their everyday study and work. As this group of participants is avoiders from sensory stimuli, their sensory need is more like preferring less amount and variety of stimuli from their environments. Therefore, spending a time alone is very beneficial for them to prevent getting tired, irritated, or overwhelmed in the crowded places. So I asked them to give themselves permission to be alone more frequently. For this group of participants, I recommended that they limit large-group experience. For example, it is not appropriate for them, according to their sensory pattern, to involve a member of a big group for different activities such as organizing an event on the campus, or being involved in any big student communities in the university. Instead of that, I suggested that they find opportunities for small groups or one-on-one interaction. Even for spending their lunch time, it is better for them to accompany a couple of their close friends instead of going with lots of classmates or friends which are several students gathering together. As

general, this group of participants needs fewer amounts of stimuli in their activity level, in terms of variety and amount of activity experience.

If the participant showed that he or she is most likely in the low registration sensory pattern, for the activity level sense, based on Dunn's sensory processing model, which was provided in the Adolescent/Adult Sensory Profile® manual (Brown & Dunn, 2002), I recommended that he or she ask people to summarize or restate the most important points that they are talking about. For example, if they are having any meeting with their lecturer, supervisor, or classmate, it is recommended that they ask them to restate the important part of comments to make sure that the participants has gotten the whole information and has not missed any part. For this group of participants, it is recommended that they go into a meeting prepared with questions, agenda, etc. If these students have any meeting with their supervisors or lecturers, they should know that what would be the topic and agenda of their meeting to make themselves prepared for that. They should study about the topic in advance to make sure that they have some brief information about the meeting topic so that they can follow the supervisor, lecture, or speaker talk easily and prevent missing any part of the talk. Another recommendation for this group of participants is to write something down or talk it through to another person before executing a task. For example, if their supervisors or project managers want them to do a task in their study experiment or in their project, these participants are required to take notes meanwhile they supervisors is explaining the task and make sure that the completely understand all the steps of that they have to go through for the assigned task. I suggested that they explain what they want to go through to a friend in the laboratory or classmate before starting doing the task, especially if it is a very high sensitive experiment or assessment that should not have any mistakes or error while doing the experiment. I recommended that this group of participants use lists, reminders, data books, calendars, etc., as cues to organize their study schedule, class

timetables, exam dates, assignment or project due, meeting schedules, and any other event or plans that needs to be remembered in terms of date, time, or even to get the task done before the due. It is also recommended that this group of participants does shopping in stores with clearly marked areas or helpful workers. For example, if they want to do their groceries shopping, it is advisable that they go to hypermarkets which have labels on top of the rows of goods or any other signs which can help the participant to do their shopping easier and not get tired or annoyed of not founding their shopping goods. Also, they can go to the markets that there are helpers to provide them service and help them to find in the store what they want to buy. As another strategy for this group of participants, I did also recommend that they talk themselves through a task to make sure they are aware of the steps. For example when they are doing any assessment as a part of their research project and experiment in the laboratory, they can provide a list of steps that they have to go through to do the task and while they are doing the task they can talk about it to themselves or even to their other friend in the same laboratory, to make sure that they are on the correct track of doing the procedure. This kind of talking to themselves can help them to stay focused on the task and on the steps that should be taken in order to complete the assessment and experiment that they are working on it.

Session 4 of the intervention. In the fourth intervention session, participant was asked about his or her experience of previous sessions strategies in all the senses including "Visual, Auditory, Taste/Smell, Touch, Movement, and Activity Level" during the last weeks of the first session to the present and the self-report form was reviewed by researcher for more information. I asked the participant to explain his or her experience during the weeks of interventions in terms of the sensory experiences in different contexts and during different activities. As the participants were all

postgraduate students, they were asked to describe their experiences of sensory awareness and sensory interventions especially during the study and working on their projects in different locations such as in the classroom, library, study room, laboratories, and their home. I did ask them to describe for me how the awareness about their sensory patterns could help them to have more satisfaction in terms of their sensory experiences and sensory needs fulfillments. Also, they were asked to share with me if the awareness of their sensory processing patterns and applying the changes and intervention strategies could help them to feel less anxious and depressed during the time, and whether it had any effect on their performances in their study and their concentration on their projects.

3.8.4 Posttest

At the end of the fourth session, which was the last session of intervention, all of the participants completed the two questionnaires of PROMIS® Depression Item Bank and PROMIS® Anxiety Item Bank as the posttest. As the participants were informed previously, we scheduled the follow-up session dates that were conducted one month after posttest. Each student took note about their date and time of follow-up session.

3.8.5 Follow-up

According to the research design, which was repeated measure design, a follow-up test was carried out after four weeks of posttest. All the participants completed again the two questionnaires of PROMIS® Depression Item Bank and PROMIS® Anxiety Item Bank as a follow-up test to determine the remaining effects of sensory processing intervention on their level of depression and anxiety. In the follow-up session, I asked their individual feedback regarding their personal experience of being in the study and experiencing the intervention strategies in their everyday life.

3.9 Control of Threats to Internal Validity

In terms of threats to internal validity the repeated-measures design with one group is not affected by threats related to comparing groups such as threats to selection, treatments, mortality, maturation, regression and interaction with selection (Creswell, 2002). There are some threats that affect one-group studies' internal validity specifically that were controlled in this study.

- *History*. To control threats to history researcher tried to avoid unanticipated events occur while the experiment was in progress. The longer the time lapse between pretest, posttest, and follow-up, the more likely history becomes a threat. For this aim, the study was done in a short period. It was considered to not administrate near or during the students' exams week according to the selected university for the study academic calendar. The stages of data collecting for repeated-measures was considered to be done in fix situational of students' academic schedule. Therefore, it was done in the beginning of the semester and during the lectures, weeks to control effects of anxiety or depression due to a difficult period of exams. The other unanticipated events that were not possible to be controlled during the study period are considered as limitations of the study.

- *Maturation:* Although the threats to maturation seems to be not relevant to the repeated-matures one-group design (Creswell, 2002) but researcher tried to proceed the study in a possible minimum time in terms of whole study and also intervention sessions length to control possible threats to maturation and fatigue.

- *Regression:* One of the ways to control threats to statistical regression is to use a perfectly reliable measurement of the dependent variable to minimize the tendency for extreme scores to regress or move toward the mean. The amount of statistical regression is inversely related to the reliability of the test. For this aim in this study, perfectly reliable questionnaires were selected to avoid a threat to regression.

- *Instrumentation:* To control threats to the instrument, the researcher used the same questionnaire for assessment the variables during pretest, posttest, and follow-up test. In addition, only one examiner administrated the study. Because if two examiners administrate it may cause threats due to different instructions and procedures.

- *Testing:* In a repeated-measures design, threats to testing will influence the study. Due to the nature of the instruments in this study, pretests did not have an effect on the participants' performance in the posttest and follow-up test. According to the questionnaires' structure, the participants were asked to answer the questions based on their experience of depression and anxiety items in the last seven days of the test. In addition, a certain length of time was scheduled for pretest, posttest, and follow-up test to control the threats to testing.

- *Experimental Mortality:* although the threats to mortality are not relevant to one-group designs (Creswell, 2002), but to control this threat even in one-group study, researcher considered a larger number of participants for the study to have the minimum effect size of the sample in the case of any drop.

3.10 Control of Threat to External Validity

Hawthorne Effect: The Hawthorne Effect is a well-documented phenomenon that affects many research experiments in social sciences. It is the process where human subjects of an experiment change their behavior, simply because they are being studied (Creswell, 2002). In experimental studies, assigning a control group is the frequent way to control this threat. In one-group repeated- measures designs, the participants are considered as their own control group during the repeated- measures. To make sure that the possible changes in the dependent variables are because of applied intervention, the researcher created a baseline period (prior to intervention) and a sustainability period (just after the intervention) to show that the changes of dependent variables. The follow-

up test showed that how the intervention affects the level of depression and anxiety in participants as well. In this study, the comparison of pretest2 and posttest, posttest and follow-up test, and pretest1 and follow-up test was considered to investigate the intervention effects on variables.

3.11 Pilot Study

A pilot study was carried out in a public university rather than the selected university of the actual study. The reason was to avoid choosing the same participants in the main research. As the pilot study university had one of the largest numbers of international students, it was the target for the pilot test. A number of 30 international postgraduate students completed the questionnaires of study.

The pilot study was initiated for this investigation to identify any flaws in the procedures designed for this study. It could help me recognize any doubts or confusion in the information given to participants or difficulties with the task planned. The pilot study provided information for me to know whether the participants can understand and complete the research questionnaires with no difficulties. According to the pilot study, there was no difficulty in the understanding of language and the structure of questionnaires for participants. The instrument reliability of internal consistency was investigated in the pilot study and are reported in Table 3.2 and Table 3.3 respectively.

According to the results of the pilot study, International postgraduate students have a higher level of depression and anxiety as compared to the mean of the normal population. Based on PROMIS® Depression and Anxiety instruments, the average score for the normal population is t-score of 50 with a standard deviation of 10. In the pilot study, it was shown that international postgraduate students have a higher level of depression and anxiety compared to normal population. As the mean of depression in the pilot study was 55.68 and the mean of anxiety was 55.93. The descriptive statistics

of the pilot study is reported in Table 3.4. This result shows the importance of studying depression and anxiety in international postgraduate student population.

Table 3.4: Descriptive Statistics of the Pilot Study

	N	Minimum	Maximum	Mean	Std. Deviation
Depression t- Score	30	51.10	62.50	55.68	2.99
Anxiety t- Score	30	50.00	61.10	55.93	3.10
Sensation Seeking	30	27.00	57.00	44.23	7.65
Sensation Avoiding	30	24.00	55.00	40.03	7.54
Sensory Sensitivity	30	25.00	55.00	40.40	7.56
Low Registration	30	18.00	58.00	34.23	8.74

3.12 Data Analysis

Data of the first phase of research was analyzed in Pearson Correlation Coefficient to investigate the correlation between sensory processing pattern and depression and anxiety. Multiple Regression was also used to explore which of the sensory processing patterns are the better predictors of depression and anxiety. Data of the second phase of research was analyzed in Repeated-Measures ANOVA to investigate the effectiveness of sensory processing intervention on depression and anxiety during the time.

Internal consistency of the Adolescent/Adult Sensory Processing Profile, PROMIS® Depression Item Bank, and PROMIS® Anxiety Item Bank was determined by Cronbach's Alpha.

3.13 Timeline and Budget

Permissions to conduct the research was received in early September 2014. For the first phase of the study, which was conducted in classes and laboratories, contacting and arranging the data collection schedule with lecturers was done during September 2014. All the data collection for phase 1 of the study was started on 1st to 22nd October 2014. According to the research design, there were 4 weeks of base-line, which was from 23rd October to 18th November 2014. During this time, data was analyzed and the participants for the second phase of the study were listed and contacted to be invited for the second phase of the study. The four weekly sessions of interventions were held from 19th November to 21st December 2014. The sustainability period was considered four weeks from 22nd December 2014 to 22nd January 2015. After that, the follow-up test was conducted from 23rd January 2015 to 28th January 2015. Data entry, data analysis, and discussion writing were done from February to April 2015.

All the expenses of the research such as purchasing the instruments of the study, printing all the forms and other documents, binding, and transportation cost, refreshments for participants, gifts as appreciation to participants, and all other research costs during the study were paid by the researcher.

3.14 Summary

In this chapter, the research design and methodology was mentioned. It was explained about the instruments that were used in the research to collect data. All the descriptions about the questionnaires were covered in details. As stated, the sample of the study was international students in postgraduate programs in a selected university. The procedure of two phases of the study was described in this chapter. The intervention sessions were explained in details for each of the sessions. In addition, the statistical method for the data analysis in this study was mentioned.

CHAPTER FOUR

FINDINGS

4.1 Introduction

This study included two phases that had different aims. The purpose of the first phase of this research was to examine the relationship between sensory processing patterns and depression and anxiety in international postgraduate students. The second phase of study aimed to investigate the effects of intervention based on sensory processing approach on depression and anxiety level in participants.

In this chapter, findings are prepared to be presented in two sections which are including phase one (Relationship between Sensory Processing Pattern and Depression and Anxiety) and phase two (Sensory Processing Intervention Effects on Depression and Anxiety). In each of the sections, four parts are described:

In the first part, the description of data collection, screening, and cleaning of data is presented. In the second part, the demographic profile of participants in each phase of the study is demonstrated. In the third part, findings of data analysis including descriptive statistics are presented and the suitable Inferential statistics fitted for each of the research questions considering the statistical method assumptions is presented to answer each of the research questions. In order to precede data analysis, the Statistical Package for the Social Sciences (SPSS) version 21 was used.

The findings present obvious explanations for the study questions, which are determined by researcher in the first chapter, are:

1. Is there any significant relationship between sensory processing pattern and depression?

2. Is there any significant relationship between sensory processing pattern and anxiety?

3. Does sensory processing intervention have significant effects on depression?

4. Does sensory processing intervention have significant effects on anxiety?

First and second research questions were answered by running the Pearson Correlation Coefficient. Third and fourth research questions were answered by using Repeated-Measures ANOVA data analysis method.

4.2 Phase One of the Study: Relationship between Sensory Processing Pattern and Depression and Anxiety

The first phase of this study adopts the quantitative approach, non-experimental study, to investigate the relationship between sensory processing patterns (sensation seeking, sensation avoiding, sensory sensitivity, and low registration) and depression and anxiety in the subjects. This phase aims to answer research question one and two of the study.

4.2.1 Data Screening and Cleaning of Phase 1 of the Study

The number of 360 students was targeted for this study. From this sample, two of the questionnaires package were not returned to me by students in the classes, and four participants had not responded all the questionnaires completely. Therefore, the total number of 354 participants was the final sample for phase one of the study. Before you start to analysis the data, it is essential to check the data set for errors.

Data of 354 participants were screened via studying the descriptive data, including the Minimum value, Maximum value, and Mean values for each of the items in questionnaires to make sure that all values are within the range of possible scores for each item and scales. This procedure is essential to detect any mistake in data entry

procedure and to find the outliers. In addition to descriptive data, the boxplot for each item and for the total score for each scale was screened to detect the outliers from the database. An outlier is a case with an extreme value of one variable or a strange combination of scores on two or more variables that it distorts statistics (Tabachnick & Fidell, 2013). According to the boxplot of data in different items and scales, there was no outlier among the scores in the data file.

Missing data is one of the other most persistent problems in data analysis. Its importance is based on the pattern of missing data. It means how much is missing and why it is missing. The pattern of missing data is more serious than the amount missing. Missing data scattered randomly through a data matrix shows the less important problem. Non-randomly missing data are very important no matter how few of them there are because they influence the power to generalizing the findings (Tabachnick & Fidell, 2013).

In this study, the missing data percentage was less than 1.5% and it was missing at random. According to Tabachnick and Fidell (2013), if only a few data points (5% or less) are missing in a random pattern from a large data set, the problems are less serious and almost any procedure for handling missing values yields similar results. In this study, missing data was handled by using EM (Expectation-Maximization) algorithm method.

4.2.2 Demographic Profile of Participants in Phase 1 of the Study

The demographic profile in this study included age, gender, marital status, and nationality. As the sample was students, they were asked to report their CGPA as well. A total number of participants was three hundred and fifty-four postgraduate students from the selected university that completed the questionnaires. From them, the number and valid percent of 244 (68.9%) were male students, and 110 (31.1%) was female

students. In terms of their marital status, 230 (65%) was single, 117 (33.1%) was married, four (1.1%) was divorced, and three (.8%) was in another marital status that includes separated (1 student) and engaged (2 students) status. Table 4.1 is reporting demographic Profile of Participants in Phase 1 of the Study.

The participants were from different nationalities. The number of students from each nationality and the valid percent of them in the sample were in this order from highest percent to lowest: Iranian 70 (19.9%), Pakistani 43 (12.3%), Indonesian 40 (11.4%), Bangladeshi 39 (11.1%), Chinese 30 (8.5%), Iraqi 30 (8.5%), Nigerian 26 (7.4%), Indian 23 (6.6%), Sudanese 13 (3.7%), Japanese 6 (1.7%), Yemeni 6 (1.7%), Syrian 4 (1.1%), Saudi Arabian 4 (1.1%), Philippine 3 (.9%), Bruneian 3 (.9%), Libyan 3 (.9%), Omani 1 (.3%), Maldivian 1 (.3%), Palestinian 1 (.3%), Zimbabwean 1 (.3%), Thai 1 (.3%), Burmese 1 (.3%), Tanzania 1 (.3%), and Cameroon 1 (.3%).

Table 4.1: Demographic Profile of Participants in Phase 1 of the Study

Characteristic	Frequency	Valid Percent
Gender		
Male	244	68.9
Female	110	31.1
Marital Status		
Single	230	65.0
Married	117	33.1
Divorced	4	1.1
Others	3	.8

Note: Other marital status includes separated (1 student) and engaged (2 students)

The age of the participants was measured in years at the time of data collection on phase 1 in the study. Two of the participants did not report their age and 352 of them reported. The average of age of participants was 29.68 years old (*SD* = 5.42), with ages ranging from 20 to 45 years old.

The number of one hundred and ninety of the participants reported their CGPA. The reason that others did not respond to CGPA question was that it was not applicable to them, as they were in the full-research program in their master or Ph.D. The average of CGPA in participants was 3.45 based on the selected university assessment system (*SD* = .33), with CGPA ranging from 2.41 to 4.00. Table 4.2 is reporting descriptive Statistics of age and CGPA of Participants in Phase 1 of the Study.

Table 4.2: Descriptive Statistics of Age and CGPA of Participants in Phase 1 of the Study

	N	Minimum	Maximum	Mean	Std. Deviation
Age	352	20.00	45.00	29.68	5.42
CGPA	190	2.41	4.00	3.45	.33

4.2.3 Data Analysis and Findings of Phase 1 of the Study

The first phase of the study aimed at exploring the relationship between sensory processing patterns (sensation seeking, sensation avoiding, sensory sensitivity, and low registration) and the level of depression and anxiety in participants. Therefore, depression and anxiety are the dependent variables, and sensory processing patterns are the independent variables in the current study. Descriptive statistics of variables in Phase 1 of the Study is reported in Table 4.3.

As it is shown in Table 4.3, the level of depression in participants ranges from 38 to 68, with a Mean value of 52.71 (*SD* = 6.05). According to PROMIS® Depression instrument, Mean for the normal population including different races, ages, and genders in the US was 50 (*SD* = 10) (Pilkonis et al., 2011).

As it is shown in Table 4.3, the anxiety in participants has the Mean value of 53.34 (*SD* = 7.45), and the anxiety level ranges from 31.60 to 70.30. According to

PROMIS® Anxiety instrument, Mean for the normal population including different races, ages, and genders in the US was 50 (*SD* = 10) (Pilkonis et al., 2011).

As it is reported in Table 4.3, the four categories of sensory processing range from 17 to 62. The Mean value of Sensation Seeking is 45.33 (*SD* = 7.42), the Mean value of Sensation Avoiding is 39.45(*SD* = 6.89), the Mean value of Sensory Sensitivity is 37.74 (*SD* = 8.17), the Mean value of Low Registration is 31.88 (*SD* = 6.52)

Table 4.3: Descriptive Statistics of Variables in Phase 1 of the Study

	Minimum	Maximum	Mean	Std. Deviation
Depression t- Score	38.00	68.00	52.71	6.05
Anxiety t- Score	31.60	70.30	53.34	7.45
Sensation Seeking	25.00	62.00	45.33	7.42
Sensation Avoiding	22.00	57.00	39.45	6.89
Sensory Sensitivity	18.00	55.00	37.74	8.17
Low Registration	17.00	49.00	31.88	6.52

4.2.3.1 Preliminary Analysis for Research Question 1and 2

To analyze the data to answer research question 1 and 2, Pearson Correlation Coefficients was used. According to Ho (2013), Correlation is primarily concerned with investigating whether a relationship exists and with determining its magnitude and direction. When two variables vary together, they are said to be correlated. To make sure that data can be analyzed by Pearson Correlation method, the assumptions underlying this inferential statistics method was tested. In this regard, the bivariate normality of distribution, skewness, kurtosis, linearity, and homoscedasticity were examined.

Normality of variables can be assessed by either statistical or graphical methods. Two components of normality are skewness and kurtosis. Skewness has to do with the symmetry of the distribution; a skewed variable is a variable whose mean is not in the

center of the distribution. Kurtosis has to do with the peakedness of a distribution. (Tabachnick & Fidell, 2013, p.79)

While there are tests that can be used to evaluate skewness and kurtosis values, these are too sensitive with large samples. With reasonably large samples, skewness will not create an essential difference in the analysis. Kurtosis can result in an underestimate of the variance, but this risk is also reduced with a large sample. Therefore, investigating the shape of the distribution through histograms or normal Q-Q plot is recommended (Tabachnick & Fidell, 2013; Field, 2013; Pallant, 2011).

Many scales and measures used in the social sciences have scores that are skewed, either positively or negatively. This does not necessarily indicate a problem with the scale, but rather reflects the underlying nature of the construct being measured. Clinical measures of anxiety or depression are often positively skewed in the general population, with most people recording relatively few symptoms of these disorders (Pallant, 2011, p.64).

In this study, skewness investigation was done to ensure normality. Upon visual examination of the Q-Q plot of variables, the data were considered sufficiently normal to allow for parametric testing. Figure 4.1 shows the normal Q-Q plot of t-score for depression and Figure 4.2 shows the normal Q-Q plot of t-score for anxiety.

