

CHAPTER FOUR

RESULTS

4.1 DESCRIPTIVE STATISTICS OF THE SUBJECTS IN THE STUDY

The sample composed of 90 subjects (30 subjects from each ethnic group).

Table 4.1 The characteristic features of the subjects in the study (n=90).

Ethnic group	Male (n)	Female (n)	Age range (years)	Mean age (\pmSD)
Malay	9	21	21-53	28.53(\pm 9.54)
Chinese	6	24	21-57	23.80(\pm 6.34)
Indians	8	22	20-50	26.30(\pm 9.44)
Total	23	67		

4.2 MEAN L*A*B* VALUES FROM THE THREE DEVICES

The mean L*a*b* values (\pm SD) for the sample studied obtained using the three devices are shown in table 4.2

Table 4.2 Mean L*a*b* values (\pm SD) of skin shades captured by the three devices.

Device	L*	a*	b*
Spectrophotometer	61.61(\pm 7.56)	8.29(\pm 1.55)	10.19(\pm 2.36)
Camera	49.40(\pm 6.27)	7.23(\pm 1.79)	15.82(\pm 3.43)
Scanner	51.86(\pm 6.77)	11.64(\pm 1.16)	16.93(\pm 2.16)

Paired t- test analysis of L*a*b* values from spectrophotometer, digital camera, and scanner showed that all values were significantly different ($p < 0.05$) (Table 4.2a).

Table 4.2a Paired t test for L*a*b* values of the 3 devices.

Devices	Mean	SD	SD Error Mean	95% CI	T	DF	Sig.
Sp – DC	12.21	6.51	.69	10.85 13.58	17.77	89	.01*
Sp – Sc L*	9.76	6.18	.65	8.46 11.05	14.96	89	.01*
Sc – DC	2.46	4.45	.47	1.52 3.39	5.24	89	.01*
Sp – DC	1.06	1.73	.18	.69 1.42	5.81	89	.01*
Sp – Sc a*	-3.36	1.40	.15	-3.65 -3.06	-22.73	89	.01*
Sc – DC	4.41	1.63	.17	4.07 4.75	25.71	89	.01*
Sp – DC	-5.63	3.10	.33	-6.28 -4.99	-17.26	89	.01*
Sp – Sc b*	-6.74	2.30	.24	-7.23 -6.26	-27.87	89	.01*
Sc – DC	1.11	2.45	.26	.60 1.63	4.3	89	.01*

Sp; spectrophotometer, DC; Digital Camera, Sc; Scanner

The means of the L*a*b* values for all three devices are significantly different ($p < 0.01$). *Significant value ($p < 0.05$).

4.3 MEAN L*A*B* VALUES (\pm SD) OF THE SKIN SHADES FOR EACH ETHNIC GROUP

Table 4.3 Mean L*a*b* values (\pm SD) of the skin shades for each ethnic group obtained by the three devices (n=30 for each ethnic group).

Ethnic Group		Malay	Chinese	Indian
Spectro- photometer	L*	61.03(\pm 6.84)	66.63(\pm 6.32)	57.17(\pm 6.47)
	a*	9.13(\pm 1.50)	7.37(\pm 1.47)	8.37(\pm 1.13)
	b*	11.07(\pm 2.18)	9.00(\pm 2.02)	10.50(\pm 2.43)
Digital camera	L*	50.13(\pm 4.65)	54.20(4.18)	43.87(\pm 5.04)
	a*	7.93(\pm 1.66)	5.90(\pm 1.54)	7.87(\pm 1.38)
	b*	16.33(\pm 2.95)	14.10(\pm 3.22)	17.03(\pm 3.48)
Scanner	L*	53.10(\pm 2.94)	57.97(\pm 2.66)	44.50(\pm 5.36)
	a*	12.03(\pm 1.35)	11.47(\pm 1.22)	11.43(\pm .77)
	b*	17.67(\pm 1.75)	15.23(\pm 1.72)	17.90(\pm 1.95)

Table 4.3a Independent t test between Malay and Chinese.