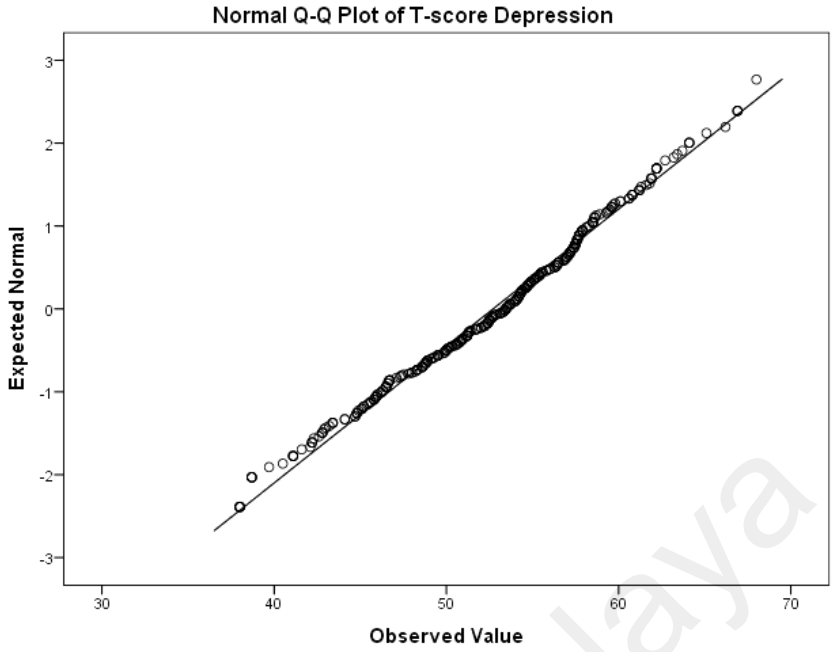

Figure 4.1: Normal Q-Q Plot of t-score for Depression

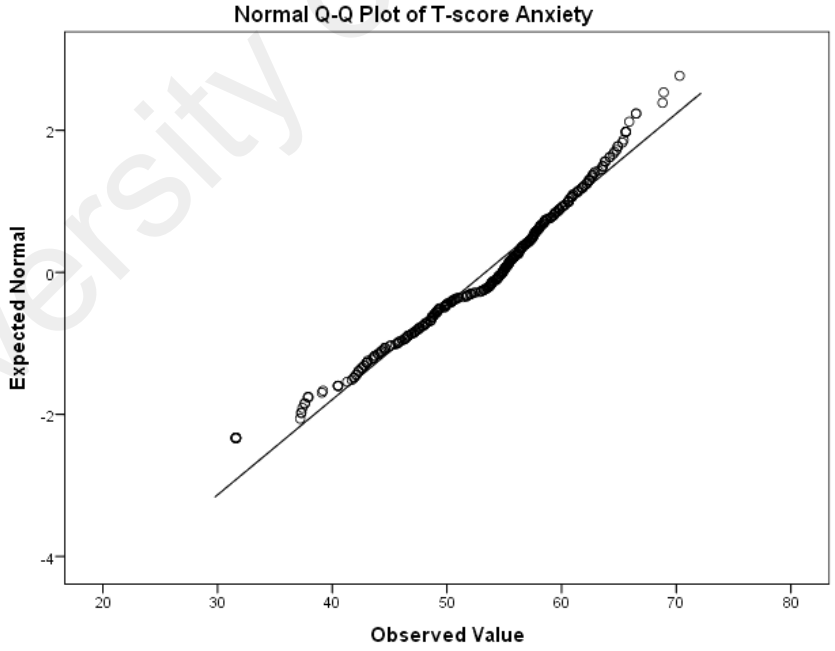

Figure 4.2: Normal Q-Q Plot of t-score for Anxiety

The other assumptions for Pearson Correlation are linearity and homoscedasticity. Linearity means that the relationship between the two variables must be linear, that is, a straight line can most accurately represent the relationship. In addition, homoscedasticity indicates the variability of scores along one variable should remain constant at all values of the other variable. By using Scatterplots the assumptions of linearity and homoscedasticity was tested and it was considered to meet the assumptions to use Pearson correlation to analyses the data for both research question 1 and 2.

4.2.3.2 Data Analysis and Findings for Research Question 1

RQ 1: Is there any significant relationship between sensory processing pattern and depression?

Research question 1 was to investigate the relationship between sensory processing patterns and depression in the participants. To answer this question, Pearson Product Moment Correlation Coefficient statistic method was used. As explained earlier, the data met the underlying assumptions for correlation.

Table 4.4 shows the result of Pearson Correlation for the relationship between sensory processing patterns and depression. The results revealed a significant and negative relationship between sensation seeking and depression, and a significant and positive relationship between three other sensory processing patterns including sensation avoiding, sensory sensitivity, and low registration and depression. This finding is supporting the research hypothesis, which states that there is a significant relationship between sensory processing pattern and the level of depression.

As it is shown in Table 4.4, the correlation between sensation seeking and depression is negative and statistically significant (r = -.12, p = .019). According to Cohen (1988), the correlation is considered as small correlation strength. The

correlation is negative, indicating that higher levels of sensation seeking were associated with lower levels of depression in this study sample. This means that as the participants' sensation seeking increase, their depression level decrease. In another word, if the person has a higher level of sensation seeking, he is experiencing a lower level of depression.

The results indicated that there is a significant and positive correlation between sensation avoiding and depression ($r = .31$, $p < .001$) with medium correlation strength. The correlation is positive, indicating that if sensation avoiding level increases the depression level will be increased as well. In another word, if the person has a higher level of sensation avoiding, he is experiencing a higher level of depression, and if the person has a lower level of sensation avoiding, he is experiencing a lower level of depression.

As it is clear in Table 4.4, there is correlation between sensory sensitivity and depression ($r = .24$, $p < .001$). This correlation strength is small. As the correlation is positive, it indicates that higher levels of sensory sensitivity were associated with higher levels of depression in the participants. This means that as the participants' sensory sensitivity increase, so do their depression level. In another word, if the person has a high level of sensory sensitivity, he is experiencing a high level of depression, and if the person has a low level of sensory sensitivity, he is experiencing a low level of depression.

There was also a significant and positive correlation between low registration and depression ($r = .13$, $p = .009$) with small correlation strength. The correlation is positive, indicating that an increase in low registration will result in an increase in depression level. In another word, if the person has a high level of low registration, he is experiencing a high level of depression, and if the person has a low level of low registration, he is experiencing a low level of depression.

Table 4.4: Pearson Correlation between Sensory Processing Patterns and Depression (N= 354)

	Depression	
	Pearson Correlation	Sig. (2-tailed)
Sensation Seeking	-.125*	.019
Sensation Avoiding	.310**	.000
Sensory Sensitivity	.244**	.000
Low Registration	.138**	.009

* $p < .05$ ** $p < .01$

In addition, Linear Multiple Regression was used to explore the contribution of each sensory processing pattern to the level of depression in participants. As Table 4.5 shows, sensory avoiding ($\beta = .25$, $p < .05$) and sensation seeking ($\beta = .14$, $p < .05$) are making a significant unique contribution to the prediction of the depression. It means that if the person has a high level of sensory avoiding it can be possibly predicted that he will experience a high level of depression. Also, it can be said that if the person has a high level of sensation seeking it can be possibly predicted that he will experience a low level of depression as well.

The other two sensory processing patterns, sensory sensitivity ($\beta = .05$, $p > .05$) and low registration ($\beta = .03$, $p > .05$), are not making a significant contribution to the prediction of depression level in this study. In another word, we cannot conclude that if the person has a high level of sensory sensitivity and low registration, he will experience a high level of depression as well.

Based on these findings we can conclude that sensation seeking and sensation avoiding are better predictors for depression and the conceptual model can be shown in Figure 4.3.

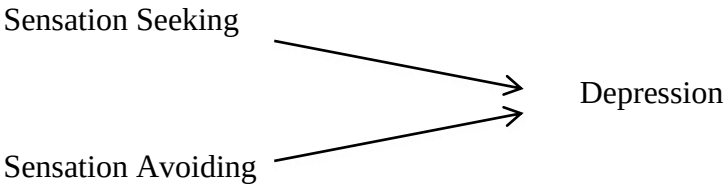

Figure 4.3: Conceptual Model of Sensory Patterns as Predictors for Depression

Table 4.5: Summary of Multiple Regression Analysis for Depression (N = 354)

	Depression				
	B	SE B	β	t	Sig
Sensation Seeking	-.119	.042	-.146**	-2.849	.005
Sensation Avoiding	.226	.065	.258**	3.506	.001
Sensory Sensitivity	.043	.057	.058	.752	.453
Low Registration	.036	.053	.039	.689	.491

Note: R^2 = .118. * $p < .05$ ** $p < .01$

4.2.3.3 Data Analysis and Findings for Research Question 2

RQ 2: Is there any significant relationship between sensory processing pattern and anxiety?

Research question 2 was to investigate the relationship between sensory processing patterns and anxiety in the participants. To answer this question, Pearson Product Moment Correlation Coefficient statistic method was used. The data met the underlying assumptions for correlation.

Table 4.6 shows the result of Pearson Correlation to explore the relationship between sensory processing patterns and anxiety. The results showed a negative relationship between sensation seeking and anxiety but it is not statistically significant. There is a significant and positive relationship between sensation avoiding, sensory sensitivity, low registration, and anxiety. This finding is supporting the research

hypothesis, which states that there is a significant relationship between sensory processing pattern and the level of anxiety.

As it is shown in Table 4.6, the results indicated that there is a significant and positive correlation between sensation avoiding and anxiety (r = .35, p < .001). According to Cohen (1988), it is medium correlation strength. The correlation is positive, indicating that an increase in sensation avoiding level will result in an increase in anxiety level. In another word, if the person has a high level of sensation avoiding, he is experiencing a high level of anxiety, and if the person has a low level of sensation avoiding, he is experiencing a low level of anxiety.

As it is clear in Table 4.6, the correlation between sensory sensitivity and anxiety is positive and statistically significant (r = .35, p < .001). The correlation strength is medium. As the correlation is positive, it indicates that higher levels of sensory sensitivity were associated with higher levels of anxiety in the participants. This means that as the participants' sensory sensitivity increase, so do their anxiety level. In another word, if the person has a high level of sensory sensitivity, he is experiencing a high level of anxiety, and if the person has a low level of sensory sensitivity, he is experiencing a low level of anxiety.

There was also a significant and positive correlation between low registration and anxiety (r = .23, p = .001) with small correlation strength. The correlation is positive, indicating that an increase in low registration will result in an increase in anxiety level. In another word, if the person has a high level of low registration, he is experiencing a high level of anxiety, and if the person has a low level of low registration, he is experiencing a low level of anxiety.

As it is shown in Table 4.6, the correlation between sensation seeking and depression is negative and statistically not significant (r = -.45, p = .399). It indicates that the association between decreasing and increasing the levels of sensation seeking

and anxiety is not statistically significant. In another word, we cannot conclude that if the person has a high level of sensation seeking, he is experiencing a low level of anxiety, and if the person has a low level of sensation seeking, he is experiencing a high level of anxiety.

Table 4.6: Pearson Correlation between Sensory Processing Patterns and Anxiety (N=354)

	Anxiety	
	Pearson Correlation	Sig. (2-tailed)
Sensation Seeking	-.045	.399
Sensation Avoiding	.356**	.000
Sensory Sensitivity	.353**	.000
Low Registration	.238**	.000

* $p < .05$ ** $p < .01$

Linear Multiple Regression was used to explore the contribution of each sensory processing pattern to the level of anxiety in participants. As Table 4.7 shows, sensory avoiding ($\beta = .192$, $p < .05$) and sensory sensitivity ($\beta = .180$, $p < .05$) are making a significant unique contribution to the prediction of the anxiety. It means that if the person has a high level of sensory avoiding it can be possibly predicted that he will experience a high level of anxiety. Also, it can be said that if the person has a high level of sensory sensitivity it can be possibly predicted that he will experience a high level of anxiety as well.

The other two sensory processing patterns, sensation seeking ($\beta = .090$, $p > .05$) and low registration ($\beta = .099$, $p > .05$) are not making a significant contribution to the prediction of anxiety level in this study. It means that if the person has higher or lower level of sensation seeking or low registration it cannot be a predictor for the level of anxiety that the person will experience.

Based on these findings we can conclude that sensation avoiding and sensory sensitivity are better predictors for anxiety and the conceptual model can be shown in Figure 4.4.

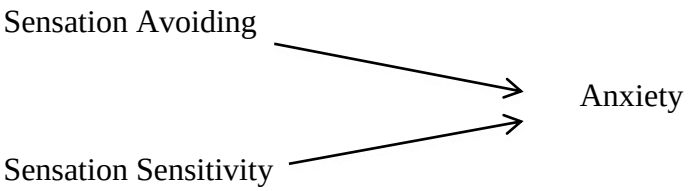

Figure 4.4: Conceptual Model of Sensory Patterns as Predictors for Anxiety

Table 4.7: Summary of Multiple Regression Analysis for Anxiety (N = 354)

	Anxiety				
	B	SE B	β	t	Sig
Sensation Seeking	-.090	.050	-.090	-1.794	.074
Sensation Avoiding	.208	.078	.192**	2.674	.008
Sensory Sensitivity	.164	.068	.180*	2.398	.017
Low Registration	.113	.064	.099	1.770	.078

Note: R^2 = .159. * $p < .05$ ** $p < .01$

4.3 Phase Two of the Study: Effect of Sensory Processing Intervention on Depression and Anxiety

The second phase of the study is also a quantitative approach. It is a quasi-experimental design, using the Repeated-Measures design to investigate the effects of sensory processing intervention on depression and anxiety on the subjects involved in the intervention. This phase aims to answer research question three and four of the study.

4.3.1 Data Screening and Cleaning of Phase 2 of the Study

For the second phase of the study, which is investigating effects of sensory processing intervention on depression and anxiety, one-group Repeated-Measures design was considered. For these aim, 40 students were invited to attend to the study. During the data collecting and interventions, two of the participants dropped from the research. One of the participants left Malaysia to her home country. She could participate only in pretests and was not available to attend to all four of the intervention sessions and posttest. Another participant refused to continue the interventions after the interview session. According to her explanation, her drop was due to difficulties to attend for sessions in terms of time and interest. Therefore, these two participants' data was removed from the phase two of the study. The final total number of sample for phase 2 of the study was 38 participants. Data of these 38 participants were screened via studying the descriptive data, including the Minimum value, Maximum value, and Mean values for each of the items in questionnaires to make sure that all values are within the range of possible scores for each item and scale. In addition, the boxplot of data was screened to detect outliers. There were no outliers and no missing data in the data file for all of the repeated measurements including pretests, posttest, and follow-up test.

4.3.2 Demographic Profile of Participants in Phase 2 of the Study

A total number of participants in phase 2 of the study was thirty-eight students that participated in all intervention sessions and completed the questionnaires in all measurements of pretests, posttest, and follow-up test. From them, the number and valid percent of 24 (63.2%) were male students, and 14 (36.8%) was female students. In terms of their marital status, 20 (52.6%) was single, 15 (39.5%) was married, and three (7.9%) was in another marital status including separated (1 student) and engaged (2

students). Table 4.8 is reporting demographic profile of participants in phase 2 of the Study.

Table 4.8: Demographic Profile of Participants in Phase 2 of the Study

Characteristic	Frequency	Valid Percent
Gender		
Male	24	63.2
Female	14	36.8
Marital Status		
Single	20	52.6
Married	15	39.5
Others	3	7.9

Note: Other marital status includes separated (1 student) and engaged (2 students)

The participants in phase 2 of the study were also from different nationalities. The number of students from each nationality and the valid percent of them in the sample were in this order from highest percent to lowest: Iranian 20 (52.6%), Pakistani 9 (23.7%), Indian 4 (10.5%), Nigerian 2 (5.3%), Iraqi 1 (2.6%), Sudanese 1 (2.6%), and Zimbabwean 1 (2.6%).

The average age of participants was 31.26 years old (*SD* = 5.91), with ages ranging from 20 to 44 years old. Table 4.9 is reporting descriptive statistics of the age of participants in phase 2 of the study.

Table 4.9: Descriptive Statistics of Age of Participants in Phase 2 of the Study (N = 38)

	Minimum	Maximum	Mean	Std. Deviation
Age	20.00	44.00	31.26	5.91

4.3.3 Data Analysis and Findings of Phase 2 of the Study

The second phase of the study aimed at investigating the effect of sensory processing intervention on depression and anxiety. The research design for this phase is one-group Repeated-Measures design.

To answer research questions 3 and 4, Repeated-Measures (within-subject) analysis of variance with post hoc testing was used to determine effects of the time. For this aim, four comparisons were explored:

1. TEST 1 (Pretest 1) – TEST 2 (Pretest 2) (baseline): Do depression and anxiety levels change over a four-week period without intervention?

2. TEST 2 (Pretest 2) –Test 3 (Posttest): Is sensory processing intervention effective?

3. TEST 3 (Posttest) –TEST 4 (Follow-up test): Are effects of intervention sustained without contact?

4. TEST 1 (Pretest 1) –TEST 4 (Follow-up test): Are there overall changes in depression and anxiety level from first to the last meeting?

4.3.3.1 Preliminary Analysis for Research Question 3 and 4

To analyze the data to answer research question 3 and 4, Repeated-Measures ANOVA was used. To make sure the possibility of using this statistics method, the assumptions underlying Repeated-Measures ANOVA were tested. Repeated-Measures ANOVA assumption includes the dependent variable should be measured at continues level. Independent variable should involve at least two categorical, related groups or matched pairs. It indicates that the same subjects are participating in both groups. There should be no significant outliers in the groups. The dependent variable should have a normal distribution. Moreover, the variances of the differences between all combinations of related groups must be equal. This assumption is known as sphericity.

All the assumptions underlying Repeated-Measures ANOVA was checked and it indicated the possibility of using Repeated-Measures ANOVA for phase 2 of study which is included research questions 3 and 4. The assumptions of normality and sphericity are reported in detail for each of the variables.

Test of normality was done through Kolmogorov-Smirnov and Shapiro-Wilk. Skewness and kurtosis were also explored. The result from the test of normality showed that the assumption of normality is met and can precede data analysis using parametric statistics (Table 4.12 and Table 4.19).

Another assumption to check before using Repeated- Measures ANOVA, is the sphericity. The sphericity assumption is tested by Mauchly's test as part of the Repeated-Measures analysis. If the Mauchly's test result is significant, then there are differences between pairs of variables and it means that it does not meet Repeated-Measures assumptions. In this study, the Mauchly's test result was not significant. Therefore, the assumption of Repeated-Measures ANOVA was met and it can be used it to analyze the data (Table 4.13 and Table 4.20). All the results of testing assumptions are reported in the section of each of research questions 3 and 4.

4.3.3.2 Data Analysis and Findings for Research Question 3

RQ 3: Does sensory processing intervention have a significant effect on depression?

Research question 3 was about to investigate the effect of sensory processing intervention on depression level in the participants. To answer this question, data was analyzed using Repeated-Measures ANOVA statistics method. In this part, descriptive statistics of depression is reported in different measurements during the period of Repeated-Measures designed study (Table 4.10). Test of normality was performed. The underlying assumption for Repeated-Measures using Mauchly's Test of Sphericity is

mentioned (Table 4.13). In addition, the findings of data analysis using Repeated-Measures (within-subject) analysis of variance (Table 4.14 and Table 4.15), and the Mean scores graph for the outcomes of depression across a testing period is reported.

Table 4.10: Descriptive Statistics of Depression in Different Measurements of the Study (N = 38)

Depression Measurements	Minimum	Maximum	Mean	Std. Deviation
TEST 1 (Pretest1)	53.70	63.40	57.94	2.45
TEST 2 (Pretest2)	49.40	65.50	57.65	3.89
TEST 3 (Posttest)	33.50	57.90	50.07	4.64
TEST 4 (Follow-up test)	45.10	57.50	50.61	3.12

As it is shown in Table 4.10, the Mean for depression in TEST 1 (*M* = 57.94, *SD* = 2.45) and TEST 2 (*M* = 57.65, *SD* = 3.89) is higher that Mean of depression in TEST 3 (*M* = 50.07, *SD* = 4.64) and TEST 4 (*M* = 50.61, *SD* = 3.12). It shows that depression has decreased from pretests to posttest and follow-up test during the time.

Before analyzing the data, the normality of distribution was checked to make sure that it is possible to use parametric statistics. Table 4.11 shows the skewness and kurtosis of the depression in four measurements during the time in the study.

Table 4.11: Skewness and Kurtosis Statistics of Depression in Repeated Measures of Study (N = 38)

	Skewness		Kurtosis	
Depression Measurements	Statistic	Std. Error	Statistic	Std. Error
TEST 1 (Pretest1)	.60	.38	.016	.75
TEST 2 (Pretest2)	.19	.38	-.33	.75
TEST 3 (Posttest)	-1.2	.38	3.05	.75
TEST 4 (Follow-up test)	.36	.38	-.44	.75

In addition, test for normality was performed using the Kolmogorov-Smirnov Test and the Shapiro-Wilk. The Kolmogorov-Smirnov statistic and the Shapiro-Wilk statistic are tests for normality, and if their significance levels are greater than .05, then normality are assumed. Although underlying nature of depression makes the distribution of scores skewed (Pallant, 2011), but as it is shown in Table 4.12, for the Kolmogorov-Smirnov and the Shapiro-Wilk tests, the computed significance in four of the tests of depression in a period of study are > .05 considering the Kolmogorov-Smirnov or the Shapiro-Wilk tests. Therefore, normality can be assumed for the data distribution in the study and it is possible to use parametric analysis methods.

Table 4.12: Tests of Normality of Depression in Repeated Measures of Study (N = 38)

Depression Measurements	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
TEST 1 (Pretest1)	.14	38	.04	.94	38	.05
TEST 2 (Pretest2)	.10	38	.20	.97	38	.67
TEST 3 (Posttest)	.11	38	.20	.92	38	.01
TEST 4 (Follow-up test)	.10	38	.20	.97	38	.45

To explore the sphericity assumption, the Mauchly's Test was performed. Table 4.13 shows the result of Mauchly's Test of Sphericity.

Table 4.13: Mauchly's Test of Sphericity in Depression variable During the Time (N=38)

Within-Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.
Time	.763	9.644	5	.086

The results from the analysis of Mauchly's Test of Sphericity in depression variable during the time indicate that the Mauchly's Test of Sphericity is not significant (p = .086). Therefore, the Tests of within Subjects Effects table can be interpreted from the analysis of Repeated-Measures ANOVA output. Table 4.14 Shows the Repeated-Measures ANOVA analysis within-subjects effects in depression variable in different time points of study.

Table 4.14: Tests of Within-Subjects Effects in Repeated- Measures ANOVA for Depression During the Time (N = 38)

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power
Time	Sphericity Assumed	2120.02	3	706.67	68.92	.00	.65	206.762	1.000
	Greenhouse-Geisser	2120.02	2.57	822.35	68.92	.00	.65	177.677	1.000
	Huynh-Feldt	2120.02	2.78	760.44	68.92	.00	.65	192.142	1.000
	Lower-bound	2120.02	1.00	2120.02	68.92	.00	.65	68.921	1.000
Error (Time)	Sphericity Assumed	1138.13	111	10.25					
	Greenhouse-Geisser	1138.13	95.38	11.93					
	Huynh-Feldt	1138.13	103.15	11.03					
	Lower-bound	1138.13	37.00	30.76					

As it is shown in Table 4.14, a Repeated-Measures ANOVA by assuming sphericity determined that mean depression differed statistically significantly between time points (F (3,111) = 68.92, p < .001). This result informed that there is an overall significant difference in means in the four measures of depression during the TEST 1 (pretest1), TEST 2 (pretest2), TEST 3 (posttest), and TEST 4 (follow-up test). This finding is supporting the research hypothesis, which states that sensory processing intervention has significant effects on depression.

As the within-subjects variable Time is statistically significant, results from the repeated contrast are used to determine which time point of tests is contributed to the overall difference of depression score during the time. These results are presented as Tests of Within-Subjects Contrasts (Table 4.15). In addition, to indicate that where those differences occurred, the Bonferroni post hoc test was performed. The results of the Bonferroni post hoc test presents to allow us to discover which specific means differed (Table 4.16)

Table 4.15: Tests of Within-Subjects Contrasts in Repeated- Measures ANOVA for Depression during the Time (N = 38)

Source	Time	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power
Time	Level 1 vs. Level 2	3.24	1	3.24	.24	.62	.00	.24	.078
	Level 2 vs. Level 3	2184.25	1	2184.25	80.03	.00	.68	80.03	1.00
	Level 3 vs. Level 4	11.16	1	11.16	.56	.45	.015	.56	.11
Error (Time)	Level 1 vs. Level 2	481.10	37	13.00					
	Level 2 vs. Level 3	1009.75	37	27.29					
	Level 3 vs. Level 4	735.39	37	19.87					

Table 4.16: Pairwise Comparisons in Repeated- Measures ANOVA for Depression during the Time (N = 38)

(I) Time	(J) Time	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
1	2	.29	.58	1.00	-1.33	1.92
	3	7.87*	.80	.00	5.64	10.10
	4	7.33*	.63	.00	5.55	9.10
2	1	-.29	.58	1.00	-1.92	1.33
	3	7.58*	.84	.00	5.21	9.94
	4	7.03*	.78	.00	4.86	9.21
3	1	-7.87*	.80	.00	-10.10	-5.64
	2	-7.58*	.84	.00	-9.94	-5.21
	4	-.54	.72	1.00	-2.55	1.47
4	1	-7.33*	.63	.00	-9.10	-5.55
	2	-7.03*	.78	.00	-9.21	-4.86
	3	.54	.72	1.00	-1.47	2.55

Note: Time 1= TEST 1 (Pretest 1), Time 2 = TEST 2 (Pretest 2), Time 3 = TEST 3 (Posttest), Time 4 = TEST 4 (Follow-up test)

* $p < .05$

Results reveal significance level for differences between the individual time points in depression variable in participants. It shows that there is a significant difference in depression mean between pretest 2 (M = 57.65, SD = 3.89) and posttest (M = 50.07, SD = 4.64) which is exactly before interventions and immediately after interventions, F (1,37) = 80.03, $p < .001$, partial $\eta 2 = .68$. In addition there is a significant difference in depression mean between pretest 1 (M = 57.94, SD = 2.45) and follow-up test (M = 50.61, SD = 3.12) which is before interventions and 4 weeks after interventions as sustainability duration. From the Mean Difference, it shows that there is significantly reduce in depression level at this time points. There is no significant

difference between pretest 1 (*M* = 57.94, *SD* = 2.45) and pretest 2 (*M* = 57.65, *SD* = 3.89) which was the baseline of study that participants receive interventions and they were not in contact with the researcher.

Therefore, we can conclude that sensory processing intervention causes a statistically significant reduction in depression level in participants from first meeting (before intervention sessions) to exactly after four weeks of intervention sessions, and the effects sustained after the four-week period in a follow-up test. However, the reduction in depression level was not continuous from posttest (immediately after intervention sessions) to follow-up test (four weeks after intervention sessions). Figure 4.5 shows the profile plot of differences of estimated marginal means of depression in time points.

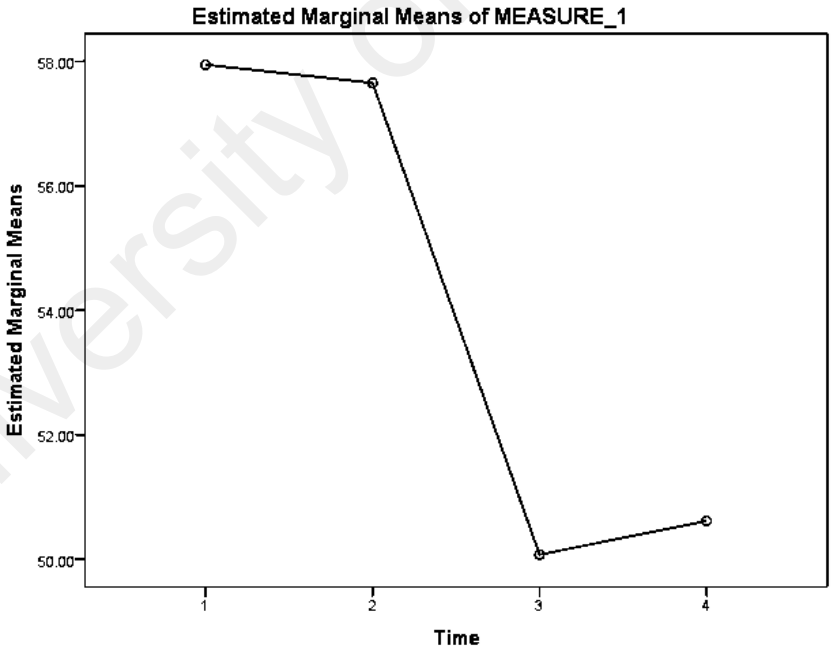

Figure 4.5: Profile Plot of Differences of Estimated Marginal Means of Depression in Time Points

Note: Time 1 = TEST 1 (Pretest 1), Time 2 = TEST 2 (Pretest 2), Time 3 = TEST 3 (Posttest), Time 4 = TEST 4 (Follow-up test).

4.3.3.3 Data Analysis and Findings for Research Question 4

RQ 4: Does sensory processing intervention have a significant effect on anxiety?

Research question 4 was about to investigate the effects of sensory processing intervention on anxiety level in the participants. To answer this question, data was analyzed using Repeated-Measures ANOVA statistics method. In this part, descriptive statistics of anxiety is reported in different measurements during the period of Repeated-Measures designed study (Table 4.17). Test of normality was performed. The underlying assumption for Repeated-Measures using Mauchly's Test of Sphericity is mentioned (Table 4.20). In addition, the findings of data analysis using Repeated-Measures (within-subject) analysis of variance (Table 4.21 and Table 4.22), and the Mean scores graph for the outcomes of anxiety across testing periods is reported.

Table 4.17: Descriptive Statistics of Anxiety in Different Measurements of the Study (N=38)

Anxiety Measurements	Minimum	Maximum	Mean	Std. Deviation
TEST 1 (Pretest1)	50.50	66.50	59.70	3.27
TEST 2 (Pretest2)	46.20	71.60	59.51	4.58
TEST 3 (Posttest)	46.40	60.20	53.25	3.66
TEST 4 (Follow-up test)	43.70	59.00	51.31	3.80

As it is shown in Table 4.17, the Mean for anxiety in TEST 1 (M = 59.70, SD = 3.27) and TEST 2 (M = 59.51, SD = 4.58) is higher that Mean of anxiety in TEST 3 (M = 53.25, SD = 3.66) and it continues decreasing in TEST 4 (M = 51.31, SD = 3.80). It shows that anxiety has decreased from pretests to posttest and follow-up test in period of testing.

Before analyzing the data, the normality of distribution in anxiety data was checked to make sure that it is possible to use parametric statistics. Table 4.18 Shows

the skewness and kurtosis of the anxiety in four measurements during the time in the study.

Table 4.18: Skewness and Kurtosis Statistics of Anxiety in Repeated Measures of Study (N = 38)

	Skewness		Kurtosis	
Anxiety Measurements	Statistic	Std. Error	Statistic	Std. Error
TEST 1 (Pretest1)	-.096	.383	.604	.750
TEST 2 (Pretest2)	-.084	.383	1.624	.750
TEST 3 (Posttest)	.310	.383	-.742	.750
TEST 4 (Follow-up test)	.201	.383	-.520	.750

Test for normality was also applied by using the Kolmogorov-Smirnov Test and the Shapiro-Wilk . As it is shown in Table 4.19, for both of the Kolmogorov-Smirnov and the Shapiro-Wilk tests, the computed significance in four of the tests of anxiety in a period of study are > .05. Therefore, it is possible to consider that the data distribution has met the normality assumption and it is possible to use parametric analysis methods.

Table 4.19: Tests of Normality of Anxiety in Repeated Measures of Study (N = 38)

	Kolmogorov-Smirnov			Shapiro-Wilk		
Anxiety Measurements	Statistic	df	Sig.	Statistic	Df	Sig.
TEST 1 (Pretest1)	.10	38	.20	.97	38	.38
TEST 2 (Pretest2)	.09	38	.20	.97	38	.58
TEST 3 (Posttest)	.09	38	.20	.96	38	.22
TEST 4 (Follow-up test)	.08	38	.20	.97	38	.65

To explore the sphericity assumption, the Mauchly's Test was performed. Table 4.20 shows the result of Mauchly's Test of Sphericity.

Table 4.20: Mauchly's Test of Sphericity in Anxiety variable during the Time (N = 38)

Within-Subjects Effect	Mauchly's W	Approx. Chi-Square	Df	Sig.
Time	.81	7.53	5	.18

The results from the analysis of Mauchly's Test of Sphericity in anxiety variable during the time indicate that the Mauchly's Test of Sphericity is not significant (p = .18). Therefore, the Tests of within Subjects Effects table can be interpreted from the analysis of Repeated-Measures ANOVA output. Table 4.21 Shows the Repeated-Measures ANOVA analysis in anxiety variable in different time points of study.

Table 4.21: Tests of Within-Subjects Effects in Repeated- Measures ANOVA for Anxiety During the Time (N = 38)

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power
Time	Sphericity Assumed	2110.42	3	703.47	68.33	.00	.64	204.99	1.00
	Greenhouse-Geisser	2110.42	2.69	784.46	68.33	.00	.64	183.83	1.00
	Huynh-Feldt	2110.42	2.92	722.41	68.33	.00	.64	199.62	1.00
	Lower-bound	2110.42	1.00	2110.42	68.33	.00	.64	68.33	1.00
Error (Time)	Sphericity Assumed	1142.75	111	10.29					
	Greenhouse-Geisser	1142.75	99.54	11.48					
	Huynh-Feldt	1142.75	108.09	10.57					
	Lower-bound	1142.75	37.00	30.88					

As it is shown in Table 4.21, a Repeated-Measures ANOVA by assuming sphericity determined that mean anxiety differed statistically significantly between time points (F (3,111) = 68.33, p < .001). This result informed that there is an overall

significant difference in means in the four measures of anxiety during the TEST 1 (pretest1), TEST 2 (pretest2), TEST 3 (posttest), and TEST 4 (follow-up test). This finding is supporting the research hypothesis, which states that sensory processing intervention has significant effects on anxiety.

As the within-subjects variable Time is statistically significant, results from the repeated contrast are used to determine which time point of tests is contributed to the overall difference of anxiety score during the time. These results are reported as Tests of Within-Subjects Contrasts (Table 4.22). In addition, to indicate that where those differences happened, the Bonferroni post hoc test was performed. The results of the Bonferroni post hoc test presents to allow us to discover which specific means differed (Table 4.23).

Table 4.22: Tests of Within-Subjects Contrasts in Repeated- Measures ANOVA for Anxiety during the Time (N = 38)

Source	Time	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power
Time	Level 1 vs. Level 2	1.25	1	1.25	.06	.80	.00	.06	.057
	Level 2 vs. Level 3	1493.13	1	1493.13	97.62	.00	.72	97.62	1.00
	Level 3 vs. Level 4	141.77	1	141.77	9.14	.00	.19	9.14	.83
Error (Time)	Level 1 vs. Level 2	776.65	37	20.99					
	Level 2 vs. Level 3	565.88	37	15.29					
	Level 3 vs. Level 4	573.54	37	15.50					

Table 4.23: Pairwise Comparisons in Repeated- Measures ANOVA for Anxiety during the Time (N = 38)

(I) Time	(J) Time	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
1	2	.18	.74	1.00	-1.89	2.25
	3	6.45*	.74	.00	4.38	8.51
	4	8.38*	.78	.00	6.18	10.57
2	1	-.18	.74	1.00	-2.25	1.89
	3	6.26*	.63	.00	4.50	8.03
	4	8.20*	.84	.00	5.83	10.56
3	1	-6.45*	.74	.00	-8.51	-4.38
	2	-6.26*	.63	.00	-8.03	-4.50
	4	1.93*	.63	.02	.15	3.71
4	1	-8.38*	.78	.00	-10.57	-6.18
	2	-8.20*	.84	.00	-10.56	-5.83
	3	-1.93*	.63	.02	-3.71	-.15

Note: Time 1 = TEST 1 (Pretest 1), Time 2 = TEST 2 (Pretest 2), Time 3 = TEST 3 (Posttest), Time 4 = TEST 4 (Follow-up test)

* $p < .05$

Results reveal significance level for differences between the individual time points in anxiety variable in participants. It shows that there is a significant difference in anxiety mean between pretest 2 (M = 59.51, SD = 4.58) which is exactly before interventions, and posttest (M = 53.25, SD = 3.66) which is immediately after interventions, F (1,37) = 97.62, $p < .001$, partial η2 = .72. There is a significant difference in anxiety mean between pretest 1 (M = 59.70, SD = 3.27) which is before interventions, and follow-up test (M = 51.31, SD = 3.80) which is 4 weeks after interventions as sustainability duration. In addition, there is a significant difference in anxiety mean between posttest (M = 53.25, SD = 3.66) and follow-up test (M = 51.31, SD = 3.80) that shows continuity of effect F (1,37) = 9.14, $p < .001$, partial η2 = .19.

From the Mean Difference, it shows that there is significantly reduce in anxiety level at this time points. There is no significant difference between pretest 1 (M = 59.70, SD = 3.27) and pretest 2 (M = 59.51, SD = 4.58) which was the baseline of study that participants receive interventions and they were not in contact with the researcher.

Therefore, we can conclude that sensory processing intervention causes a statistically significant reduction in anxiety level in participants from first meeting (before intervention sessions) to exactly after four weeks of intervention sessions, and the effects sustained after the four-week period in a follow-up test. In addition, the reduction in anxiety level was continuous from posttest (immediately after intervention sessions) to follow-up test (four weeks after intervention sessions). Figure 4.6 is showing the profile plot of differences of estimated marginal means of anxiety in time points.

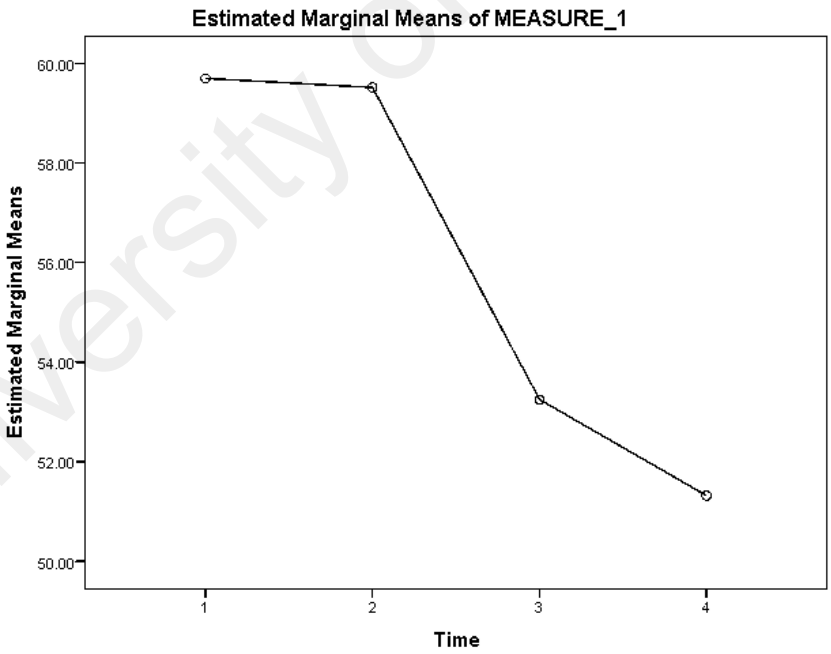

Figure 4.6: Profile Plot of Differences of Estimated Marginal Means of Anxiety in Time Points

Note: Time 1 = TEST 1 (Pretest 1), Time 2 = TEST 2 (Pretest 2), Time 3 = TEST 3 (Posttest), Time 4 = TEST 4 (Follow-up test).

4.4 Summary

In this chapter, the finding of the research was reported in several parts. For each of the research phases, the description of data screening, and cleaning was reported. The demographic profile of participants in each phase of the study was described. Then, findings of data analysis including descriptive statistics were reported. The underlying assumptions for the inferential statistical methods for each of the research questions were tested and after that, the data analysis proceeded. Finding of each research questions were reported separately.

As finding revealed, there was a positive significant relationship between some of the sensory processing patterns (sensation avoiding, sensory sensitivity, and low registration) and depression and anxiety. The results showed that there is a negative significant relationship between sensation seeking and depression, but the relationship between sensation seeking and anxiety was not statistically significant.

The results of the study revealed that sensory processing interventions had a significant effect on reducing depression and anxiety during the time. However, the reduction of anxiety level continued even a month after the intervention sessions.

CHAPTER FIVE

DISCUSSION AND CONCLUSION

5.1 Introduction

The first purpose of this study was to explore sensory processing relationship with depression and anxiety in university students. Moreover, the second purpose of the study was examining the effect of sensory processing intervention on depression and anxiety in university students. The current research is the first known attempt in this aim.

In this chapter, firstly, a summary of findings is presented, secondly, findings is discussed according to each of research questions. Thirdly, implications are mentioned by targeting of who can benefit from this research finding presents. Fourthly, some suggestions and recommendations for future studies are mentioned.

5.2 Summary of the Findings

After descriptive and inferential analysis of data, findings from the first phase of the study, which was exploring the relationship between sensory processing patterns and depression and anxiety, indicated that there was a significant relationship between sensory processing patterns and depression. There was a positive significant relationship between sensation avoiding and depression, the positive significant relationship between sensation avoiding and depression, and the positive significant relationship between low registration and depression. However, there was a negative significant relationship between sensation seeking and depression.

Finding showed that there was a positive significant relationship between sensation avoiding and anxiety, the positive significant relationship between sensory sensitivity and anxiety, and the positive significant relationship between low registration

and anxiety. Nevertheless, the relationship between sensation seeking and anxiety was not statistically significant.

The results of the second phase of the study revealed that sensory processing interventions had a significant effect on reducing depression and anxiety level during the time. There was an overall significant difference in means in the four measures of depression during the TEST 1 (pretest1), TEST 2 (pretest2), TEST 3 (posttest), and TEST 4 (follow-up test). In addition, the mean value of anxiety differed statistically significantly between time points.

Results showed that depression level was reduced during the intervention sessions and this reduction remained to compare to the depression level before intervention sessions. However, the reduction of anxiety level steadily continued even a month after the intervention sessions in the follow-up test.

5.3 Discussion

In this part, the findings for each of research questions is discussed separately.

5.3.1 Relationship between Sensory Processing Pattern and Depression

RQ 1: Is there any significant relationship between sensory processing pattern and depression?

Finding of first research question indicated that three of sensory processing patterns including sensation avoiding, sensory sensitivity, and low registration had a positive correlation with depression. However, there was a negative correlation between sensation seeking and depression. It means that if the international student has a high level of sensation avoiding, sensory sensitivity, and low registration he is experiencing a high level of depression, and if the international student has a high level of sensation seeking, he is experiencing a low level of depression.

These results are in line with the findings of studies by Kimball et al. (2012), Engel-Yeger and Dunn (2011a), Liss et al. (2008), Aron et al. (2005), where all found that sensory processing sensitivity is in a positive relationship with depression and negative affect.

In line with previous studies, individuals who have sensitivity to sensory stimuli in their environment are more likely to experience negative psychological symptoms such as depression (Aron & Aron, 1997; Brindle et al., 2015). Also as Liss et al. (2008) mentioned, the two potential elements of sensory processing sensitivity, which are ease of excitation, and low sensory threshold are positively related to depression especially in the context of a difficult home environment. Moreover, people with high sensory sensitivity are more likely to experience negative psychological symptoms compared to individuals with normative sensory processing. In addition, the results are in line with the findings of previous studies that stated high sensory processing sensitivity is associated with more frequent symptoms of ill health (Benham, 2006), and reduced quality of life (Pfeiffer et al., 2014).

Considering this point that sensory sensitivity and sensation avoiding are two of the sensory processing patterns, which are in the low neurological threshold sensory quadrants, this study is also consistent with previous studies that found a relationship between low sensory threshold and depression and other psychological difficulties. According to Ahadi and Basharpoor (2010) and Liss et al. (2008), the low sensory threshold is related to mental health.

Interestedly, in addition to participants with higher scores in the low neurological threshold quadrants (sensory sensitivity and sensation avoiding), participants with high level in low registration quadrant, which is considered to belong to the high neurological threshold quadrant, showed also a higher level of depression. According to previous researches, depressive disorders may be associated with higher

expressions of low registration and lower expressions of sensation seeking (Dickens et al., 2003; Rotenberg & Cholostoy, 2004). Similarly, in this research, sensation seeking and depression had a negative significant relationship.

As Raine et al. (2002) mentioned sensory seeking pattern may not be a maladaptive pattern of sensory processing, and stimulation seeking can be considered as a possibly adaptive trait. Moreover, sensory seeking may be adaptive because seekers put on control over their environments. Jerome and Liss (2005) also stated that sensory seeking pattern relates to secure attachment, which is considered as one of the mental health related variables. In previous literature, high levels of sensation seeking as a psychological trait had a relationship with the mania scale of the Minnesota Multiphasic Personality Inventory (Carton et al., 1995). According to American Psychiatric Association (2013) in DSM–5, mania and depression have two different criteria, which are in contrast with each other.

From another point of view, according to Beck's cognitive model of psychopathology, biased information processing from internal or external sources can cause dysfunctional beliefs in person. These dysfunctional beliefs may distort person's interpretation of his experience and its consequence is cognitive distortions. In the result of cognitive distortions, maladaptive emotions and behaviors occur. Therefore, the result is a psychopathological state in the person (Beck, 1979). According to this model, a specific situation, or stressors, such as an event relating to losses or failure may activate the depressive schema in the person (Beck & Clark, 1988). Based on this, possible reasons that can be related to this study findings is the experience of losses and failure in the participants with a higher level of low registration, sensory sensitivity, and sensation avoiding.

International students with low registration pattern may miss some of the environmental stimuli because of their high neurological threshold and their passive

behavioral response. They may be somehow unconscious to ongoing activity around them and they may be the last person who gets aware of happenings in their environment. Because of these criteria of their sensory processing pattern, they may experience and feel losses and failure after lately noticing what had happened around them or after other people make them aware of the happenings in their environments. This kind of experiencing failure or losses may activate the depressive schema in them and cause them to have a high level of depression in self-report depression scales.

Based on Beck's cognitive model, depressed individuals have schemas involving themes of personal deficiency, self-blame, failure, worthlessness, loss, and negative expectations dominated. They bias toward selectively processing negative self-referent information, minimizing or ignoring positive materials, and making evaluations about personally relevant events as negative, inescapable, inclusive, and absolutistic (Beck & Clark, 1988). In this regard, it is possible to state that international students with sensory processing patterns that have a low neurological threshold (sensory sensitivity and sensation avoiding), may find themselves more overwhelmed in most of the situations because of receiving many stimuli from their environment. As they find themselves overwhelmed more than other people and in more environments, they may conclude this biased negative self-referent thinking, personal deficiency, and self-blame.