Devices		F	Sig.	T	Df	Sig. (2-t)	M Dif	SE Dif	95% CI	
Spectro- photometer	L*	.23	.64	-3.29	58	.01*	-5.60	1.70	-9.00	-2.20
	a*	.00	.98	4.60	58	.01*	1.77	.38	1.00	2.54
	b*	.05	.82	3.81	58	.01*	2.07	.54	.98	3.15
Digital camera	L*	1.94	.17	-3.56	58	.01*	-4.07	1.14	-6.35	-1.78
	a*	.83	.37	4.92	58	.01*	2.03	.41	1.21	2.86
	b*	.24	.63	2.80	58	.01*	2.23	.80	.64	3.83
Scanner	L*	.26	.61	-6.73	58	.01*	-4.87	.72	-6.32	-3.42
	a*	.34	.56	1.70	58	.09	.567	.33	-.10	1.23
	b*	.00	.97	5.44	58	.01*	2.43	.45	1.54	3.33

*Significant value (p<0.05).

Spectrophotometer values: Mean L*a*b* values were significantly different (p<0.05).

Digital camera values: Mean L*a*b* values were significantly different (p<0.05).

Scanner values: Mean L* and b* values were significantly different (p<0.05). There was however, no significant difference in the a* values (p>0.05).

Table 4.3b Independent t tests between Malay and Indians.

Devices		F	Sig.	T	Df	Sig. (2-t)	M Dif.	SE Dif.	95% CI	
Spectro- photometer	L*	.30	.59	2.25	58	.03*	3.87	1.72	.43	7.31
	a*	1.94	.17	2.23	58	.03*	.77	.34	.08	1.46
	b*	.87	.36	.95	58	.35	.57	.60	-.63	1.76
Digital camera	L*	.16	.69	5.00	58	.01*	6.27	1.25	3.76	8.77
	a*	2.27	.14	.17	58	.87	.07	.39	-.72	.86
	b*	.98	.33	-.84	58	.40	-.70	.83	-2.37	.97
Scanner	L*	19.06	.00	7.71	58	.01*	8.60	1.12	6.37	10.83
	a*	9.09	.00	2.11	58	.04*	.60	.28	.03	1.17
	b*	.00	.96	-.49	58	.63	-.23	.48	-1.19	.73

*Significant value (p<0.05).

Spectrophotometer values: Mean L* and a* values were significantly different (p< 0.05). There was however, no significant difference in the b* values (p<0.05).

Digital camera values: Only the L* values were significantly different (p<0.05).

Scanner values. Mean L* and a* values were significantly different (p< 0.05). There was however, no significant difference in the b* values (p<0.05).

Table 4.3c Independent t test between Chinese and Indians.

Devices		F	Sig.	T	Df	Sig. (2-t)	M Dif	SE Dif	95% CI	
Spectro- photometer	L*	.01	.92	5.73	58	.01*	9.47	1.65	6.16	12.77
	a*	2.24	.14	-2.95	58	.01*	-1.00	.34	-1.68	-.32
	b*	1.50	.23	-2.60	58	.01*	-1.50	.58	-2.66	-.35
Digital camera	L*	2.82	.10	8.64	58	.01*	10.33	1.20	7.94	12.73
	a*	.27	.60	-5.21	58	.01*	-1.97	.38	-2.72	-1.21
	b*	.25	.62	-3.39	58	.01*	-2.93	.87	-4.67	-1.20
Scanner	L*	24.30	.01	12.34	58	.01*	13.47	1.10	11.28	15.65
	a*	6.18	.02	.13	58	.90	.03	.26	-.50	.56
	b*	.00	.98	-5.62	58	.01*	-2.67	.48	-3.62	-1.72

*Significant value (p<0.05).

Spectrophotometer values: Mean L*a*b* values were significantly different (p<0.05).

Digital camera values: Mean L*a*b* values were significantly different (p<0.05).

Scanner values: Mean L* and b* values were significantly different (p< 0.05). There was however, no significant difference in the a* values (p<0.05).

4.4 THE LAB VALUES FOR SKIN SHADE IN RELATION TO GENDER

Table 4.4 Mean L*a*b* values (\pm SD) of the three devices according to gender for all subjects in the study (n=90).

Device/Gender		Female (n=67)	Male (n=23)
		Mean (\pm SD)	Mean (\pm SD)
Spectrophotometer	L*	62.61(\pm 7.53)	58.70(\pm 7.00)
	a*	8.04(\pm 1.42)	9.00(\pm 1.71)
	b*	10.13(\pm 2.38)	10.35(\pm 2.35)
Digital camera	L*	50.12(\pm 6.28)	47.30(\pm 5.87)
	a*	7.10(\pm 1.79)	7.61(\pm 1.78)
	b*	15.93(\pm 3.51)	15.52(\pm 3.22)
Scanner	L*	52.70(\pm 6.42)	49.39(\pm 7.30)
	a*	11.36(\pm 1.03)	12.48(\pm 1.16)
	b*	16.78(\pm 2.07)	17.39(\pm 2.41)

Table 4.4a Independent t test between gender when all subjects were combined in a group (n=90).

Devices		F	Sig.	T	DF	Sig. (2-t)	M Dif	SE Dif	95% CI	
Spectro- photometer	L*	.89	.35	-2.19	88	.03*	-3.92	1.79	-7.47	-.36
	a*	.48	.49	2.64	88	.01*	.96	.36	.24	1.67
	b*	.02	.89	.37	88	.71	.2163	.57	-.93	1.35
Digital camera	L*	.26	.62	-1.89	88	.06	-2.82	1.49	-5.78	.15
	a*	.00	.98	1.17	88	.25	.50	.43	-.35	1.4
	b*	.67	.41	-.485	88	.63	-.40	.83	-2.06	1.25
Scanner	L*	.53	.47	-2.06	88	.04*	-3.31	1.61	-6.50	-.12
	a*	2.05	.16	4.37	88	.01*	1.12	.26	.61	1.63
	b*	1.46	.23	1.18	88	.24	.62	.52	-.42	1.65

*Significant value (p<0.05).

Spectrophotometer values: Mean L* and a* values were significantly different (p<0.05). There was however, no significant difference in the b* values (P<0.05).

Digital camera values: Mean L*a*b* values were not significantly different (p<0.05).

Scanner values: Mean L* and a* values were significantly different (p<0.05). There was however, no significant difference in the b* values (P<0.05).

Table 4.5 Mean L*a*b* values (\pm SD) for the Malay ethnic group according to gender (n=30):

Device/Gender		Female (n=21)	Male (n=9)
		Mean (\pmSD)	Mean (\pmSD)
Spectrophotometer	L*	61.24(\pm 7.29)	60.56(\pm 6.02)
	a*	8.71(\pm 1.27)	10.11(\pm 1.62)
	b*	10.76(\pm 2.14)	11.78(\pm 2.22)
Digital camera	L*	50.48(\pm 5.21)	49.33(\pm 3.08)
	a*	7.62(\pm 1.69)	8.67(\pm 1.41)
	b*	15.95(\pm 3.41)	17.22(\pm 1.09)
Scanner	L*	54.00(\pm 2.93)	51.00(\pm 1.66)
	a*	11.48(\pm 1.21)	13.33(\pm .50)
	b*	17.19(\pm 1.54)	18.78(\pm 1.79)

Table 4.6 Mean L*a*b* values (\pm SD) for the Chinese ethnic group according to gender, (n=30).

Device/Gender		Female (n=24)	Male (n=6)
		Mean (\pmSD)	Mean (\pmSD)
Spectrophotometer	L*	67.96(\pm 5.69)	61.33(\pm 6.38)
	a*	7.04(\pm 1.30)	8.67(\pm 1.51)
	b*	8.75(\pm 2.01)	10.00(\pm 1.90)
Digital camera	L*	55.00(\pm 2.99)	51.00(\pm 6.69)
	a*	5.83(\pm 1.40)	6.17(\pm 2.14)
	b*	14.04(\pm 3.13)	14.33(\pm 3.88)
Scanner	L*	58.04(\pm 2.79)	57.67(\pm 2.25)
	a*	11.25(\pm 1.07)	12.33(\pm 1.51)
	b*	15.13(\pm 1.75)	15.67(\pm 1.63)

Table 4.7 Mean L*a*b* values (\pm SD) for the Indian ethnic group according to gender, (n=30).

Device/Gender		Female (n=22)	Male (n=8)
		Mean(\pmSD)	Mean(\pmSD)
Spectrophotometer	L*	58.09(\pm 6.03)	54.63(\pm 7.35)
	a*	8.50(\pm 1.06)	8.00(\pm 1.31)
	b*	11.05(\pm 2.36)	9.00(\pm 2.07)
Digital camera	L*	44.45(\pm 5.24)	42.25(\pm 4.37)
	a*	8.00(\pm 1.48)	7.50(\pm 1.07)
	b*	17.95(\pm 2.94)	14.50(\pm 3.78)
Scanner	L*	45.64(\pm 5.11)	41.38(\pm 5.01)
	a*	11.36(\pm .79)	11.63(\pm .74)
	b*	18.18(\pm 1.56)	17.13(\pm 2.75)

4.5 THE RESULTS OF THE VISUAL ASSESSMENT

The results of the visual assessment of matching of the skin tags to the skin shade of the subjects are shown in (Figure 4.1).