5.3.2 Relationship between Sensory Processing Pattern and Anxiety

RQ 2. Is there any significant relationship between sensory processing pattern and anxiety?

Finding of second research question indicated that three of sensory processing patterns including sensation avoiding, sensory sensitivity, and low registration had a positive correlation with anxiety. There was no significant correlation between sensation seeking and anxiety. It means that if the international student has a high level

of sensation avoiding, sensory sensitivity, and low registration he is experiencing a high level of anxiety and by increasing the level of these three patterns, the anxiety level increases as well. However, for the sensation seeking pattern we cannot confirm and say that if sensation seeking level increases, the anxiety level decreases. These results are somehow in line with the findings of studies by Ben-Avi et al. (2012), Engel-Yeger and Dunn (2011b), Ahadi and Basharpoor (2010), Hofmann & Bitran (2007), Benham (2006), and Jerome and Liss (2005).

The result of this study is consistent with the findings of Engel-Yeger and Dunn (2011). They also stated that in their study the strongest correlations were found between anxiety and sensory sensitivity and sensation avoiding, which are both low neurological threshold patterns. In the current study, these two sensory processing patterns showed a higher correlation with anxiety level in participants comparing to other sensory processing patterns. Similar to the current study, they also found a positive relationship between low registration and anxiety.

The findings of this study are in line with Liss et al. (2008) study. As they identified two potential components of sensory processing sensitivity, which are ease of excitation and low sensory threshold; both are positively related to anxiety. In addition, these sensory sensitivity components have been related to neurotic personality traits (Ahadi & Basharpoor, 2010). Moreover, Kimbal et al. (2012) mentioned that sensation avoiding correlated with social introversion, low registration with alienation, thinking disorder, and self-depreciation, and sensory sensitivity with anxiety.

Similarly, the previous studies showed that highly sensitive people experience higher levels of anxiety and high sensory processing sensitivity is associated with greater perceived stress and more frequent symptoms of ill health (Benham, 2006). In another study in adults, a positive relationship was found between anxiety and

environmental stimuli. They reported their anxiety related to their sensitivity to environmental stimuli (Neal et al., 2002).

Findings are consistent with the previous study which was done in the group of adults with OCD. Rieke and Anderson (2009) found that the mean scores in sensory sensitivity, sensation avoiding, and low registration were higher in the group of participants with OCD comparing the mean score of normal participants. As according to American Psychiatric Association (2000) in DSM–IV–TR, OCD is considered as one type of anxiety disorders, and in DSM-5, anxiety is attached to CBT experience. So, the findings of this study are in the same line to their findings as well. Moreover, according to previous studies comorbid anxiety disorders and attention deficit disorders were also prevalent in the people in OCD group, both of which involve conditions that may be associated with lower neurological thresholds and greater expressions of sensation avoiding or sensory sensitivity (Dunn & Bennett, 2002; Neal et al., 2002).

Previous research on sensory processing sensitivity (Aron et al., 2005) has indicated that highly sensitive individuals with negative childhood environments may more shy than non-sensitive individuals. Moreover, Hofmann and Bitran (2007) mentioned that harm avoidance is highly associated with sensory processing sensitivity. Pfeiffer and Kinnealey (2003) also found a correlation between sensory defensiveness and anxiety and found that occupational therapy intervention related to sensory processing resulted in a significant decrease in sensory defensiveness and anxiety. According to Beck's model, defensiveness is one of the cognitions that underlie anxiety and the harm avoidance is what anxious people are struggling to do.

In Beck's cognitive psychopathology model, cognitive schemas related to danger and harm to personal well-being is underlying the experience of anxiety. At the core of anxiety is a sense of defenselessness. Anxious individuals mentally focus on danger and harm because of the activation of the maladaptive cognitive schemas,

leading them to indiscriminately interpret any environmental events as being dangerous (Beck et al., 1985). According to the cognitive model, people have a tendency to exaggerate and enlarge the amount of danger that they may feel in fearful situations. That is the reason that they feel danger and harm even if the situation and input are very less dangerous and harmful.

Considering Beck's cognitive model of psychopathology for anxiety, individuals with sensory processing patterns with a low neurological threshold (sensory sensitivity and sensation avoiding) are receiving most of the stimuli from their environment because of their low thresholds. They can notice even the small amount of stimuli. Therefore, they may more feel themselves the target of harm or danger.

In this study, low registration and anxiety were in a positive relationship. Adults with low registration sensory pattern are the group that notices the stimuli from the environment later than others do. Maybe when they notice the stimuli, they are at maximum amount and it makes the person feel more in danger and harm that brings anxiety as well. Besides that, low registration and sensory sensitivity are two of the sensory patterns, which are in the passive self-regulation behavioral responses. It means that they are not actively controlling the environment in terms of providing their satisfaction level of input. They are passive in regards of their sensory inputs and let things happen around them with applying no control on them. Therefore, they may feel environmental stimuli more uncontrollable, unpredictable, dangers, and harmful. Consequently, it may increase their level of anxiety.

In this study, the relationship between sensation seeking and anxiety was not statistically significant. Sensation seeking pattern includes high neurological threshold and active responses. Because of these two components, they may feel less danger from the environment as they do not notice some of the stimuli in their environment because of their high threshold and also because they try to control their environment to make

the input in sort of their satisfaction level they do not find themselves in overwhelming or uncontrollable situations. These make them not show high anxiety level in their self-report scale comparing to others.

5.3.3 Effects of Sensory Processing Interventions on Depression and Anxiety

RQ 3. Does sensory processing intervention have significant effects on depression?

RQ 4. Does sensory processing intervention have significant effects on anxiety?

Findings of third and fourth research questions in this study indicate that sensory processing intervention had a significant effect on reducing depression and anxiety level during the time. There was an overall significant difference in depression and anxiety mean values in the four measures of these two variables during the TEST 1 (pretest1), TEST 2 (pretest2), TEST 3 (posttest), and TEST 4 (follow-up test). Results showed that depression and anxiety levels were reduced during the intervention sessions and in comparing to their levels before intervention sessions for both depression and anxiety. However, the reduction of anxiety level steadily continued even a month after the intervention sessions in the follow-up test.

Careful searching and reviewing of published researches and literature in sensory processing interventions showed that there was no study that investigated the sensory processing interventions especially interventions based on sensory processing patterns in the adult population. Most of the previous studies, studying the effectiveness of sensory processing interventions were done in children population of special groups. There were studies in children with autism, ADHD, and other disorders. These studies on children showed that sensory processing interventions have a positive impact. As Dunn et al. (2012) found that interventions based on sensory processing patterns could increase children participations in daily life routines in their context. Moreover, other

studies showed that sensory processing interventions expand children's attentive behavior in the everyday life context of school (Hanft & Pilkington, 2000; Kandel et al., 2000). Another study found that sensory processing interventions have a positive impact on children with ADHD that enhanced their seating behavior and creativity (Schilling et al., 2003), expand children's attention, reducing their negative behaviors, and raise their work efficiency (Fertel-Daly et al., 2001; VandenBerg, 2001). The current study is also similar to these studies in terms of the positive impact of sensory processing interventions on the participants.

The result of this study is consistent with the findings of Pfeiffer and Kinnealey (2003). In a pilot study on fifteen adults, they explored the relationship between sensory defensiveness and anxiety, as well as the impact of a sensory integration treatment protocol on normal adults. Their findings supported the use of a sensory treatment protocol, which was included providing insight into sensory defensiveness, regular and daily sensory input, and engagement in activities of choice providing primarily proprioceptive, vestibular, and tactile sensory input, to decrease sensory defensiveness and secondary anxiety.

According to the participants' explanations, the most important role of sensory processing interventions on them was the insight and awareness regarding sensory experiences that they have in their daily life and in different environments at their home, class, work, and community. Based on the research procedure, they were given weekly self-report forms, which was pre-printed forms from the researcher that included sensory strategies for each of the senses to apply in their daily routines based on their sensory processing patterns needs. In addition, in the weekly sessions participants were asked to explain and report their sensory experiences in the past week and to mention how they feel about it. The most important point that almost all of the participants

mentioned was the awareness of their sensory experiences and sensory inputs that they had.

According to Beck's cognitive model of psychopathology, a specific situation, or stressors, such as an event relating to losses or failure may activate the depressive schema in the person, the cognitive schemas related to danger, and harm to personal well-being is underlying the experience of anxiety (Beck & Clark, 1988).

Considering this model, it is understandable when people have awareness about an experience, a situation, and an event, they can much more easily understand and accept it and to get along with it. The same thing happens when people are aware of the sensory inputs that they are receiving from their environment. When they have awareness of their sensory processing pattern, they do not mind it as a danger or harm. In the result, they do not get anxious due to sensory inputs in most of the situations. Even though sensory seeking pattern seems to be an adaptive sensory processing pattern, and students with sensory processing pattern have less psychological difficulties, but they need to receive interventions as well according to the need of the context or environment that they are studying or working. For example, a student with sensory seeking pattern may seek for new sensory stimuli in his environment, which can affect his concentration whenever he has to do some task that needs a great concentration. In addition, these students may make other people annoyed by their behaviors of sensation seeking all the times. As an example, they may listen to music while they are doing their study in the laboratories or doing any experiments on their projects.

When participants were aware of sensory inputs, they start to have control, and changes on based on sensory interventions in this research, they did not find sensory inputs uncontrollable and unpredictable upcoming. As they start to apply changes and

notice this awareness, they achieved a feeling of power and control which will reduce the failure and losses feeling. In consequence, depression level decreases.

As the findings indicated, the level of anxiety was reducing even a month after interventions in the follow-up test but depression level did not continue this steady reduction. The reason may relate to the causes of depression, which are deeper, and needs deeper and long-term psychological interventions comparing to anxiety.

5.4 Implications

The practical and theoretical implications of this study are discussed separately.

5.4.1 Practical Implications

The results of this study have the several implications for a different group of professionals. Mental health professionals, psychologists in different fields including educational psychologists, clinical psychologists, counselors, family therapists, coaches, and any other person who is working in the area of mental health and education can benefit from this study's results. Moreover, individuals themselves also can benefit the knowledge of sensory processing as they can apply the changes in their environments based on their sensory patterns to make their sensory experiences in the form and level that it is much suitable for them according to their sensory needs.

This study contributes to evidence that the two most prevalence psychological difficulties, which are depression and anxiety, are in a relationship with sensory processing patterns in individual adults. In addition, sensory processing intervention, especially as the provider of sensory processing awareness to international students in their daily life help them to experience a lower level of psychological difficulties and increase their mental health. This study showed that depression and anxiety could be reduced when international students apply some intervention strategies in their life. It

can be a new door to enhance international students mental health and reduce their depression and anxiety. When they enhance their mental health it will affect other aspects of their life such as their academic performance, occupational performance, communications, adjustment, and so many other things which are related to mental health enhancement.

Several studies have shown that depression and anxiety are prevalent in international students from different nationalities all over the world. People who live in a foreign culture may face depression and anxiety and display maladaptive behaviors as an outcome of this acculturative stress (Furukawa, 1997). International students are also experiencing a foreign context in the country of their study. International students face unique sources of stress such as homesickness, financial difficulties, racial discrimination, and adjustment difficulties, relationship with local people, adapting to the new educational system, academics issues, and so many other stressors. In addition to adjusting to a new educational system and a new social environment (Hyun et al., 2007), they often are struggling with language barriers, immigration difficulties, culture shock, social adjustment, and homesickness (Sümer et al., 2008). Because of the constant need for cultural adjustment and for coping with all these stresses, international students are at greater risk for various psychological problems (Misra & Castillo, 2004; Mori, 2000). That is, international students are a defenseless group who are at risk for depressive symptoms and anxiety. By considering this fact, providing any information and knowledge that investigate and help to increase mental health level for international students is very beneficial. Therefore, the result of this study has implications for an educational psychologist.

In the context of schools and universities, educational psychologists should consider students mental health issues from the perspective of their sensory needs and their sensory processing patterns. They can provide assessments for students' sensory

processing patterns by using the sensory profile and investigate the possible effects of their sensory processing pattern on their mental health. If youngers are struggling with a mental health problem, such as depression, anxiety or any other mental health problems, they cannot be successful in their personal and academic life effectively. Different negative consequences, such as social isolation, drugs and alcohol abuse, unsafe sexual behavior, unemployment, academic failure, suicide attempts and poor health can be a result of mental health problems. An educational psychologist can provide awareness for students. They can provide sessions in the group or individual formats to inform students about their sensory processing pattern and to make them aware that how they can have self-treatment related to the issues of sensory inputs. When students know about their sensory pattern, they can understand themselves better. When students are aware of their sensory needs, they know sensory processing strategies as the guide to understand and control sensory inputs; they can help themselves to meet their sensory needs. Students can prevent any possible psychological difficulties if they start self-monitoring and self-awareness regarding their mental health. For example, if a student knows that his sensory processing pattern is sensory sensitivity, he can apply the suitable strategies of this pattern to prevent overwhelming in the classroom. For example, he may sit in a chair that is stable and in the place with limited noises.

In addition, considering that sensory characteristics of the environment are very important, educational psychologists can give the students the knowledge and insight of understanding how they can contribute to their own improvement in mental health and consequently in their academic achievement. Educational psychologists can give the knowledge of sensory processing pattern to teachers as well. So that teacher will understand that different students have different sensory patterns and needs. They can provide the most appropriate environment and activities for students by considering their sensory patterns. For example, if there is a student with low registration sensory

pattern, the teacher may ask the student to sit in a nearer place to the teacher to hear all the class information easily. Another example is considering the sensitivity in the students with a low neurological threshold, especially sensory sensitivity pattern, to provide the appropriate sensory inputs to prevent them from overwhelming in the class activities and class environment.

This study finding has important implications for clinical psychologists, too. This study contributes evidence that clients with mental health issues and psychological difficulties might be well helped if therapists screen their sensory processing issues. Mental health that is defined the ability to deal with the challenges in life, is very important and essential. It should be considered that mental health is as important and vital as physical health for everyone. Most people usually experience problems that relate to mental health such as anxiety, depression, harassment, stress, learning disability, family problems, and so forth. One of the most noticeable facts these days is that severe mental health problems, and difficulties such as suicide and self-injurious behaviors, have increased among youth. Depression and anxiety are among the most common psychological problems in adults. Both are associated with reduced quality of life, poor social functioning, and excess incapacity (WHO, 2004). Besides those clinical depressions, everybody experiences depressive symptoms, such as a feeling of sadness, worthlessness, others' unfriendliness, helplessness, loneliness, and so forth, to some degree in everyday life (Muñoz & Ying, 2002).

According to this study finding, sensory processing patterns seem to be an important and effective factor in mental health improvement. Therefore, the study has important implications for clinical psychologists. Clinical psychologists should consider sensory processing pattern of clients as one of the possible factors that affect causation and influence in their psychological problems, specifically depression and anxiety. They can assess client's sensory pattern to investigate if there is any issue in adapting to the

sensory environment and if client's sensory needs are fulfilled. On the other hand, sensory processing interventions can be applied for reducing client's psychological problems. Clinical psychologists can offer the suitable and effective sensory interventions based on the client's sensory patterns. Clients can be aware of their sensory patterns and they can understand which situations and environment are satisfying them in terms of sensory needs. Clinical psychologists can help clients to apply the appropriate changes in their home, work, and study and to use the knowledge of sensory patterns in their daily life to reduce their anxiety and depression and enhance their mental health and life satisfaction.

Mental health coaches can also benefit from knowledge about sensory processing patterns and interventions. They can provide services and guides for individuals to help them feel more skilled and capable of controlling their sensory environment to increase the satisfaction about sensory experiences and decrease probable psychological difficulties. Family counselors can use the knowledge of sensory patterns in their family counseling sessions as well. They should consider that based on sensory possessing pattern model, each of the family members may have different sensory patterns that can affect the family satisfaction. Counselors should give the insight to their client about their own and the other members of their family. When a person knows that his family members may obtain different sensory pattern than himself, he can understand each other better and by considering individual differences in sensory patterns and needs, the family conflicts will decrease. Family therapist and counselors can provide this awareness for their clients and families and increase the effectiveness of their counseling.

Moreover, all individuals can benefit the implications of sensory processing knowledge to improve their skills and increase their mental health. When international students are aware of their sensory patterns, they can easily understand how to change

their sensory environment to make it in the way that is appropriate for their sensory needs. Therefore they can contact their environment more effectively by being aware of sensory inputs.

5.4.2 Theoretical Implications

Findings of the study support the previous knowledge that psychological and physiological factors are in a relationship and affecting international students' mental health status. From several perspectives, it is possible to relate psychological difficulties such as depression and anxiety to physiological aspects such as neurological thresholds and sensory processing patterns. Besides that, the research findings show that having awareness about physiological aspects can help the international students to have more control on their psychological difficulties such as depression and anxiety. According to Beck's cognitive model of psychopathology, the person's perceptions of the self, the world, and the future can lead them to experience depression and anxiety (Beck, 2005). In Beck's cognitive psychopathology model, cognitive schemas related to danger and harm to personal well-being is underlying the experience of anxiety. At the core of anxiety is a sense of defenselessness. Anxious individuals mentally focus on danger and harm because of the activation of the maladaptive cognitive schemas, leading them to indiscriminately interpret any environmental events as being dangerous (Beck et al., 1985).

To connect this theory to Dunn's sensory processing model, one might say that sensory processing patterns may affect individual's perception of the self and the world. For example, a international student with a sensory pattern of low registration may find himself in the danger and harm because he notices the sensory inputs by a delay, due to his high neurological threshold. So they may found the world a harmful place which

makes them feel in danger all the time and in consequence, they may experience anxiety.

Furthermore, when international students make changes in their environment and control the sensory inputs based on their sensory needs, may affect their perception of the world and prevent of forming the cognitive distortions and irrational beliefs that are the causes of psychological difficulties from the cognitive model perspective (Beck, 2005). For example, if a international student with sensory sensitivity pattern gets aware about his sensory pattern will understand that he is experiencing lots of sensory inputs because of his low neurological threshold. By having the insight about his sensory pattern he does not found himself guilty because of getting overwhelmed in lots of situations as he will know that this is due to his sensory threshold and pattern. In general, findings of the study can make a relationship between the cognitive model of psychopathology and sensory processing model in terms of the two common psychological difficulties, which are depression and anxiety.

5.5 Suggestions for the Study

Findings of this study suggest that the environmental sensory inputs are one of the factors that may affect international students' mental health and can be considered to increase mental health factors in them. As the study shows, depression and anxiety can be reduced by sensory processing interventions. When international students are aware of their sensory processing patterns, they can manage to reach their satisfactory level of sensory experiences by controlling their sensory environment and their responses to the sensory inputs. Having insight about sensory pattern can help international students to have appropriate responses to their sensory needs. Therefore, international students should have knowledge and insight about sensory input's effects on their depression and anxiety to promote their mental health.

It is suggested to the mental health professions specifically students' counselors have assessment and interview with students and provide the awareness about student's sensory processing. Psychologist and counselors in schools and colleges should conduct sessions in the format of group or individual for students and provide more knowledge about their mental health status and their sensory processing patterns. by having the knowledge and awareness, students can apply sensory strategies in their personal life to reach a higher level of sensory satisfaction and less experienced depression and anxiety. Furthermore, psychologist, counselors, and teachers in academic settings should understand that students have different sensory patterns and needs. They should provide an appropriate and effective environment for them to enhance their sensory satisfaction and increase their mental health.

Not only in academic setting but in general, the study suggests that people should consider that everyone might have a different sensory pattern, which may affect the way that they receive, process and respond to sensory inputs. Therefore, everyone including teachers, counselors, parents, partners, and all the people are contacted with each other very often should consider their sensory processing patterns to have a more effective relationship with each other and prevent any conflicts in their communication in terms of individual sensory pattern's differences.

5.6 Research Limitation

Considering this issue that the topic of sensory processing interventions in adults based on sensory processing patterns is a new research topic in psychology filed, there was very limited references and literature related to this study, especially in the normal population. Although there were studies in occupational therapy field by using sensory processing interventions methods, there was a lack of research in psychology in a normal population of adults. Therefore, writing the literature review caused some limitation for this study and the background of related studies was not that much

expanded to give a better discussion for findings from a sensory processing point of view. Consequently, the researcher went further to review and mentions other literature and previous studies, which may seem not exactly matched to this research topic, but directly or indirectly related to this study's variables and related to the field of mental health. In addition, researcher combined Beck's cognitive model of psychopathology and Dunn's sensory processing model to discuss the findings.

The study's external validity is also limited because this study was among the first studies to describe how the sensory processing intervention effects on depression and anxiety level in students within the context of Dunn's (1997) model. We can understand much more realistically if we study the impact of the interventions on other people and a different group to be able to state that how the interventions can really impact the students' depression and anxiety. We cannot mention that based on only one study. Therefore, several studies should be done and their findings should be compared and reviewed. Several other issues limit the study's internal and external validity, some of which relate to sampling, as the sample of this study was international postgraduate students from one public university in Malaysia.

In this study one-group repeated-measures design was considered to apply for the second phase of the study, which aimed to investigate the effectiveness of sensory processing interventions on depression and anxiety in participants. The combination of the variables of study (anxiety, depression and the sensory processing patterns) are very different among international students. Therefore, it was not possible to assign match pairs in two groups as an experimental study with two groups as control and experimental groups. Students had different sensory patterns and different level of depression and anxiety. Finding students with the same pattern of sensory processing and almost same level of depression and anxiety, with nearly same demographic information such as their age, gender, marital status, and so on, was not possible to find

and consider them as our control group. On the other hand, as our study design was repeated-measures design, it was very difficult to ask the control group for four times testing during the repeated measurements time points. As the population of the study was international students in a public university, the rate of drop from the control group would be possibly high as they were not involved in any intervention sessions and they would not be interested in responding to the research for four times of assessments. Besides the lack of interest to reply to the researcher, another possible factor could be their availability to continue and involve in four times of masseurs. As we had the same experience in our one-group of the experiment, the students may leave the country to their origin country and hometowns, so it could be another issue to have a control group in this study. For all of these risks and possibilities, we designed our research as one group repeated- measures design and we considered the one-group as their own control group by considering base-line and sustainability periods in the design.

The most obvious limitation of repeated-measures designs is the length of time required to complete the study (Ellis, 1999), it was scheduled to administrate all stages of study in the minimum possible time. Besides that, in each study, some threats to validity may occur. The researcher tried to control these threats in different aspects as it is mentioned in chapter three, but still, some of the uncontrollable threats may have effects on the study.

In the first phase of the study, we had multi-stage random sampling method and the second phase of the study was conducted on the participants who had a high level of depression and anxiety and at least one remarkable sensory processing pattern. That is why we did not use random sampling from the whole population of the university for the intervention phase, as it might happen that the students with low level of depression and anxiety be included the sample which was not this study target. That is why we

cannot consider our second phase of study as a true experimental study because the sampling was not random. Therefore, we had a quasi-experiment design.

The findings of this study may be difficult to generalize to the full spectrum of individuals with depression and anxiety, as the results are derived from university postgraduate students. Additional research will be needed in order to determine whether this result can be generalized to other populations.

Besides, I used self-report questionnaires in Likert scale items, which rely on the participants' subjective interpretations and may be skewed by social desirability considerations. According to Pallant (2011), clinical measures of anxiety or depression are often positively skewed in the general population, with most people recording relatively few symptoms of these disorders. It is not possible to escape this fact's effects for this study as well. High level of depression and anxiety reported by participants could be attributed to their perception that these two are not good characteristics or because they suspected the aim of the study, although they were assured of anonymity.

All recruitment instruments and materials were in the English language so that it may have effects on the interventions output as well. Although the participants were international postgraduate students in an international English language university, but English is not their first and native language, which may affect their full and easy participation in the intervention in terms of making them uncomfortable to express their sensory needs and experiences fully and clearly.

According to the nature of these interventions, it would be helpful to have access to the participants' home and class environment to observe all the sensory characteristics of their environment to have a more clear vision about the beneficial intervention strategies. As the intervention was applied by participants, it may have effects on the correct and necessary strategies to apply the changes and controlling the sensory inputs from the environment.

There are many different variables, which have direct and indirect effects on depression and anxiety. In most of the studies, it is not possible to control each of the other variables affecting depression and anxiety in participants. The current study was not also immune to this fact.

5.7 Recommendations for Future Studies

This study established other aspects of mental health knowledge and raised important considerations by findings the relationship between sensory processing patterns, depression, anxiety, and effectiveness of sensory processing interventions on these mental health variables. Psychological research should aim to explore this construct more deeply. The construct of sensory processing could demonstrate to be a valuable implement in assessing the possibility of the development of certain psychological difficulties, and in increasing our understanding of an effective intervention on mental health enhancement. It is recommended to conduct this study in different countries and among local and international students in different levels and in other universities. Also doing the same study on another population rather than students is recommended.

Replicating the study by controlling other factors that have an effect on depression and anxiety can help to know the exact influence of sensory processing intervention on depression and anxiety. This study can be considering other different psychological problems as well. It is recommended to have future studies by investigation other psychological difficulties and sensory processing patterns.

As this study was conducted in one-group repeated measure design, it is highly recommended to study the effectiveness of sensory interventions in a two-group experimental design. Exploring the effectiveness of treatment can be more reliable if the

research is conducted in experimental design. Therefore, that researcher can compare control group and experiment group after applying the sensory processing interventions.

Moreover, providing contextual and long-term interventions can provide beneficial results to this area. Applying the necessary changes in the individuals' context of living, studying, and working, through an expert in sensory processing intervention field, can show reliable findings of the effectiveness of these interventions. When students or research participants are applying sensory strategies in their daily life, they may not be completely and efficiently apply all the recommended strategies. Therefore, it would be better if there is a possibility for the researcher to have contextual interventions and apply the strategies and changed in the participants' environment in a different setting of the home, work, and study place.

As this study was considering depression and anxiety as a psychological difficulty and not as a clinical mental disorder, it is recommended that future studies include adults who have clinical depression or anxiety, which had a psychiatric diagnosis. A study exploring the effectiveness of sensory processing interventions in those individuals diagnosed with anxiety disorders can provide beneficial knowledge in this field.

In future studies, it will be effective to use other instruments rather than self-report questionnaires to identify sensory processing and psychological variables. Contextual observation through an expert in sensory processing is more helpful and trustable. In addition, to specify the details of the interventions using transcripts from observations and from coaching sessions is another recommendation for future studies.

5.8 Conclusion

This research was another study to understand more about the factors that may help professionals and individuals to provide services and help to increase mental health

in people, especially by reducing the level of depression and anxiety that they are experiencing. By focusing on the two common psychological difficulties, which are depression and anxiety, the research findings showed that international students' sensory processing pattern is one of the possible factors that may affect the level of the depression and anxiety that they are experiencing. Based on the research findings, it can be concluded that international students mental health status are affected by their neurological thresholds and the way that they response to sensory stimuli. They may have low or high neurological threshold in different senses (including taste/smell, movement, visual, touch, activity level, and auditory), and they may respond actively or passively to these sensory stimuli. This research showed that when international students are aware of their sensory processing pattern, they could make some changes in their environment to receive their satisfactory sensory inputs. This process, as the research findings revealed, may decrease the level of depression and anxiety that they experience. In general, the research findings showed that sensory processing pattern and depression and anxiety have a relationship. Moreover, the research finding showed that providing sensory processing intervention may help individuals to increase their mental health in the aspect of depression and anxiety.

REFERENCES

Adewuya, A. O., Ola, B. A., & Afolabi, O. O. (2006). Validity of the patient health questionnaire *(*PHQ-9) as a screening tool for depression amongst Nigerian university students. *Journal of Affective Disorders, 96*(1-2), 89-93. doi: 10.1016/j.jad.2006.05.021

Adlparvar, A. (2009). *Relationship between sensory processing and parenting stress: a preliminary evaluation of effectiveness of reducing their stress* (Master dissertation). Retrived from fep.sbu.ac.ir/Portals/7/PayannamehIMG/p19/583.doc

Adlparvar, A., Mazaheri, M., Sadeghi, M., Adlparvar, A., & Khodabakhsh, S. (2013). The relationship between sensory processing styles and marital satisfaction. *Journal of Family Research, 9*(3), 279-298.

Ahadi, B., & Basharpoor, S. (2010). Relationship between sensory processing sensitivity, personality dimensions and mental health. *Journal of Applied Sciences, 10*(7), 570-574.

Ahn, R. R., Miller, L. J., Milberger, S., & McIntosh, D. N. (2004). Prevalence of parents' perceptions of sensory processing disorders among kindergarten children. *The American Journal of Occupational Therapy, 58*(3), 287-293.

American College Health Association (2008). American college health association-national college health assessment spring 2007 reference group data report (abridged). *Journal of American College Health, 56*(5), 469-479.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders: DSM-IV-TR.* Arlington, VA: American Psychiatric Publishing.

Aron, E. N., & Aron, A. (1997). Sensory-processing sensitivity and its relation to introversion and emotionality. *Journal of Personality and Social Psychology, 73*(2), 345-368.

Aron, E. N., Aron, A., & Davies, K. M. (2005). Adult shyness: the interaction of temperamental sensitivity and an adverse childhood environment. *Personality and Social Psychology Bulletin, 31*(2), 181-197.

Aronen, E. T., & Kurkela, S. A. (1996). Long-term effects of an early home-based intervention. *Journal of the American Academy of Child & Adolescent Psychiatry, 35*(12), 1665-1672.

Ashburner, J., Bennett, L., Rodger, S., & Ziviani, J. (2013). Understanding the sensory experiences of young people with autism spectrum disorder: A preliminary investigation. *Australian Occupational Therapy Journal, 60*(3), 171-180. doi: 10.1111/1440-1630.12025

Avery, D., Kizer, D., Bolte, M., & Hellekson, C. (2001). Bright light therapy of subsyndromal seasonal affective disorder in the workplace: Morning vs. afternoon exposure. *Acta Psychiatrica Scandinavica, 103*(4), 267-274.

Ayres, A. (1972). *Sensory integration and learning disabilities*. Los Angeles, CA: Western Psychological Services.

Bank, W. (2000). *World development report, 2000/2001: Attacking poverty*. New York, NY: Oxford University Press.

Baranek, G. (2002). Efficacy of sensory and motor interventions for children with autism. *Journal of Autism and Developmental Disorders, 32*(5), 397-422. doi: 10.1023/A:1020541906063

Baranek, G. T., Foster, L. G., & Berkson, G. (1997). Tactile defensiveness and stereotyped behaviors. *The American Journal of Occupational Therapy, 51*(2), 91-95.

Barlow, D. H. (2004). *Anxiety and its disorders: The nature and treatment of anxiety and panic*. New York, NY: Guilford Press.

Barton, B. A. (2011). *Prevalence and correlates of depression and anxiety disorders in U.S. graduate students.* (Doctoral dissertation). Retrived from ProQuest dissertations and theses. (UMI NO. 3480878)

Baxter, L. R. (1990). Brain imaging as a tool in establishing a theory of brain pathology in obsessive compulsive disorder. *Journal of Clinical Psychiatry, 51,* 5-22.

Bayram, N., Bilgel, N. (2008). The prevalence and socio-demographic correlations of depression, anxiety and stress among a group of university students. *Social Psychiatry and Psychiatric Epidemiology*, *43*(8), 667-672. doi: 10.1007/s00127-008-0345-x

Beck, A. T. (1964). Thinking and depression: Theory and therapy. *Archives of General Psychiatry, 10*(6), 561-571.

Beck, A. T. (1979). *Cognitive therapy and the emotional disorders*. New York, NY: Penguin.

Beck, A. T. (2005). The current state of cognitive therapy: A 40-year retrospective. *Archives of General Psychiatry, 62*(9), 953-959.

Beck, A. T., & Clark, D. A. (1988). Anxiety and depression: An information processing perspective. *Anxiety Research, 1*(1), 23-36.

Beck, A. T., Freeman, A., & Davis, D. D. (2006). *Cognitive therapy of personality disorders.* New York, NY: Guilford Press.

Beck, A. T., Wright, F. D., Newman, C. F., & Liese, B. S. (2011). *Cognitive therapy of substance abuse*. New York, NY: Guilford Press.

Beck, A., Emery, G., & Greenberg, R. (1985). *Anxiety disorders and phobias: A cognitive approach.* New York, NY: Basic Books.

Beck, A., Rush, A., Shaw, B., & Emery, G. (1979). *Cognitive therapy of depression*. New York, NY: Guilford Press.

Behrens, R. (1990). Protecting the health of the international traveller. *Transactions of the Royal Society of Tropical Medicine and Hygiene, 84*(5), 611-629.

Ben-Avi, N., Almagor, M., & Engel-Yeger, B. (2012). Sensory processing difficulties and interpersonal relationships in adults: An exploratory study. *Psychology, 3*(01), 70-77. doi: 10.4236/psych.2012.31012

Benham, G. (2006). The highly sensitive person: Stress and physical symptom reports. *Personality and Individual Differences, 40*(7), 1433-1440. doi: 10.1016/j.paid.2005.11.021

Bensing, J. M., Hulsman, R. L., & Schreurs, K. M. (1999). Gender differences in fatigue: Biopsychosocial factors relating to fatigue in men and women. *Medical Care, 37*(10), 1078-1083.

Bontempo, T. (2009). *Sensory processing patterns in high-ability adults with autism spectrum disorders in the workplace* (Master dissertation). Retrieved from http://hdl.handle.net/1974/5523

Boyd, B. A., & Shaw, E. (2010). Autism in the classroom: A group of students changing in population and presentation. *Preventing School Failure: Alternative Education for Children and Youth, 54*(4), 211-219. doi: 10.1080/10459881003744552

Braff, D. L. (1993). Information processing and attention dysfunctions in schizophrenia. *Schizophrenia Bulletin, 19*(2), 233-259.

Brandwein, A. B. (2014). *The neurodevelopment of basic sensory processing and integration in autism spectrum disorder.* New York, NY: City University.

Brandy, J. M. (2011). *Depression in freshmen college students* (Doctoral dissertation). Retrived from http://ecommons.luc.edu/luc_diss/177

Brindle, K., Moulding, R., Bakker, K., & Nedeljkovic, M. (2015). Is the relationship between sensory-processing sensitivity and negative affect mediated by emotional regulation?. *Australian Journal of Psychology*, 67(4), 214-221. doi: 10.1111/ajpy.12084

Brockevelt, B. L., Nissen, R., Schweinle, W. E., Kurtz, E., & Larson, K. J. (2013). A comparison of the sensory profile scores of children with autism and an age-and gender-matched sample. *South Dakota Medicine: The Journal of the South Dakota State Medical Association, 66*(11), 459, 461, 463-455.

Brown, C., & Dunn, W. (2002). *Adolescent/adult sensory profile: user's manual*. San Antonio, TX: Therapy Skill Builders.

Brown, C., Tollefson, N., Dunn, W., Cromwell, R., & Filion, D. (2001). The adult sensory profile: measuring patterns of sensory processing. *The American Journal of Occupational Therapy, 55*(1), 75-82.

Bundy, A. C., Lane, S., & Murray, E. A. (2002). *Sensory integration: Theory and practice* (2nd ed.). Philadelphia, PA: Davis.

Buysse, D. J., Yu, L., Moul, D. E., Germain, A., Stover, A., Dodds, N. E., & Pilkonis, P. A. (2010). Development and validation of patientreported outcome measures for sleep disturbance and sleep-related impairments. *Sleep, 33,* 781–792.

Carton, S., Morand, P., Bungenera, C., & Jouvant, R. (1995). Sensation-seeking and emotional disturbances in depression: Relationships and evolution. *Journal of Affective Disorders, 34,* 219–225.

Cella, D., Riley, W., Stone, A., Rothrock, N., Reeve, B., Yount, S., & Hays, R. (2010). The patient-reported outcomes measurement information system (promis) developed and tested its first wave of adult self-reported health outcome item banks: 2005–2008. *Journal of Clinical Epidemiology, 63,* 1179–1194. doi:10.1016/j.jclinepi.2010.04.011

Cella, D., Yount, S., Rothrock, N., Gershon, R., Cook, K., Reeve, B., & Rose, M. (2007). The patient-reported outcomes measurement information system (promis): Progress of an NIH roadmap cooperative group during its first two years. *Medical Care, 45*(5 Suppl 1), S3. doi:10.1097/ 01.mlr.0000258615.42478.55

Centers for Disease Control and Prevention. (2010). Current depression among adults-United States, 2006 and 2008. *Morbidity and Mortality Weekly Report, 59*(38), 1229-1259

Choi, S. W., Schalet, B., Cook, K. F., & Cella, D. (2014). Establishing a common metric for depressive symptoms: Linking the BDI-II, CES-D, and PHQ-9 to PROMIS depression. *Psychological Assessment, 26* (2014), pp. 513–527.

Clarke, G. N., Hornbrook, M., Lynch, F., Polen, M., Gale, J., Beardslee, W., & Seeley, J. (2001). A randomized trial of a group cognitive intervention for preventing depression in adolescent offspring of depressed parents. *Archives of General Psychiatry, 58*(12), 1127-1134.

Cohen, J.W. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). New York, NY: Routledge.

Creswell, J. W. (2002). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Upper Saddle River, NJ: Pearson Education.

Creswell, J. W. (2012). *Qualitative inquiry and research design: Choosing among five approaches.* Thousand Oaks, CA: Sage.

Crowder, M. J., & Hand, D. J. (1990). *Analysis of repeated measures*. New York, NY: Chapman & Hall.

DeWalt, D. A., Rothrock, N., Yount, S., & Stone, A. A. (2007). Evaluation of item candidates: The PROMIS qualitative item review. *Medical Care, 45*(5 Suppl 1), S12. doi:10.1097/01.mlr.0000254567.79743.e2

Dickens, C., McGowan, L., & Dale, S. (2003). Impact of depression on experimental pain perception: A systematic review of the literature with meta-analysis. *Psychosomatic medicine, 65*(3), 369-375.

Donohue, J. M., & Pincus, H. A. (2007). Reducing the societal burden of depression: A review of economic costs, quality of care and effects of treatment. *Pharmacoeconomics*, *25*(1), 7-24.

Dubovsky, S. L., & Dubovsky, A. N. (2002). *Concise guide to mood disorders.* Washington, DC: American Psychiatric Publishing.

Dunn, R. (1987). Research on instructional environments: Implications for student achievement and attitudes. *Professional School Psychology*, *2*(1), 43.

Dunn, W. (1997). The impact of sensory processing abilities on the daily lives of young children and their families: A conceptual model. *Infants and Young Children, 9,* 23-35.

Dunn, W. (2001). The sensations of everyday life: Empirical, theoretical, and pragmatic considerations. *The American Journal of Occupational Therapy, 55*(6), 608-620.

Dunn, W. (2007). Supporting children to participate successfully in everyday life by using sensory processing knowledge. *Infants and Young Children, 20*(2), 84-101.

Dunn, W. (2014). *Sensory Profile™ 2.* NCS Pearson, Inc.

Dunn, W., & Bennett, D. (2002). Patterns of sensory processing in children with attention deficit hyperactivity disorder. *Occupational Therapy Journal of Research, 22*(1), 4-15.

Dunn, W., & Daniels, D. B. (2002). Initial development of the Infant/Toddler Sensory Profile. *Journal of Early Intervention, 25*(1), 27-41.

Dunn, W., Cox, J., Foster, L., Mische-Lawson, L., & Tanquary, J. (2012). Impact of a contextual intervention on child participation and parent competence among children with autism spectrum disorders: A pretest-posttest repeated-measures design. *American Journal of Occupational Therapy, 66*(5), 520-528.

Dunn, W., Myles, B. S., & Orr, S. (2002). Sensory processing issues associated with asperger syndrome: A preliminary investigation. *The American Journal of Occupational Therapy, 56*(1), 97-102.

Dunst, C. J., & Bruder, M. B. (2002). Valued outcomes of service coordination, early intervention, and natural environments. *Exceptional Children, 68*(3), 361-375.

Dunst, C. J., & Raab, M. (2004). Parents' and practitioners' perspectives of young children's everyday natural learning environments. *Psychological Reports, 94*(1), 251-256.

Dunst, C. J., Bruder, M. B., Trivette, C. M., Hamby, D., Raab, M., & McLean, M. (2001). Characteristics and consequences of everyday natural learning opportunities. *Topics in Early Childhood Special Education, 21*(2), 68-92.

Dunst, C. J., Hamby, D., Trivette, C. M., Raab, M., & Bruder, M. B. (2000). Everyday family and community life and children's naturally occurring learning opportunities. *Journal of Early Intervention, 23*(3), 151-164.

Eisenberg, D., Golberstein, E., & Gollust, S. E. (2007). Help-seeking and access to mental health care in a university student population. *Medical Care, 45*(7), 594-601.

Eisenberg, D., Gollust, S. E., Golberstein, E., & Hefner, J. L. (2007). Prevalence and correlates of depression, anxiety, and suicidality among university students. *American Journal of Orthopsychiatry, 77*(4), 534-542. doi: 10.1037/0002-9432.77.4.534

Ellis, M. V. (1999). Repeated measures designs. *The Counseling Psychologist, 27*(4), 552-578.

Engel, G. L. (1977). The need for a new medical model: A challenge for biomedicine. *Science, 196*(4286), 129-136. doi: 10.1126/science.847460

Engel-Yeger, B., & Dunn, W. (2011a). Exploring the relationship between affect and sensory processing patterns in adults. *The British Journal of Occupational Therapy, 74*(10), 456-464. doi: 10.4276/030802211x13182481841868

Engel-Yeger, B., & Dunn, W. (2011b). The relationship between sensory processing difficulties and anxiety level of healthy adults. *The British Journal of Occupational Therapy, 74*(5), 210-216. doi: 10.4276/030802211x13046730116407

Engel-Yeger, B., & Shochat, T. (2012). The relationship between sensory processing patterns and sleep quality in healthy adults. *Canadian Journal of Occupational Therapy, 79*(3), 134-141. doi: 10.2182/cjot.2012.79.3.2

Engel-Yeger, B., Palgy-Levin, D., & Lev-Wiesel, R. (2015). Predicting fears of intimacy among individuals with post-traumatic stress symptoms by their sensory profile. *The British Journal of Occupational Therapy*, 78(1), 51-57.

Evren, B., & Evren, C. (2007). Relationship between alexithymia and social anxiety in female outpatients with dermatological disorder presenting for psychiatric consultation. *Journal of Clinical Psychology in Medical Settings, 14*(3), 258-265.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G* Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*(4), 1149-1160.

Fernández-Andrés, M. I., Pastor-Cerezuela, G., Sanz-Cervera, P., & Tárraga-Mínguez, R. (2015). A comparative study of sensory processing in children with and without autism spectrum disorder in the home and classroom environments. *Research in developmental disabilities, 38*, 202-212.

Fertel-Daly, D., Bedell, G., & Hinojosa, J. (2001). Effects of a weighted vest on attention to task and self-stimulatory behaviors in preschoolers with pervasive developmental disorders. *The American Journal of Occupational Therapy, 55*(6), 629-640.

Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. Sage.

Fletcher, J. M. (2011). *An examination of the effect of depression on the cognitive functioning and academic performance of college students* (Doctoral dissertation). Tennessee State University.

Fries, J. F., Cella, D., Rose, M., Krishnan, E., & Bruce, B. (2009). Progress in assessing physical function in arthritis: PROMIS short forms and computerized adaptive testing. *Journal of Rheumatology, 36,* 2061– 2066. doi:10.3899/jrheum.090358

Furukawa, T. (1997). Depressive symptoms among international exchange students, and their predictors. *Acta Psychiatrica Scandinavica*, *96*(4), 242-246.

Gall, G., Pagano, M. E., Desmond, M. S., Perrin, J. M., & Murphy, J. M. (2000). Utility of psychosocial screening at a school-based health center. *Journal of School Health*, *70*(7), 292-298.

Haines, M. E., Norris, M. P., & Kashy. D. A. (1996). The effects of depressed mood on academic performance in college students. *Journal of College Student Development. 37*(5), 519-526.

Han, X., Han, X., Luo, Q., Jacobs, S., & Jean-Baptiste, M. (2013). Report of a mental health survey among Chinese international students at Yale university. *Journal of American College Health, 61*(1), 1-8. doi: 10.1080/07448481.2012.738267

Hanft, B. E., & Pilkington, K. O. (2000). Therapy in natural environments: The means or end goal for early intervention. *Infants & Young Children*, *12*(4), 1-13.

Heiligenstein, E., Guenther, G., Hsu, K., & Herman, K. (1996). Depression and academic impairment in college students. *Journal of American College Health, 45*(2), 59-64.

Herrmann, M. J., Jacob, C., Unterecker, S., & Fallgatter, A. J. (2003). Reduced response-inhibition in obsessive-compulsive disorder measured with topographic evoked potential mapping. *Psychiatry Research, 120*(3), 265-271.

Ho, R. (2013). *Handbook of Univariate and Multivariate Data Analysis with IBM SPSS*. Boca Raton, FL: CRC Press.

Hofmann, S. G., & Bitran, S. (2007). Sensory-processing sensitivity in social anxiety disorder: Relationship to harm avoidance and diagnostic subtypes. *Journal of Anxiety Disorders, 21*(7), 944-954.