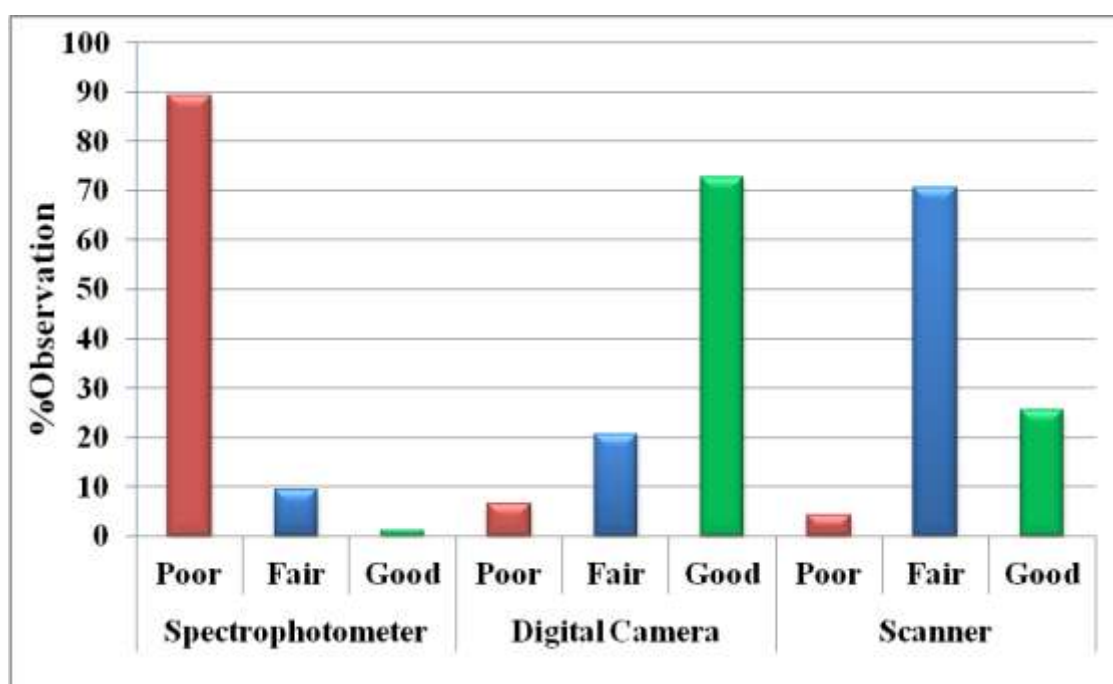


Figure 4.1 The percentage of the printed skin tags from the three devices assessed visually as poor, fair and good by four assessors in the study.

Table 4.8 Chi-square test for the total observers and devices.

	Spectrophotometer				Digital camera				Scanner			
	1	2	3	4	1	2	3	4	1	2	3	4
Observer	1	2	3	4	1	2	3	4	1	2	3	4
X ²	42.7	151.26	151.26	42.7	58.86	67.26	73.26	65.4	51.66	68.6	74.46	56.6
Df	1	2	2	1	2	2	2	2	2	2	2	2
Asymp. Sig.	.01*	.01*	.01*	.01*	.01*	.01*	.01*	.01*	.01*	.01*	.01*	.01*

*Significant value (p<0.05).

All the results are significant as shown in (Table 4.8).

4.6 CLASSIFICATION OF THE SKIN SHADE

4.6.1 The dark colour group

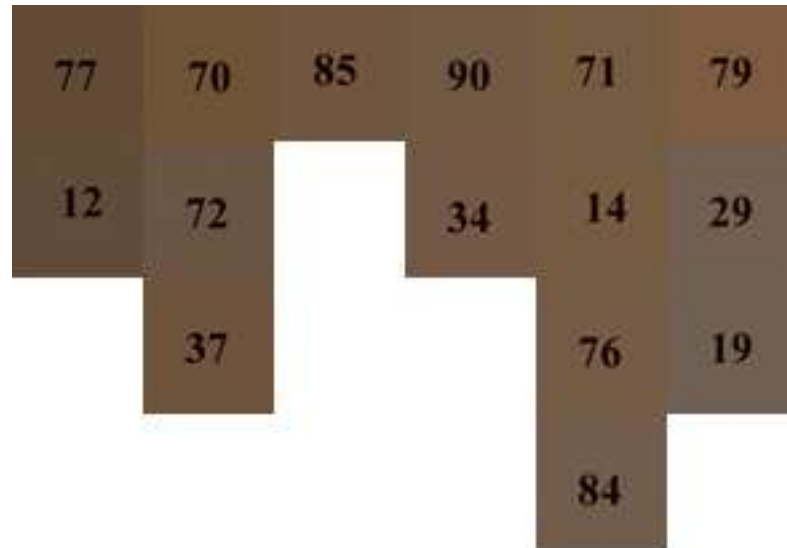


Figure 4.2 Range of colours in the dark colour group. The numbers on the printed boxes indicate the subject number of the subjects in the study.