Hsiao, Y. (2016). *Perfectionism, acculturative stress, coping styles, and depression among international students* (Doctoral dissertation). Retrived from http://scholarworks.gsu.edu/cps_diss/113

Humes, L. E. (2014). Individual differences in sensory and cognitive processing across the adult lifespan. *The Journal of the Acoustical Society of America*, *136*(4), 2213-2213.

Humes, L. E. (2015). Age-related changes in cognitive and sensory processing: focus on middle-aged adults. *American Journal of Audiology, 24(*2), 94-97.

Humphry, R. (2002). Young children's occupations: Explicating the dynamics of developmental processes. *The American Journal of Occupational Therapy, 56*(2), 171-179.

Hunt, J., & Eisenberg, D. (2010). Mental health problems and help-seeking behavior among college students. *Journal of Adolescent Health, 46*(1), 3-10.

Hyun, J. K., Quinn, B. C., Madon, T., & Lustig, S. (2006). Graduate student mental health: Needs assessment and utilization of counseling services. *Journal of College Student Development, 47*(3), 247-266.

Hyun, J., Quinn, B., Madon, T., & Lustig, S. (2007). Mental health need, awareness, and use of counseling services among international graduate students. *Journal of American College Health, 56*(2), 109-118.

Ingram, R. E., & Price, J. M. (2009). *Vulnerability to psychopathology: Risk across the lifespan.* New York, NY: The Guilford Press.

Israel, M., & Hay, I. (2006). *Research ethics for social scientists*. Sage.

Jagiellowicz, J., Aron, A., & Aron, E. N. (2016). Relationship between the temperament trait of sensory processing sensitivity and emotional reactivity. *Social Behavior and Personality: An international journal, 44*(2), 185-199.

Jané-Llopis, E., Barry, M., Hosman, C., & Patel, V. (2005). Mental health promotion works: A review. *Promotion & Education, 12*(S2), 9-25.

Jane-Llopis, E., Hosman, C., Jenkins, R., & Anderson, P. (2003). Predictors of efficacy in depression prevention programmes Meta-analysis. *The British Journal of Psychiatry, 183*(5), 384-397.

Janes, E., Riby, D. M., & Rodgers, J. (2014). Exploring the prevalence and phenomenology of repetitive behaviours and abnormal sensory processing in children with Williams Syndrome. *Journal of Intellectual Disability Research, 58*(8), 746-757.

Jerome, E. M., & Liss, M. (2005). Relationships between sensory processing style, adult attachment, and coping. *Personality and Individual Differences, 38*(6), 1341-1352.

Johnson, F. (1975). Depression: Some proposals for future research. *Diseases of the Nervous System, 36*(5), 228-32.

Jones, R. C. (2008). *The effects of depressed mood on academic outcomes in adolescents and young adults* (Doctoral dissertation). Retrieved from ProQuest dissertation and thesis database. (UMI NO. 3347344)

Kandel, E. R., Schwartz, J. H., & Jessell, T. M. (2000). *Principles of neural science*. New York, NY: McGraw-Hill.

Kelly, M. A. R., Morse, J. Q., Stover, A., Hofkens, T., Huisman, E., Shulman, S., & Pilkonis, P. A. (2011). Describing depression: Congruence between patient experiences and clinical assessments. *British Journal of Clinical Psychology, 50*, 46–66. doi:10.1348/014466510X493926

Kern, J. K., Trivedi, M. H., Garver, C. R., Grannemann, B. D., Andrews, A. A., Savla, J. S., & Schroeder, J. L. (2006). The pattern of sensory processing abnormalities in autism. *Autism, 10*(5), 480-494.

Kessler, R. C., & Wang, P. S. (2002). Epidemiology of depression. *Handbook of depression, 2*, 5-22.

Kessler, R. C., Foster, C. L., Saunders, W. B., & Stang, P. E. (1995). Social consequences of psychiatric disorders, I: Educational attainment. *American Journal of Psychiatry, 152*(7), 1026-1032.

Khodabakhsh, S., (2012). The relationship between sensory processing style and stress. *Psychology & Health, 27*, 247.

Kimball, J. G., Birstler, C. T., Bosse, E. F., Nelson, L. M., & Woods, M. R. (2012). The relationships among sensory processing styles, personality traits, and body mass index: A pilot study. *Occupational Therapy in Mental Health, 28*(1), 72-87. doi: 10.1080/0164212x.2012.650994

Kinnealey, M., & Fuiek, M. (1999). The relationship between sensory defensiveness, anxiety, depression and perception of pain in adults. *Occupational Therapy International, 6*(3), 195-206.

Kinnealey, M., Oliver, B., & Wilbarger, P. (1995). A phenomenological study of sensory defensiveness in adults. *The American Journal of Occupational Therapy, 49*(5), 444-451.

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement, 30,* 607-610.

Kuhl, E. A., Kupfer, D. J., & Regier, D. A. (2011). Patient-centered revisions to the DSM-5. *Virtual Mentor, 13*, 873–879.
doi: 10.1001/virtualmentor.2011.13.12.stas1-1112

Kusunoki, K., Sato, T., Taga, C., Yoshida, Y., Komori, K., Narita, T., & Ozaki, N. (2000). Low novelty-seeking differentiates obsessive-compulsive disorder from major depression. *Acta Psychiatrica Scandinavica, 101*(5), 403-405.

Lehtinen, V. (2008). *Building up good mental health: Guidelines based on existing knowledge: Monitoring Mental Health Environments.* Finland: STAKES.

Liss, M., Mailloux, J., & Erchull, M. J. (2008). The relationships between sensory processing sensitivity, alexithymia, autism, depression, and anxiety. *Personality and Individual Differences, 45*(3), 255-259.

Liss, M., Timmel, L., Baxley, K., & Killingsworth, P. (2005). Sensory processing sensitivity and its relation to parental bonding, anxiety, and depression. *Personality and Individual Differences, 39*(8), 1429-1439.

Liu, Y., Chen, X., Li, S., Yu, B., Wang, Y., & Yan, H. (2016). Path analysis of acculturative stress components and their relationship with depression among international students in China. *Stress and Health.* doi: 10.1002/smi.2658.

Lowry-Webster, H. M., Barrett, P. M., & Dadds, M. R. (2001). A universal prevention trial of anxiety and depressive symptomatology in childhood: Preliminary data from an Australian study. *Behavioral Change, 18*(1), 36-50.

Ludlow, A., Mohr, B., Whitmore, A., Garagnani, M., Pulvermüller, F., & Gutierrez, R. (2014). Auditory processing and sensory behaviours in children with autism spectrum disorders as revealed by mismatch negativity. *Brain and Cognition, 86*, 55-63. doi: 10.1037/a0013490.

Martinot, J., Allilaire, J., Mazoyer, B., Hantouche, E., Huret, J., Legaut-Demare, F., & Baron, J. (1990). Obsessive-compulsive disorder: A clinical, neuropsychological and positron emission tomography study. *Acta Psychiatrica Scandinavica, 82*(3), 233-242.

McIntosh, D. N., Miller, L. J., Shyu, V., & Hagerman, R. J. (1999). Sensory-modulation disruption, electrodermal responses, and functional behaviors. *Developmental Medicine & Child Neurology, 41*(9), 608-615.

Melle, I., Friis, S., Hauff, E., & Island, T. K. (1996). The importance of ward atmosphere in inpatient treatment of schizophrenia on short-term units. *Psychiatric Services, 47*(7), 721-726.

Meyer, A. (1917). Progress in teaching psychiatry. *Journal of the American Medical Association, 69*(11), 861.

Meyer, B., & Carver, C. S. (2000). Negative childhood accounts, sensitivity, and pessimism: A study of avoidant personality disorder features in college students. *Journal of Personality Disorders, 14*(3), 233-248.

Meyer, L., & Melchert, T. P. (2011). Examining the content of mental health intake assessments from a biopsychosocial perspective. *Journal of Psychotherapy Integration, 21*(1), 70-89. doi: 10.1037/a0022907

Miller, L. J., Anzalone, M. E., Lane, S. J., Cermak, S. A., & Osten, E. T. (2007). Concept evolution in sensory integration: A proposed nosology for diagnosis. *Amercian Journal of Occupational Therapy, 61*(2), 135-140.

Miller, L., & Lane, S. (2000). Toward a consensus in terminology in sensory integration theory and practice: Part 1: Taxonomy of neurophysiological processes. *Sensory Integration Special Interest Section Quarterly, 23*(1), 1-4.

Misra, R., & Castillo, L. G. (2004). Academic stress among college students: Comparison of American and international students. *International Journal of Stress Management, 11*(2), 132.

Mori, S. C. (2000). Addressing the mental health concerns of international students. *Journal of Counseling & Development, 78*(2), 137-144.

Muñoz, R. F., & Ying, Y.-W. (2002). *The prevention of depression: Research and practice.* Baltimore, MD: The Johns Hopkins University Press.

Muntaner, C., Pulver, A., McGrath, J., & Eaton, W. (1993). Work environment and schizophrenia: An extension of the arousal hypothesis to occupational self-selection. *Social Psychiatry and Psychiatric Epidemiology, 28*(5), 231-238.

Musisi, S., Mollica, R., & Weiss, M. (2005). Supporting refugees and victims of war. *Prevention of Mental Disorders: Effective Interventions and Policy Options, In C Hosman, E Jané-Llopis, S Saxena (Eds).* Oxford: Oxford University Press.

National Institutes of Mental Health. (2009). Anxiety Disorders. *U.S. Department Of Health and Human Services.* Retrived from http://www.nimh.nih.gov/health/publications/anxiety-disorders/nimhanxiety.pdf

Neal, J. A., Edelmann, R. J., & Glachan, M. (2002). Behavioural inhibition and symptoms of anxiety and depression: Is there a specific relationship with social phobia?. *British Journal of Clinical Psychology, 41*(4), 361-374.

Newman, C. F., Leahy, R. L., Beck, A. T., Reilly-Harrington, N. A., & Gyulai, L. (2002). *Bipolar disorder: A cognitive therapy approach.* Washington, DC, US: American Psychological Association.

Norcross, J. C., & Goldfried, M. R. (2005). *Handbook of psychotherapy integration.* Oxford: Oxford University Press.

Nyklíček, I., & Vingerhoets, AJ. (2000). Alexithymia is associated with low tolerance to experimental painful stimulation. *Pain, 85*(3), 471-475.

OECD Indicators. (2008). *Education at a Glance*. Retrieved from www.oecd.org/publishing/corrigenda

Ovuga, E., Boardman, J., & Wasserman, D. (2006). Undergraduate student mental health at Makerere University, Uganda. *World Psychiatry, 5*(1), 51.

Pallant, J. (2011). *SPSS survival manual* (4th ed.): *A step by step guide to data analysis using SPSS version 18*. Crows Nest. New South Wales: Allen & Unwin.

Paul, M., Panton, C., & Marzigliano, N. (2008). Do students with healthy habits perform better in their academics?. *Academy of Educational Leadership, 13*(2), 47-55.

Pearson Education, Inc. (2008). Technical report adolescent/adult sensory profile. Retrieved from http://images.pearsonassessments.com/images/tmrs/tmrs_rg/AD_Adult_SP_TR_Web.pdf?WT.mc_id=TMRS_Adolescent_Adult_Sensory_Profile.

Perveen, S. (2015). Relationship between negative cognitive style and depression among university students. *The Online Journal of New Horizons in Education, 5(4*). 74-83. Retrieved from http://www.tojned.net/pdf/v05i04/tojned-volume05-i04-09.pdf

Pfeiffer, B., & Kinnealey, M. (2003). Treatment of sensory defensiveness in adults. *Occupational Therapy International, 10*(3), 175-184.

Pfeiffer, B., Brusilovskiy, E., Bauer, J., & Salzer, M. S. (2014). Sensory processing, participation, and recovery in adults with serious mental illnesses. *Psychiatric rehabilitation journal, 37*(4), 289.

Pilkonis, P. A., Choi, S. W., Reise, S. P., Stover, A. M., Riley, W. T., & Cella, D. (2011). Item banks for measuring emotional distress from the patient-reported outcomes measurement information system (PROMIS®): depression, anxiety, and anger. *Assessment, 18*(3), 263-283.

Portney, L., & Watkins, M. (2000). *Foundations of clinical research: Applications to practice*. Englewood Cliffs, NJ: Prentice Hall.

Poyrazli, S. (2015). Psychological symptoms and concerns experienced by international students: Outreach implications for counseling centers. *Journal of International Students, 5(*3), 306-312. Retrieve from http://files.eric.ed.gov/fulltext/EJ1060046.pdf

Quednow, B. B., Kühn, K. U., Stelzenmueller, R., Hoenig, K., Maier, W., & Wagner, M. (2004). Effects of serotonergic and noradrenergic antidepressants on auditory startle response in patients with major depression. *Psychopharmacology, 175*(4), 399-406.

Raine, A., Reynolds, C., Venables, P. H., & Mednick, S. A. (2002). Stimulation seeking and intelligence: A prospective longitudinal study. *Journal of Personality and Social Psychology, 82*(4), 663-674.

Re, P., McConnell, J. W., Reidinger, G., Schweit, R., & Hendron, A. (2014). Effects of yoga on patients in an adolescent mental health hospital and the relationship between those effects and the patients' sensory-processing patterns. *Journal of Child and Adolescent Psychiatric Nursing, 27*(4), 175-182.

Rector, N. A., Stolar, N., & Grant, P. (2011). *Schizophrenia: Cognitive theory, research, and therapy*. New York, NY: Guilford Press.

Rieke, E. F., & Anderson, D. (2009). Adolescent/adult sensory profile and obsessive–compulsive disorder. *The American Journal of Occupational Therapy, 63*(2), 138-145.

Rijk, A. E., Schreurs, K. M., & Bensing, J. M. (1999). Complaints of fatigue: Related to too much as well as too little external stimulation? *Journal of Behavioral Medicine, 22*(6), 549-573.

Rotenberg, V. S., & Cholostoy, A. (2004). Behavioural attitudes in major depression: A pilot investigation. *Homeostasis, 43*(1), 16-18.

Rutter, M. (1985). Resilience in the face of adversity: Protective factors and resistance to psychiatric disorder. *British Journal of Psychiatry, 147*, 598-611. doi: 10.1192/bjp.147.6.598.

Schaaf, R. C., Cohn, E. S., Burke, J., Dumont, R., Miller, A., & Mailloux, Z. (2015). Linking sensory factors to participation: Establishing intervention goals with parents for children with autism spectrum disorder. *American Journal of Occupational Therapy, 69(*5), 6905180050p1-6905180050p8. doi: 10.5014/ajot.2015.018036

Schäfer, R., Schneider, C., Tress, W., & Franz, M. (2007). Cortical augmenting in alexithymic subjects after unpleasant acoustic stimulation. *Journal of Psychosomatic Research, 63*(4), 357-364.

Schilling, D. L., Washington, K., Billingsley, F. F., & Deitz, J. (2003). Classroom seating for children with attention deficit hyperactivity disorder: Therapy balls versus chairs. *The American Journal of Occupational Therapy*, *57*(5), 534-541.

Schneck, C. (2001). The efficacy of a sensorimotor treatment approach by occupational therapists. In R. Huebner (Ed.), *Autism: A sensorimotor approach to management* (pp. 139–178). Gaithersburg, MD: Aspen.

Shamsuddin, K., Fadzil, F., Ismail, W. S. W., Shah, S. A., Omar, K., Muhammad, N. A., & Mahadevan, R. (2013). Correlates of depression, anxiety and stress among Malaysian university students. *Asian Journal of Psychiatry, 6*(4), 318-323.

Shochet, I. M., Dadds, M. R., Holland, D., Whitefield, K., Harnett, P. H., & Osgarby, S. M. (2001). The efficacy of a universal school-based program to prevent adolescent depression. *Journal of Clinical Child Psychology, 30*(3), 303-315.

Simeonsson, R. J., Leonardi, M., Lollar, D., Bjorck-Akesson, E., Hollenweger, J., & Martinuzzi, A. (2003). Applying the international classification of functioning, disability and health (ICF) to measure childhood disability. *Disability & Rehabilitation, 25*(11-12), 602-610.

Stewart, C. R., Sanchez, S. S., Grenesko, E. L., Brown, C. M., Chen, C. P., Keehn, B., ... & Müller, R. A. (2016). Sensory symptoms and processing of nonverbal

auditory and visual stimuli in children with autism spectrum disorder. *Journal of Autism and Developmental Disorders, 46(*5), 1590-1601.

Struthers, C. W., Perry, R. P., & Menec, V. H. (2000). An examination of the relationship among academic stress, coping, motivation, and performance in college. *Research in Higher Education, 41*(5), 581-592.

Sümer, S., Poyrazli, S., & Grahame, K. (2008). Predictors of depression and anxiety among international students. *Journal of Counseling & Development, 86*(4), 429-437.

Svanum, S., & Zody, Z. B. (2001). Psychopathology and college grades. *Journal of Counseling Psychology, 48*(1), 72-76.

Szabo, A., Ward, C., & Jose, P. E. (2016). Uprooting stress, coping, and anxiety: A longitudinal study of international students. *International Journal of Stress Management, 23(*2), 190.

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Boston: Pearson

Tadevosyan-Leyfer, O., Dowd, M., Mankoski, R., Winklosky, B., Putnam, S., McGrath, L., & Folstein, S. E. (2003). A principal components analysis of the Autism Diagnostic Interview-Revised. *Journal of the American Academy of Child & Adolescent Psychiatry, 42*(7), 864-872.

Talib, N. (2011). Factors affecting academic performance of university students in Pakistan. *Interdisciplinary Journal of Contemporary Research in Business, 3*(2), 589-600.

Tomchek, S. D., Huebner, R. A., & Dunn, W. (2014). Patterns of sensory processing in children with an autism spectrum disorder. *Research in Autism Spectrum Disorders, 8*(9), 1214-1224.

Tomchek, S. D., Little, L. M., & Dunn, W. (2015). Sensory pattern contributions to developmental performance in children with autism spectrum disorder. *American Journal of Occupational Therapy, 69(*5), 6905185040p1-6905185040p10. doi:10.5014/ajot.2015.018044

Tomoda, A., Mori, K., Kimura, M., Takahashi, T., & Kitamura, T. (2000). One-year prevalence and incidence of depression among first-year university students in Japan: A preliminary study. *Psychiatry and Clinical Neurosciences, 54*(5), 583-588.

Turner, A. L., & Berry, T. R. (2000). Counseling center contributions to student retention and graduation: A longitudinal assessment. *Journal of College Student Development, 41*(6), 627-636.

Uljarević, M., Prior, M. R., & Leekam, S. R. (2014). First evidence of sensory atypicality in mothers of children with autism spectrum disorder (ASD). *Molecular Autism, 5*(1), 26.

VandenBerg, N. L. (2001). The use of a weighted vest to increase on-task behavior in children with attention difficulties. *The American Journal of Occupational Therapy, 55*(6), 621-628.

Vonesh, E., & Chinchilli, V. M. (1996). *Linear and nonlinear models for the analysis of repeated measurements*. New York, Basel: Marcel Dekker, Inc.

Wong, M. T. (2011). *Mapping cognitive networks of anxiety, depression, and aggression* (Doctoral dissertation). Retrived from ProQuest dissertations and theses. (1151099753)

Wong, T. W., Gao, Y., & Tam, W. W. S. (2007). Anxiety among university students during the SARS epidemic in Hong Kong. *Stress and Health, 23*(1), 31-35.

Woods, Y. (2006). *Comparison of the stress levels and GPA of African American college students at historically black and predominantly white institutions.* (Master dissertation). Retrived from http://dc.etsu.edu/etd/1095/

World Health Organization, WHO. (2001). *2001 the word health report of mental health: New understanding, new hope.* Geneva, Switzerland: Author.

World Health Organization, WHO. (2004). *Prevention of mental disorders: effective interventions and policy options: A summary report*. Geneva, Switzerland: Author.

World Health Organization, WHO. (2005). *Mental health-facing the challenges, building solutions: Report from the WHO European ministerial conference.* Geneva, Switzerland: Author.

World Health Organization, WHO. (2010). *International travel and health: Situation as on 1 January 2010.* Geneva, Switzerland: Author.

Zackheim, L. (2007). Alexithymia: The expanding realm of research. *Journal of Research, 63*(4), 345-347.

Zobel-Lachiusa, J. (2013). *Sensory processing and the self care task of eating in children with autism* (Doctoral dissertation). Retrieved from http://scholarworks.umass.edu/open_access_dissertations/773

APPENDIX A

Consent Letter (First Phase of Study)

Dear Participant

You are being invited to participate in a research study on people's sensory processing and mental health. In particular, this research aims to explore whether individual's sensory processing pattern have relationship with level of depression and anxiety that they are experiencing and beside that its relationship with their academic achievement.

In this stage, you are invited to complete attached questionnaires of Adolescent/Adult Sensory Profile®, PROMIS® Depression Item Bank, PROMIS® Anxiety Item Bank and a Demographic Questionnaire. If we found it you are an appropriate participant for the second stage of study we will contact you and you may accept the invitation to participant the second phase of this research as well.

University of Malaya, Faculty of Education, has approved this study. It will be done among international students that are in postgraduate program of study in UM.

This research will require about 20-30 minute of your time.

If you would like to know the results of this research, contact S.Khodabakhsh at Sonia@siswa.um.edu.my. Thank you for your consideration. Your help is greatly appreciated.

Your signature below indicates that you have read the above information and agree to participate in this research titled as below:

"Effects of Sensory Processing Intervention on Depression and Anxiety among International Students in a Public University".

Name: …… Date & Signature

Contact Number: …….

Email address: …….

APPENDIX B

Consent Letter (Second Phase of Study)

Dear Participant

You are being invited to participate in a research study on people's sensory processing and mental health. In particular, this research aims to explore whether individual's sensory processing pattern have relationship with level of depression and anxiety that they are experiencing and beside that its relationship with their academic achievement.

In this stage of study, you are invited to participate in four sessions of weekly intervention and to complete questionnaires PROMIS® Depression Item Bank and PROMIS® Anxiety Item Bank for three times re-tests as pre, post and follow up.

University Malaya, Faculty of Education, has approved this study. It will be done among international students that are in postgraduate program of study in UM.

If you would like to know the results of this research, contact S.Khodabakhsh at Sonia@siswa.um.edu.my. Thank you for your consideration. Your help is greatly appreciated.

Your signature below indicates that you have read the above information and agree to participate in this research titled as below:

"Effects of Sensory Processing Intervention on Depression and Anxiety among International Students in a Public University".

Name: …… Date & Signature

Contact Number: …….

Email address: …….

APPENDIX C

Permission and Confirmation from Lecturer Regarding Data Collection in Classes

Date:

To Whom It May Concern:

It is to confirm that Miss. Somayeh Khodabakhsh, Matric No: PHA100043, PhD student in Faculty of Education, Department of Educational Psychology and Counseling, has done her data collection for her PhD thesis in my class.