Figure 4.2a The basic colour of the dark skinned group. The mean $L^*a^*b^*$ values for the dark colour were: ($L^*= 38$, $a^*= 9$, $b^*= 17$).

Table 4.9 The subjects whose skin shades were classified as dark.

Ethnic/Gender	Male	Female	Total
Malays	0	1(6.7%)	1(6.7%)
Chinese	1(6.7%)	0	1(6.7%)
Indians	4(26.6%)	9(60%)	13(86.6%)
Total	5(33.3%)	10(66.7%)	15(100%)

4.6.2 The medium colour group

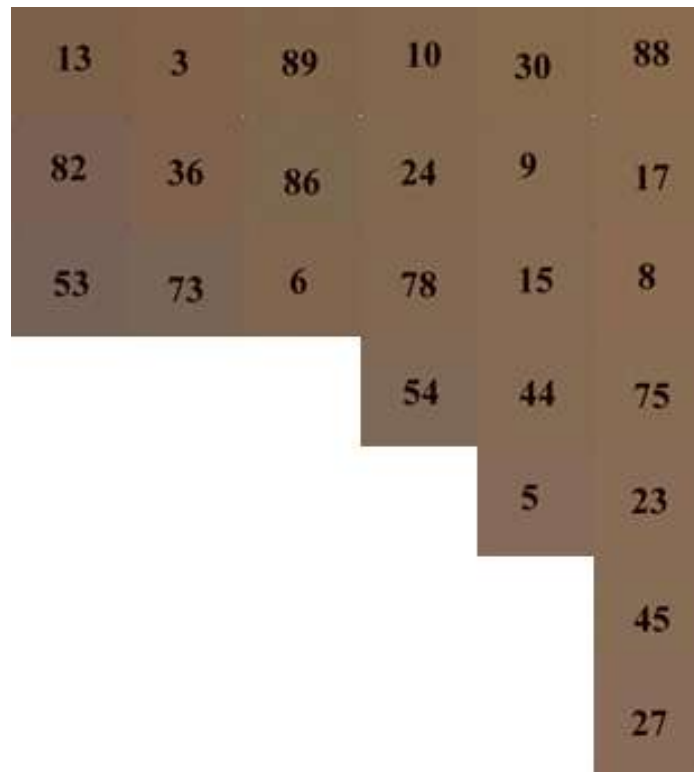


Figure 4.3 Range of colours in the medium colour group. The numbers on the printed boxes indicate the subject number of the subjects in the study.



Figure 4.3a The basic colour of the medium skinned group. The mean $L^*a^*b^*$ values for the medium colour were: ($L^*=46$, $a^*=9$, $b^*=16$).

Table 4.10 The subjects whose skin shades were classified as medium.

Ethnic/Gender	Male	Female	Total
Malays	4(16%)	8(32%)	12(48%)
Chinese	1(4%)	0	1(4%)
Indians	4(16%)	8(32%)	12(48%)
Total	9(36%)	16(64%)	25(100%)