Data collection was done through International Students by using instruments Demographic Questionnaire, Adolescent/Adult Sensory Profile®, PROMIS® Depression Item Bank and PROMIS® Anxiety Item Bank.

Lecturer Name & Signature: ……

Faculty:……..….

Department:…….……..

Course: ……

APPENDIX D

Demographic Questionnaire

All information in this questionnaire is strictly confidential.

Name:
Contact Number:
Email Address:
Age:
Gender : □ Male □ Female
Marital Status: □ Single □ Married □ Divorced □ …….
Nationality: ……
Course of Study: ……..……Intake Year: …..…….. Faculty:…..……
CGPA: ……..
English Language proficiency: Equal to IELTS overall score …….
How long have you been living in Malaysia? …….
Do you have any medical problem? □ No □ Yes: ……..
Are you under any kind of medication? □ No □ Yes: …….
Have you ever received any psychiatric treatment? □ No □ Yes: ……..
Have you ever received any psychotherapy services? □ No □ Yes: ……..

APPENDIX E

PROMIS® Depression Item Bank

	In the past 7 days ……	Never	Rarely	Sometimes	Often	Always
1	I felt worthless	1	2	3	4	5
2	I felt that I had nothing to look forward to	1	2	3	4	5
3	I felt helpless	1	2	3	4	5
4	I withdrew from other people	1	2	3	4	5
5	I felt that nothing could cheer me up	1	2	3	4	5
6	I felt that I was not as good as other people	1	2	3	4	5
7	I felt sad	1	2	3	4	5
8	I felt that I wanted to give up on everything	1	2	3	4	5
9	I felt that I was to blame for things	1	2	3	4	5
10	I felt like a failure	1	2	3	4	5
11	I had trouble feeling close to people	1	2	3	4	5
12	I felt disappointed in myself	1	2	3	4	5
13	I felt that I was not needed	1	2	3	4	5
14	I felt lonely	1	2	3	4	5
15	I felt depressed	1	2	3	4	5
16	I had trouble making decisions	1	2	3	4	5
17	I felt discouraged about the future	1	2	3	4	5
18	I found that things in my life were overwhelming	1	2	3	4	5
19	I felt unhappy	1	2	3	4	5
20	I felt I had no reason for living	1	2	3	4	5
21	I felt hopeless	1	2	3	4	5
22	I felt ignored by people	1	2	3	4	5
23	I felt upset for no reason	1	2	3	4	5
24	I felt that nothing was interesting	1	2	3	4	5
25	I felt pessimistic	1	2	3	4	5
26	I felt that my life was empty	1	2	3	4	5
27	I felt guilty	1	2	3	4	5
28	I felt emotionally exhausted	1	2	3	4	5

APPENDIX F

PROMIS® Anxiety Item Bank

	In the past 7 days ……	Never	Rarely	Sometimes	Often	Always
1	I felt fearful	1	2	3	4	5
2	I felt frightened	1	2	3	4	5
3	It scared me when I felt nervous	1	2	3	4	5
4	I felt anxious	1	2	3	4	5
5	I felt like I needed help for my anxiety	1	2	3	4	5
6	I was concerned about my mental health	1	2	3	4	5
7	I felt upset	1	2	3	4	5
8	I had a racing or pounding heart	1	2	3	4	5
9	I was anxious if my normal routine was disturbed	1	2	3	4	5
10	I had sudden feelings of panic	1	2	3	4	5
11	I was easily startled	1	2	3	4	5
12	I had trouble paying attention	1	2	3	4	5
13	I avoided public places or activities	1	2	3	4	5
14	I felt fidgety	1	2	3	4	5
15	I felt something awful would happen	1	2	3	4	5
16	I felt worried	1	2	3	4	5
17	I felt terrified	1	2	3	4	5
18	I worried about other people's reactions to me	1	2	3	4	5
19	I found it hard to focus on anything other than my anxiety	1	2	3	4	5
20	My worries overwhelmed me	1	2	3	4	5
21	I had twitching or trembling muscles	1	2	3	4	5
22	I felt nervous	1	2	3	4	5
23	I felt indecisive	1	2	3	4	5
24	Many situations made me worry	1	2	3	4	5
25	I had difficulty sleeping	1	2	3	4	5
26	I had trouble relaxing	1	2	3	4	5
27	I felt uneasy	1	2	3	4	5
28	I felt tense	1	2	3	4	5
29	I had difficulty calming down	1	2	3	4	5

APPENDIX G

Permission from Adolescent/ Adult Sensory Profile Publisher

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80 Strand
London WC2R 0RL
United Kingdom
T: +44 (0)20 7010 2860
F: +44 (0)20 7010 6631

www.pearsonclinical.co.uk

Somayeh Khodabakhsh
PhD Student
Department of Educational Psychology and Counseling
Faculty of Education
University of Malaya
50603 Kuala Lumpur
Malaysia

2 October 2014

To whom it may concern

Use of the Adolescent / Adult Sensory Profile™

This is to confirm **Somayeh Khodabakhsh**, PhD Student at the University of Malaya, has purchased for research purposes 400 copies of the Adolescent / Adult Sensory Profile record form and manual, published by **NCS Pearson Inc**, a division of Pearson Education Ltd, an English company, with its registered office located at Edinburgh Gate, Harlow, Essex CM20 2JE, England.

This product is protected by copyright and must not be copied in any form or included in thesis Appendices. This is to protect the reliability and integrity of its assessment in line with the ***International Test Commission Guidelines for Test Use***.

Yours sincerely

Sarah Weinberg
Export & Permissions Manager
Pearson

APPENDIX H

Intervention Strategies for Sensory Processing Patterns

Name: ……..

Date: .....

Intervention Strategies for Sensation Seeking Pattern

Sense: Taste/Smell

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Chew gum, eat mints when feeling restless								
2	Use scented soaps, cleaners, etc.								
3	Make spices, hot sauce, etc., available at meals								
4	Select restaurants that serve foods you've never eaten								
5	Use scented lotions								
6	Use perfumes								
7	Use air freshener in your study or work place								
8	Explore new foods that you've never tried, ask friends to introduce you to restaurants or foods								

Name: ……..

Date: .....

Intervention Strategies for Sensation Seeking Pattern

Sense: Movements

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Incorporate movement in activities								
2	Engage in physical activity before a thinking task								
3	Select activities that incorporate bending over								
4	In a group, you can be the one who passes out things or puts the chairs away								
5	In your exercises try to change speeds more often								
6	Use rolling chair								
7	Pursue a new physical activity (for example , join a bowling league, take an aerobics or dance class)								

Name: ……..

Date: .....

Intervention Strategies for Sensation Seeking Pattern

Sense: Visual

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Select bright colors								
2	Use bright lighting								
3	Look for environments with lots of visual interest and activity								
4	In meetings, classes, offices, etc., find places to sit where you can easily change your visual perspective								
5	Use shapes and forms								
6	Use colorful markers/pens								
7	Use highlighters								
8	Consider trying new colors in your wardrobe, living space, or wok space								
9	Rearrange your furniture								

Name: ……..

Date: .....

Intervention Strategies for Sensation Seeking Pattern

Sense: Touch

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Choose activities that incorporate touch with others (dancing, massage)								
2	Select clothes with a variety of textures								
3	Walk barefoot sometimes								
4	Use varying textures of carpets, towels, blankets								
5	Use textured lotions, creams								
6	Choose activities that incorporate touch with environment (cooking)								
7	Chose the furniture with textures								

Name: ……..

Date: .....

Intervention Strategies for Sensation Seeking Pattern

Sense: Activity level

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Look for group activities								
2	Find opportunities for self-expression								
3	Incorporate newness into your daily routine								
4	Go about a task in a new way								
5	Try to have new activity experiences that you've not done before								

Name: ……..

Date: .....

Intervention Strategies for Sensation Seeking Pattern

Sense: Auditory

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Incorporate into daily activities- hum/sing, play the radio while working								
2	Use background noise								
3	Find/create work and leisure activities where it is acceptable to make noise or the environment is filled with interesting auditory stimuli								
4	Experience live music more often								
5	Try to use your headphones and listen to music during the activities that do not need concentration (exercise/walk)								
6	Attend concerts or events that provide sounds								
7	Listen to books on tape								

Name: ……..

Date: .....

Intervention Strategies for Sensory Sensitivity Pattern

Sense: Taste/Smell

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Find scented products that you like and use them regularly								
2	Identify flavors and ingredients that you prefer, and find ways to incorporate them into daily meals								
3	Introduce new foods and smells gradually								
4	Do not use air fresheners								
5	Use unscented washing products								
6	Use unscented locations								

Name: ……..

Date: .....

Intervention Strategies for Sensory Sensitivity Pattern

Sense: Movement

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Use rocking chairs for calming effects								
2	Limit the amount of steps when learning a new movement activity								
3	Select movement activities that allow you to keep your head upright and/or maintain a consistent speed (for example , bike riding instead of aerobic exercising)								
4	Do not engage in the activities that is changing speed during the movements								
5	Choose a fix and stable chair instead of an unsteady one								

Name: ……..

Date: .....

Intervention Strategies for Sensory Sensitivity Pattern

Sense: Visual

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Use systematic methods of visual scanning (left to right top to bottom)								
2	In a class/conference choose the seat with limited and narrow view that provides less visual stimuli								
3	Organize drawers closets, etc., so that it is easy to pick out what you are looking for								
4	Remove background visual stimuli								
5	Do not mix different foods in one plate								
6	Reduce light sources in your room								

Name: ……..

Date: .....

Intervention Strategies for Sensory Sensitivity Pattern

Sense: Touch

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Use deep-pressure touch rather than light touch								
2	Wear clothes that are heavy or weighted								
3	Wrap yourself in a blanket								
4	Select tight, natural fiber clothing								
5	Select firm underwear								
6	Choose a seat without texture								

Name: ……..

Date: .....

Intervention Strategies for Sensory Sensitivity Pattern

Sense: Activity level

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Incorporate breaks and time-outs								
2	Look for smaller, less crowded, more organized stores in which to do your shopping								
3	Use self-cues to stay focused								
4	Break tasks down into smaller parts								
5	Do your exercise in one clear order								
6	Write out steps to a task and check them off as you complete each one								
7	Make a plan before starting a task								
8	Identifying the steps and important features that need your attention								
9	Pair up with a partner to help you maintain focus								

Name: ……..

Date: .....

Intervention Strategies for Sensory Sensitivity Pattern

Sense: Auditory

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Limit the amount of information / steps that are provided at any one time								
2	Reduce the volume or amount of auditory stimuli								
3	Provide handouts to supplement verbal information								
4	In group settings, participate in the discussion, answer questions to help maintain focus								
5	Ask another person to give you cues when it looks as if you are losing focus								
6	Listen to only one source of sound at one time								
7	Turn off unnecessary sound sources in your environment								
8	Use ear plugs if needed								

Name: ……..

Date: .....

Intervention Strategies for Sensation Avoiding Pattern

Sense: Taste/Smell

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Ask for sauces and dressings on the side of your food								
2	Use unscented cleaners, soaps, etc.								
3	When eating out, request that you be able to choose the restaurant								
4	Use unscented lotions								
5	Do not use air freshener								
6	Avoid stores with scented products								
7	Choose your food in advance before eating time								

Name: ……..

Date: .....

Intervention Strategies for Sensation Avoiding Pattern

Sense: Movements

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Elevators, escalators, and high places may be uncomfortable								
2	When reasonable, use the stairs								
3	When involved in physical activities, make arrangements to take a break__ sit down as needed								
4	Incorporate routine and repetition in movement activities								
5	Place the most frequently used objects at arm level in cabinets and drawers to avoid having to bend over								
6	Choose a seat with minimum passing people around you								
7	Create exact routines before getting into bed/waking up								
8	Rest during movement activities								

Name: ……..

Date: .....

Intervention Strategies for Sensation Avoiding Pattern

Sense: Visual

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Periodically close your eyes to decrease visual stimulation								
2	Wear sunglasses								
3	Use blurred or natural lightening, or even the dark								
4	Get rid of mess								
5	Try to have limited visual inputs								
6	Try to keep your work/study desk organized								
7	Try to limit colors around your study/work place								
8	Keep shades drawn								
9	Select one color pen at a time								
10	Put only one food on your plate at a time								
11	Avoid watching sides when you are in taxi/car/bus								

Name: ……..

Date: .....

Intervention Strategies for Sensation Avoiding Pattern

Sense: Touch

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Explain your need for personal distance, to others								
2	When purchasing clothing, select fabrics that don't irritate, and styles that are not constricting								
3	Position fans/vents so that they are not blowing directly at you								
4	Wear gloves when cooking, gardening, etc.								
5	Use one food temperature								
6	Use food with limited texture								
7	Do not go to crowded places to avoid body contact with other people								

Name: ……..

Date: .....

Intervention Strategies for Sensation Avoiding Pattern

Sense: Activity level

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Avoid traffic congested areas, crowds, busy times								
2	Maintain consistency try to reduce disturbances								
3	Establish routines that are comforting and supportive								
4	Find quite places for time alone								
5	Give yourself permission to be alone								
6	Limit large-group experience, find opportunities for small groups or one-on-one interaction								

Name: ……..

Date: .....

Intervention Strategies for Sensation Avoiding Pattern

Sense: Auditory

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Reduce background noise/ conversation (turn off the radio/TV)								
2	Go to a quit area when you really need to focus								
3	Use repetitive sounds to drown out distracting noises (fan noise)								
4	Close the door								
5	Use ear plugs								
6	Attend outings during non-peak times								
7	Choose a place with minimum auditory stimuli to seat								
8	Limit unstructured time and unscheduled talks								

Name: ……..

Date: .....

Intervention Strategies for Low Registration Pattern

Sense: Taste/Smell

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	To make meals more interesting, incorporate unfamiliar foods								
2	Try unusual combinations of foods								
3	Try foods and drinks with intense tastes or smells								
4	Use extra care when drinking hot liquids								
5	Add new aromas and tastes to foods								
6	Use scented bath products/ hand washing liquids/ dish washing liquid/ shampoo…								
7	Use scented lotions								
8	Make sure smoke detectors are present and working in your home and your work place								

Name: ……..

Date: .....

Intervention Strategies for Low Registration Pattern

Sense: Movements

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Make sure pathways are clear of objects that could be tripped over								
2	Make sure you have not put your drink glass on your work desk near to papers or other stuff								
3	Watch carefully the pathway you are walking								
4	Use/add stair rails, bars, and other cues to mark steps, doorways, etc.								
5	Put anti-skid bathmats in the tub/shower								
6	Wear non-skid shoe soles								
7	Be extra aware of safety when you are moving								

Name: ……..

Date: .....

Intervention Strategies for Low Registration Pattern

Sense: Visual

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Make visual cues more noticeable underline, bold, highlight, use color								
2	Label drawers, cabinets, paper holders								
3	Take notes so that information can be reviewed and processed later								
4	Use mirrors to check personal appearance								
5	Place important objects (keys, bills to be paid) in an obvious location								
6	Change colors, fonts, placement of objects, to decrease familiarity/ habituation								
7	Select bright and contrasting clothing or stuff								
8	Turn on bright light when you are studying or at work place								
9	Try to sit in a place that you can see the presenter/speaker more easily								

Name: ……..

Date: .....

Intervention Strategies for Low Registration Pattern

Sense: Touch

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Try to have varied and textured food options								
2	Ask others to let you know if you are getting too close								
3	Set water heaters at a lower temperature to prevent burns								
4	Pay attention to weather reports and temperature to determine appropriate dress								
5	Add texture to objects to help with detection (for example , use puffy paint on appliance knobs to know when on/off)								
6	Try to use textured cloths and other personal stuffs								

Name: ……..

Date: .....

Intervention Strategies for Low Registration Pattern

Sense: Activity level

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Go into a meeting prepared with questions, agenda, etc.								
2	Ask people to summarize/ restate the most important points								
3	Use lists, reminders, data books, calendars, etc., as cues								
4	Shop in stores with clearly marked areas or helpful workers								
5	Talk yourself through a task to make sure you are aware of the steps								
6	Write something down or talk it through to another person before executing a task								

Name: ……..

Date: .....

Intervention Strategies for Low Registration Pattern

Sense: Auditory

	Recommended Strategies	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Description
1	Ask others to slow down, speak up, or repeat as needed								
2	Record important information								
3	Ask for verbal information to be in written form								
4	Ask for lots of examples								
5	Explain or repeat information back to the speaker to make sure you processed what was said								
6	Use an alarm for reminders								
7	Try to sit in a place that you can hear the speaker/ presenter voice easily and clearly								

APPENDIX I

Confirmation of Successful Proposal Defense and Research Permission from Faculty

UNIVERSITI MALAYA

Reference No. : UM.P/PTD(IT)/6441/1
Registration No. : PHA100043
Date : 29 August 2014

SOMAYEH KHODABAKHSH
CFC, K4, Multimedia University
Cyberjaya Campus
63100 Cyberjaya
Selangor

Madam ,

SEMINAR 1 FOR DOCTOR OF PHILOSOPHY CANDIDATURE

Please refer to the above matter.

I am pleased to inform you that you have successfully defended your PhD research proposal on the 26 August 2014 and the committee has approved your research proposal. As such, you are now given permission to proceed with your research.

Please take note that you are required to show proof of acceptance for publication of at least one (1) paper in the ISI (WoS) – Ranked Full Length Journal Paper or at least two (2) papers in the category A or B refereed journal recognized by Faculty prior to a Committee of Examiners meeting and viva-voce.

Thank you.

Yours sincerely,

PROFESSOR DR. ESTHER SAROJINI DANIEL
Deputy Dean (Higher Degrees)
Faculty of Education

c.c. Head of Department of Educational Psychology and Counselling
Associate Prof. Dr. Zahari Ishak (Chairman/Reader)
Associate Professor Dr. Jas Laile Suzana Jaafar (Reader)
Associate Professor Dr. Loh Sau Cheong (Supervisor)

AKMAS SURAT KEPUTUSAN SEMINAR

FAKULTI PENDIDIKAN
Universiti Malaya, 50603 Kuala Lumpur, Malaysia • http://www.um.edu.my
Pejabat Dekan: (603) 7967 5000 Faks: (603) 7956 5506 • Timbalan Dekan: (603) 7967 5079/5080/5099 Faks: (603) 7967 5141/5089
Penolong Pendaftar: (603) 7967 5131/5001 • Pejabat Am: (603) 7967 5006/5133 Faks: (603) 7967 5130
Jabatan Asas Pendidikan dan Kemanusiaan/Jabatan Pendidikan Matematik dan Sains: (603) 7967 5040 Faks: (603) 7967 5148)
Jabatan Pendidikan Bahasa dan Literasi/Jabatan Kurikulum dan Teknologi Pengajaran: (603) 7967 5027 Faks: (603) 7967 5139
Jabatan Psikologi Pendidikan dan Kaunseling/Jabatan Pengurusan Perancangan dan Dasar Pendidikan: (603) 7967 5036 Faks: (603) 7967 5010

APPENDIX J

Faculty Letter for Data Collection from University of Malaya

UNIVERSITI MALAYA

17th September 2014

To Whom It May Concern

Name	: Somayeh Khodabakhsh
I/c No./ Passport No.	: P18764537
Registration No	: PHA100043
Programme	: Doctor of Philosophy
Specialization	: Educational Psychology

This is to confirm that the above candidate is a student of Faculty of Education, University of Malaya, beginning in semester II, session 2010/2011.

She/he is currently doing research and would require research data which can be obtained from your school/office/institution/university. We would appreciate it if you are able to assist our candidate in his/her research and would like to thank you in advance for your cooperation.

Thank you.

Yours truly,

ANIDA KAMALUDIN
Assistant Registrar (Higher Degrees)
Faculty of Education

FAKULTI PENDIDIKAN
Universiti Malaya, 50603 Kuala Lumpur, Malaysia • http://www.um.edu.my

Pejabat Dekan: (603) 7967 5000 Faks: (603) 7956 5536 • Timbalan Dekan: (603) 7967 5079/5080/5099 Faks: (603) 7967 5141/5089
Penolong Pendaftar: (603) 7967 5131/5001 • Pejabat Am: (603) 7967 5006/5133 Faks: (603) 7967 5130
Jabatan Asas Pendidikan dan Kemanusiaan/Jabatan Pendidikan Matematik dan Sains: (603) 7967 5040 Faks: (603) 7967 5148)
Jabatan Pendidikan Bahasa dan Literasi/Jabatan Kurikulum dan Teknologi Pengajaran: (603) 7967 5027 Faks: (603) 7967 5139
Jabatan Psikologi Pendidikan dan Kaunseling/Jabatan Pengurusan Perancangan dan Dasar Pendidikan: (603) 7967 5036 Faks: (603) 7967 5010

APPENDIX K

Faculty Letter for Data Collection from the Selected University for the Pilot Study

UNIVERSITY OF MALAYA

21st May 2014

Registrar
University of Putra Malaysia
43400 UPM, Serdang
Selangor Darul Ehsan

Sir/Madam,

Name	: Somayeh Khodabakhsh
Passport No	: P18764537
Registration No	: PHA 100043
Programme	: Doctor of Philosophy
Specialization	: Psychology Education

This is to confirm that the above candidate is a student in the Doctor of Philosophy, University of Malaya, beginning in semester II, session 2010/2011.

She is currently doing research and would require research data which can be obtained from your school/office/institution/university. We would appreciate it if you are able to assist our candidate in her research and would like to thank you in advance for your cooperation.

Thank you.

Yours truly,

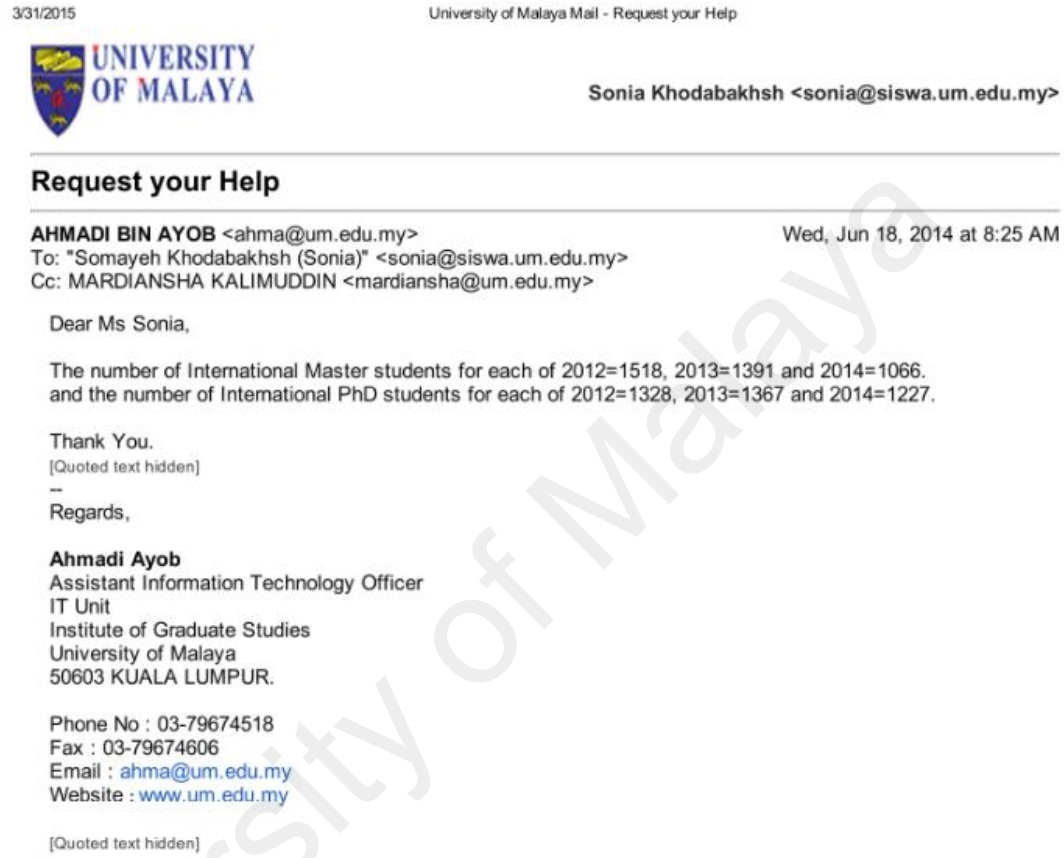
ANIDA KAMALUDIN
Assistant Registrar (Higher Degrees)
Faculty of Education

Faculty of Education, University of Malaya, 50603 Kuala Lumpur, Malaysia
• Dean's Office: (603) 7967 5000 Fax: (603) 7956 5506 • http://www.um.edu.my
• Deputy Dean: (603) 7967 5079/5080/5099 • Fax: (603) 7967 5141/5089
• Assistant Registrar: (603) 7967 5131/5001 • General Office: (603) 7967 5006/5133 • Fax: (603) 7967 5130
• Department of Mathematics and Science Education/Department of Educational Foundations and Humanities: (603) 7967 5040 • Fax: (603) 7967 5148
• Department of Language and Literacy Education/Department of Curriculum and Instructional Technology: (603) 7967 5027 • Fax: (603) 7967 5139
• Department of Educational Psychology and Counselling/Department of Educational Management, Planning and Policy: (603) 7967 5036 • Fax: (603) 7967 5010

APPENDIX L

Institute of Graduate Studies Information of International Postgraduate Students

Total Number for Sampling Purpose



3/31/2015 University of Malaya Mail - Request your Help

UNIVERSITY OF MALAYA

Sonia Khodabakhsh <sonia@siswa.um.edu.my>

Request your Help

AHMADI BIN AYOB <ahma@um.edu.my> Wed, Jun 18, 2014 at 8:25 AM
To: "Somayeh Khodabakhsh (Sonia)" <sonia@siswa.um.edu.my>
Cc: MARDIANSHA KALIMUDDIN <mardiansha@um.edu.my>

Dear Ms Sonia,

The number of International Master students for each of 2012=1518, 2013=1391 and 2014=1066.
and the number of International PhD students for each of 2012=1328, 2013=1367 and 2014=1227.

Thank You.
[Quoted text hidden]
--
Regards,

Ahmadi Ayob
Assistant Information Technology Officer
IT Unit
Institute of Graduate Studies
University of Malaya
50603 KUALA LUMPUR.

Phone No : 03-79674518
Fax : 03-79674606
Email : ahma@um.edu.my
Website : www.um.edu.my

[Quoted text hidden]

APPENDIX M

Permission to Conduct Research Intervention in Counseling Room

UNIVERSITI MALAYA

UM.P/TDPP/634/1

28 September 2014

Miss Somayeh Khodabakhsh
PHA100043
Faculty of Education
University of Malaya

Dear Miss Somayeh,

APPLICATION FOR USING COUNCELLING ROOM 5, BLOCK G, FACULTY OF EDUCATION

We refer to above matter.

Please be informed that we have approved your application for using the Counseling Room 5, Block G, Faculty of Education for the purpose of your PhD Research to conduct interventions on your research participants from 1st October 2014 to 30th January 2015.

Thank you.

Your sincerely,

DR. AHMAD ZABIDI ABD RAZAK
Deputy Dean (Development & Research)
Faculty of Education
University of Malaya

c.c: Asisstant Registrar (Development & Research)

AZAR/

FAKULTI PENDIDIKAN
Universiti Malaya, 50603 Kuala Lumpur, Malaysia • http://www.um.edu.my

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Jabatan Pendidikan Bahasa dan Literasi/Jabatan Kurikulum dan Teknologi Pengajaran: (603) 7967 5027 Faks: (603) 7967 5139
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APPENDIX N

Adolescent/Adult Sensory Profile® and summary report sample

Note: Due to Copy-Write concern, in following pages, a completed Adolescent/Adult Sensory Profile® questionnaire and the summary report sample is attached, which is published as a sample in the publisher's website: http://www.pearsonclinical.co.uk

ADOLESCENT/ADULT SENSORY PROFILE
Winnie Dunn, Ph.D., OTR, FAOTA

Item Analysis Report

Examinee's Name: Patrick E Sample
Date of Birth: 8/15/1986 **Age:** 20 yrs 0 mos **Gender:** Male **Administration Date:** 8/16/2006
Comments:

None

AN = Almost Never, S = Seldom, O = Occasionally, F = Frequently, AA = Almost Always

Sensory Processing

Item		A. Taste/Smell Processing	AN	S	O	F	AA
	1	I leave or move to another section when I smell a strong odor in a store (for example, bath products, candles, perfumes).				X	
	2	I add spice to my food.			X		
	3	I don't smell things that other people say they smell.			X		
	4	I enjoy being close to people who wear perfume or cologne.			X		
	5	I only eat familiar foods.					X
	6	Many foods taste bland to me (in other words, food tastes plain or does not have a lot of flavor).			X		
	7	I don't like strong tasting mints or candies (for example, hot/cinnamon or sour candy).		X			
	8	I go over to smell fresh flowers when I see them.	X				

Item		B. Movement Processing	AN	S	O	F	AA
	9	I'm afraid of heights.				X	
	10	I enjoy how it feels to move about (for example, dancing, running).					X
	11	I avoid elevators and/or escalators because I dislike the movement.				X	
	12	I trip or bump into things.				X	
	13	I dislike the movement of riding in a car.			X		
	14	I choose to engage in physical activities.		X			
	15	I am unsure of footing when walking on stairs (for example, I trip, lose balance, and/or need to hold the rail).			X		
	16	I become dizzy easily (for example, after bending over, getting up too fast).					X

Item		C. Visual Processing	AN	S	O	F	AA
	17	I like to go to places that have bright lights and that are colorful.				X	
	18	I keep the shades down during the day when I am at home.			X		

	19	I like to wear colorful clothing.			X		
	20	I become frustrated when trying to find something in a crowded drawer or messy room.			X		
	21	I miss the street, building, or room signs when trying to go somewhere new.				X	
	22	I am bothered by unsteady or fast moving visual images in movies or TV.					X
	23	I don't notice when people come into the room.					X
	24	I choose to shop in smaller stores because I'm overwhelmed in large stores.					X
	25	I become bothered when I see lots of movement around me (for example, at a busy mall, parade, carnival).		X			
	26	I limit distractions when I am working (for example, I close the door, or turn off the TV).					X
Item		**D. Touch Processing**	AN	S	O	F	AA
	27	I dislike having my back rubbed.				X	
	28	I like how it feels to get my hair cut.			X		
	29	I avoid or wear gloves during activities that will make my hands messy.		X			
	30	I touch others when I'm talking (for example, I put my hand on their shoulder or shake their hands).					X
	31	I am bothered by the feeling in my mouth when I wake up in the morning.			X		
	32	I like to go barefoot.				X	
	33	I'm uncomfortable wearing certain fabrics (for example, wool, silk, corduroy, tags in clothing).					X
	34	I don't like particular food textures (for example, peaches with skin, applesauce, cottage cheese, chunky peanut butter).			X		
	35	I move away when others get too close to me.				X	
	36	I don't seem to notice when my face or hands are dirty.			X		
	37	I get scrapes or bruises but don't remember how I got them.			X		
	38	I avoid standing in lines or standing close to other people because I don't like to get too close to others.			X		
	39	I don't seem to notice when someone touches my arm or back.				X	

Item		E. Activity Level	AN	S	O	F	AA
	40	I work on two or more tasks at the same time.					X
	41	It takes me more time than other people to wake up in the morning.			X		
	42	I do things on the spur of the moment (in other words, I do things without making a plan ahead of time).			X		
	43	I find time to get away from my busy life and spend time by myself.			X		
	44	I seem slower than others when trying to follow an activity or task.				X	
	45	I don't get jokes as quickly as others.					X
	46	I stay away from crowds.				X	
	47	I find activities to perform in front of others (for example, music, sports, acting, public speaking, and answering questions in class).				X	
	48	I find it hard to concentrate for the whole time when sitting in a long class or a meeting.				X	
	49	I avoid situations where unexpected things might happen (for example, going to unfamiliar places or being around people I don't know).					X

Item		F. Auditory Processing	AN	S	O	F	AA
	50	I hum, whistle, sing, or make other noises.				X	
	51	I startle easily at unexpected or loud noises (for example, vacuum cleaner, dog barking, telephone ringing).					X
	52	I have trouble following what people are saying when they talk fast or about unfamiliar topics.					X
	53	I leave the room when others are watching TV, or I ask them to turn it down.					X
	54	I am distracted if there is a lot of noise around.				X	
	55	I don't notice when my name is called.				X	
	56	I use strategies to drown out sound (for example, close the door, cover my ears, wear ear plugs).				X	
	57	I stay away from noisy settings.		X			
	58	I like to attend events with a lot of music.		X			
	59	I have to ask people to repeat things.					X

	60	I find it difficult to work with background noise (for example, fan, radio).	X				

ADOLESCENT/ADULT SENSORY PROFILE®

Sensory Profile™
Adolescent/Adult Sensory Profile®
Adolescent/Adult Sensory Profile Summary Report

Catana Brown, PhD, OTR, FAOTA & Winnie Dunn, PhD, OTR, FAOTA

Examinee's Name:	Joe Bloggs
Birth Date:	10/15/1991
Administration Date:	07/31/2014
Age at Administration:	22:9
Gender:	Male

PsychCorp

[1.0 / RE1 / QG1]

ALWAYS LEARNING PEARSON

INTRODUCTION

The Adolescent/Adult Sensory Profile was administered as part of a comprehensive assessment to determine whether aspects of sensory processing might be contributing to performance challenges in the daily life of Joe Bloggs.

The Adolescent/Adult Sensory Profile is a measure of an individual's responses to sensory events in daily life. The individual completes a Self Questionnaire assessing the frequency of his responses to certain sensory processing and activity level events as described in 60 items. (If the individual is unable to personally complete the Self Questionnaire, another individual may complete it by recording the examinee's responses on the Self Questionnaire.) We know from research that the Adolescent/Adult Sensory Profile can help identify an individual's sensory processing patterns; the results can then be used to consider how these patterns might be contributing to or creating barriers to performance in daily life.

The Adolescent/Adult Sensory Profile was given as a part of a total assessment that included interviews, observations, and other tests to reveal the possible contribution of sensory processing patterns to Joe's challenges.

QUADRANT RAW SCORES/CLASSIFICATIONS

Quadrant	Raw Score	Cut Score Range	Cut Score Classification
1. Low Registration	40/75	36-44	More Than Most People
2. Sensation Seeking	38/75	36-42	Less Than Most People
3. Sensory Sensitivity	36/75	26-41	Similar to Most People
4. Sensation Avoiding	37/75	27-41	Similar to Most People

Ages 18:0 to 64:11: Classifications are based on the performance of individuals without disabilities (n = 496).

SUMMARY AND INTERPRETIVE REPORT

Summary of Scores
The following paragraphs describe Joe's performance on the Adolescent/Adult Sensory Profile. Please also refer to the Quadrant Raw Scores/Classifications table for a visual summary of his scores.

Quadrant Scores
Joe obtained scores indicating performance similar to most people in:
- Sensory Sensitivity
- Sensation Avoiding

Joe scored in the Less Than Most People range in these quadrant(s) which indicates the possible need for further assessment in these areas:
- Sensation Seeking

Joe scored in the More Than Most People range in these quadrant(s) which indicates the possible need for further assessment in these areas:
- Low Registration

Individuals with Low Registration tend to miss or take longer to respond to stimuli that others notice. In general, they may have trouble reacting to rapidly presented or low-intensity stimuli. They may not detect a smell that bothers everyone else in the room, or may be the last one in the room to understand a joke. On the other hand, such individuals find it easier to focus on tasks of interest in distracting environments.

Individuals with "Much More Than Most People" and "More Than Most People" scores in the Low Registration quadrant notice things in their environment and are attentive to stimuli around them without being bothered by those stimuli. Noticing does not automatically mean seeking out additional stimuli, just that these individuals are aware of their surroundings.

Individuals with Sensation Seeking behaviors create additional stimuli or look for environments that provide sensory stimuli. They have an interest in exploring the environment and generally regard sensory experiences as pleasurable. These individuals also may tend to become easily bored and may find low-stimulus environments intolerable.

Individuals scoring "Much Less Than Most People" and "Less Than Most People" in the Sensation Seeking quadrant may not create additional sensory stimuli; however, a low score does not necessarily mean that such individuals are not actively involved in intensifying the sensory environment.

Interpretation of Scores
Joe is having difficulty with some aspects of the activities of daily life. He indicated that he is having difficulty in the following areas: Difficulty coping with noisy environments which impacts on socializing and anxiety levels The Adolescent/Adult Sensory Profile scores reveal that Joe can successfully use and understand some sensory information, and has difficulty understanding and using other sensory information.

Whenever possible, the team needs to use Joe's areas of strength to support his performance. His strengths lie in the area(s) of:
- Sensory Sensitivity
- Sensation Avoiding

Joe is having difficulty with other ways of processing sensory information and these are likely to be interfering with activities of daily life. He is having difficulty with:
- Low Registration
- Sensation Seeking

Quadrant Interpretation
Individuals with a "More Than Others" Low Registration pattern can profit from more intensity in sensory experiences during daily life, or by decreasing the predictability of routines. With more intensity of sensory input, these individuals can continue to pay attention and maintain attention to tasks and the activities of their daily lives.

Individuals with a "Less Than Others" Sensation Seeking pattern can benefit from employing strategies that support exploration of and interaction with the sensory environment. It is important not to force these individuals into situations that may overwhelm them, rather, encourage them to identify new yet satisfying sensory experiences.

Other assessments, interviews, and observations should augment the information obtained from the Adolescent/Adult Sensory Profile results to identify Joe's sensory processing features. Information will be made available to those who interact frequently with Joe to construct additional plans to support Joe's participation in daily activities, with a special focus on sensory processing needs.

QUADRANT GRID

Quadrant 1		Quadrant 2		Quadrant 3		Quadrant 4	
Low Registration		Sensation Seeking		Sensory Sensitivity		Sensation Avoiding	
Item	Raw Score	Item	Raw Score	Item	Raw Score	Item	Raw Score
3	4	2	3	7	3	1	2
6	4	4	1	9	3	5	2
12	5	8	4	13	2	11	4
15	4	10	3	16	4	18	2
21	4	14	2	20	3	24	1
23	2	17	3	22	2	26	2
36	3	19	5	25	1	29	4
37	2	28	3	27	2	35	3
39	3	30	1	31	2	38	2
41	1	32	4	33	4	43	1
44	2	40	1	34	3	46	2
45	1	42	2	48	3	49	2
52	2	47	2	51	1	53	2
55	2	50	1	54	2	56	4
59	1	58	3	60	1	57	3
Quadrant Raw Score Total	40	Quadrant Raw Score Total	38	Quadrant Raw Score Total	36	Quadrant Raw Score Total	37

= Low Registration

= Sensation Seeking

= Sensory Sensitivity

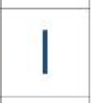
= Sensation Avoiding

PATTERN GRIDS

Taste/Smell Processing

CONTINUA					QUADRANTS			
Neurological Threshold			Behavioral Response/ Self-Regulation		1	2	3	4
	Sensory Sensitivity & Sensation Avoiding	Low Registration & Sensation Seeking	Sensation Avoiding & Sensation Seeking	Low Registration & Sensory Sensitivity	Low Registration	Sensation Seeking	Sensory Sensitivity	Sensation Avoiding
Item #	LOW	HIGH	ACTIVE	PASSIVE	(High - Passive)	(High - Active)	(Low - Passive)	(Low - Active)
1	2		2					2
2		3	3			3		
3		4		4	4			
4		1	1			1		
5	2		2					2
6		4		4	4			
7	3			3			3	
8		4	4			4		

Movement Processing

CONTINUA					QUADRANTS			
Neurological Threshold			Behavioral Response/ Self-Regulation		1	2	3	4
								
	Sensory Sensitivity & Sensation Avoiding	Low Registration & Sensation Seeking	Sensation Avoiding & Sensation Seeking	Low Registration & Sensory Sensitivity	Low Registration	Sensation Seeking	Sensory Sensitivity	Sensation Avoiding
Item #	LOW	HIGH	ACTIVE	PASSIVE	(High - Passive)	(High - Active)	(Low - Passive)	(Low - Active)
9	3			3			3	
10		3	3			3		
11	4		4					4
12		5		5	5			
13	2			2			2	
14		2	2			2		
15		4		4	4			
16	4			4			4	

Visual Processing

CONTINUA					QUADRANTS			
Neurological Threshold			Behavioral Response/ Self-Regulation		1	2	3	4
	Sensory Sensitivity & Sensation Avoiding	Low Registration & Sensation Seeking	Sensation Avoiding & Sensation Seeking	Low Registration & Sensory Sensitivity	Low Registration	Sensation Seeking	Sensory Sensitivity	Sensation Avoiding
Item #	LOW	HIGH	ACTIVE	PASSIVE	(High - Passive)	(High - Active)	(Low - Passive)	(Low - Active)
17		3	3			3		
18	2		2					2
19		5	5			5		
20	3			3			3	
21		4		4	4			
22	2			2			2	
23		2		2	2			
24	1		1					1
25	1			1			1	
26	2		2					2

Touch Processing

CONTINUA					QUADRANTS			
Neurological Threshold			Behavioral Response/ Self-Regulation		1	2	3	4
	Sensory Sensitivity & Sensation Avoiding	Low Registration & Sensation Seeking	Sensation Avoiding & Sensation Seeking	Low Registration & Sensory Sensitivity	Low Registration	Sensation Seeking	Sensory Sensitivity	Sensation Avoiding
Item #	LOW	HIGH	ACTIVE	PASSIVE	(High - Passive)	(High - Active)	(Low - Passive)	(Low - Active)
27	2			2			2	
28		3	3			3		
29	4		4					4
30		1	1			1		
31	2			2			2	
32		4	4			4		
33	4			4			4	
34	3			3			3	
35	3		3					3
36		3		3	3			
37		2		2	2			
38	2		2					2
39		3		3	3			

Activity Level

CONTINUA					QUADRANTS			
Neurological Threshold			Behavioral Response/ Self-Regulation		1	2	3	4
	Sensory Sensitivity & Sensation Avoiding	Low Registration & Sensation Seeking	Sensation Avoiding & Sensation Seeking	Low Registration & Sensory Sensitivity	Low Registration	Sensation Seeking	Sensory Sensitivity	Sensation Avoiding
Item #	LOW	HIGH	ACTIVE	PASSIVE	(High - Passive)	(High - Active)	(Low - Passive)	(Low - Active)
40		1	1			1		
41		1		1	1			
42		2	2			2		
43	1		1					1
44		2		2	2			
45		1		1	1			
46	2		2					2
47		2	2			2		
48	3			3			3	
49	2		2					2

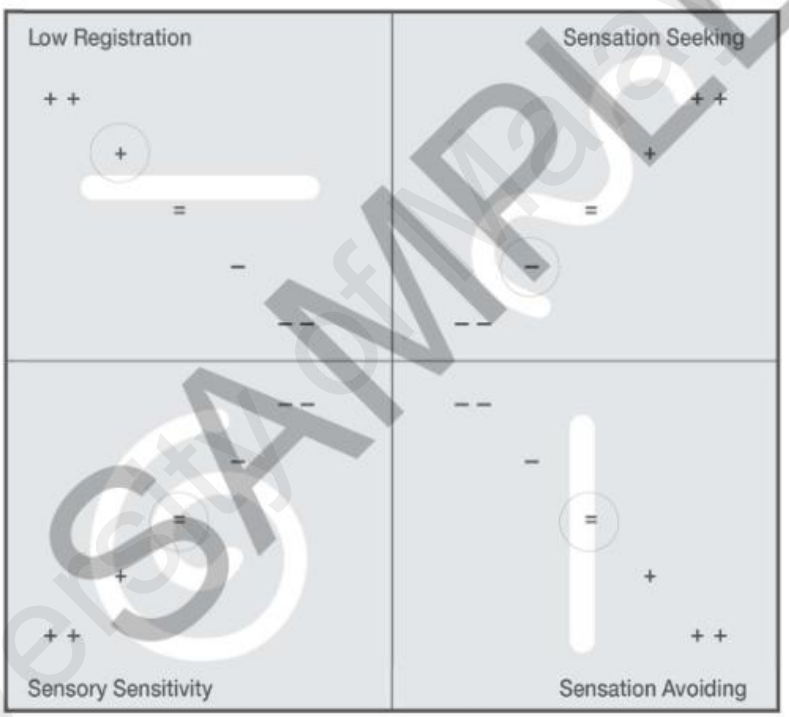
Auditory Processing

CONTINUA					QUADRANTS			
Neurological Threshold			Behavioral Response/ Self-Regulation		1	2	3	4
	Sensory Sensitivity & Sensation Avoiding	Low Registration & Sensation Seeking	Sensation Avoiding & Sensation Seeking	Low Registration & Sensory Sensitivity	Low Registration	Sensation Seeking	Sensory Sensitivity	Sensation Avoiding
Item #	LOW	HIGH	ACTIVE	PASSIVE	(High - Passive)	(High - Active)	(Low - Passive)	(Low - Active)
50		1	1			1		
51	1			1			1	
52		2		2	2			
53	3		3					3
54	2			2			2	
55		2		2	2			
56	4		4					4
57	3		3					3
58		3	3			3		
59		1		1	1			
60	1			1			1	

QUADRANT PROFILE

The following symbols are used to represent the classifications on the Quadrant Profile:

– –	Much Less Than Most People
–	Less Than Most People
=	Similar to Most People
+	More Than Most People
+ +	Much More Than Most People



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