4.6.3 The fair colour group

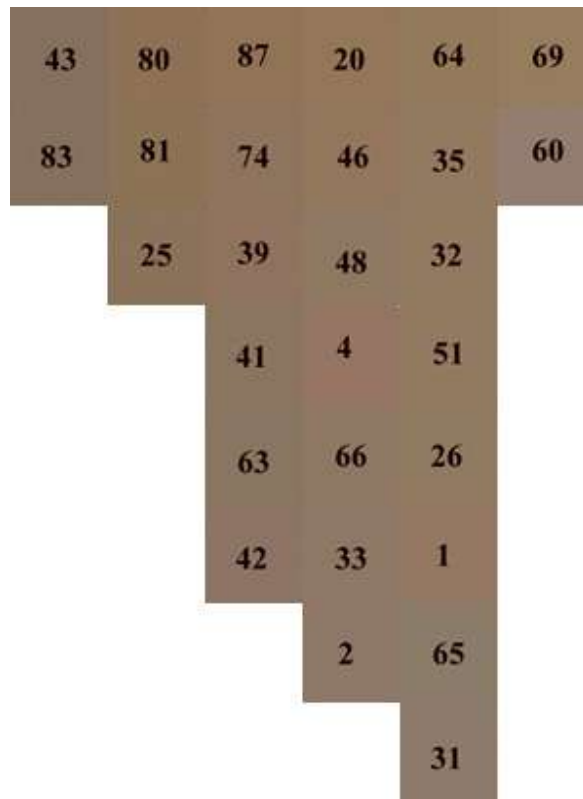


Figure 4.4 Range of colours in the fair colour group. The numbers on the printed boxes indicate the subject number of the subjects in the study.



Figure 4.4a The basic colour of the fair skinned group. The mean $L^*a^*b^*$ values for the fair colour were: ($L^*=46$, $a^*=9$, $b^*=16$).

Table 4.11 The subjects whose skin shades were classified as fair colour group.

Ethnic/Gender	Male	Female	Total
Malays	4(14.3%)	5(17.9%)	9(32.2%)
Chinese	2(7.1%)	11(39.2%)	13(46.3%)
Indians	1(3.6%)	5(17.9%)	6(21.5%)
Total	7(25%)	21(75%)	28(100%)

4.6.4 The light colour group

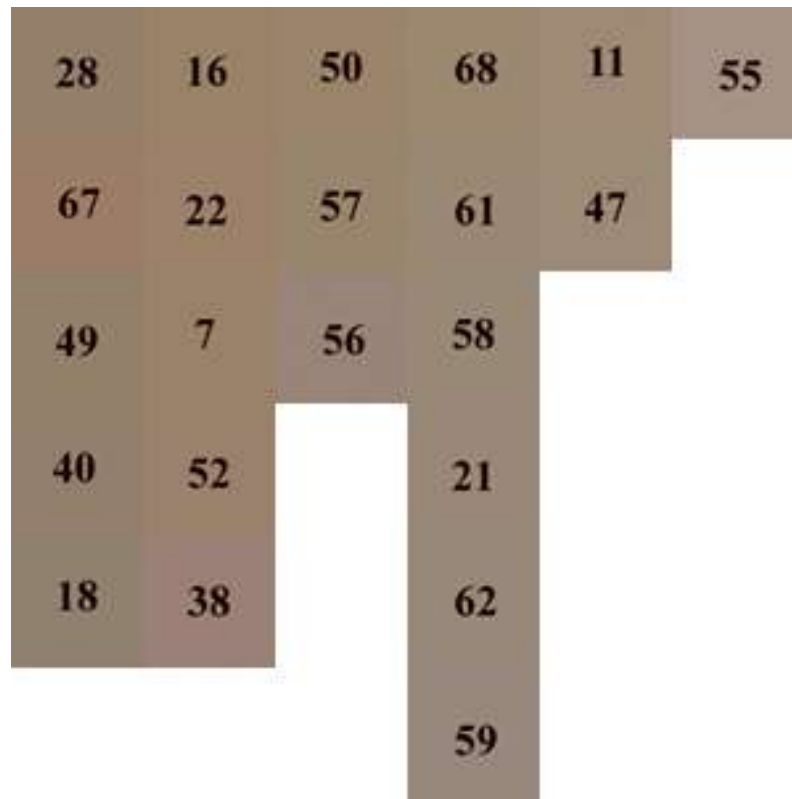


Figure 4.5 Range of colours in the light colour group. The numbers on the printed boxes indicate the subject number of the subjects in the study.



Figure 4.5a The basic colour of the light skinned group. The mean $L^*a^*b^*$ value for the light colour were: ($L^*=59$, $a^*=8$, $b^*=19$).

Table 4.12 The subjects whose skin shades were classified as light colour group.

Ethnic/Gender	Male	Female	Total
Malays	0	7(31.8%)	7(31.8%)
Chinese	2(9.1%)	13(59.1%)	15(68.2%)
Indians	0	0	0
Total	2(9.1%)	20(90.9%)	22(100%)

4.7 SKIN SHADE CLASSIFICATION OF SUBJECTS IN THE STUDY

The four basic shades which may represent the range of skin shades for the Malaysian population is shown in Figure 4.6.



Figure 4.6 Range of skin shades of the subjects in the study based on the skin shade reproduction by the digital camera.