# CHAPTER 7: UNDERLYING PATTERNS IN THE QUESTIONNAIRE DATA

This chapter explores underlying patterns in the questionnaire data relating to respondents' attitudes towards physical features, motives for forest use and feelings when in the forests and how these might inform an overall understanding of their use and experience in the recreational forests. It presents the main factors underlying the questionnaire responses, derived from factor analysis. Relationships with other variables are also explored (using ANOVA). The chapter aims to give a different perspective from the previous chapter, examining the variables that make up the underlying factors and their relationships with the socio-demographic variables. This method of data analysis gives a more holistic understanding of the motivation for forest use and experience in the recreational forests. It is also a way of triangulating the questionnaire data findings, both internally and with the findings from the qualitative data. By analysing the patterns underlying the questionnaire responses, the internal validity of the questionnaire items is evaluated, as well as the ways in which the underlying factors support or contradict the findings from the qualitative analysis. The last part of this chapter explores selected factor analysis ("Self actualisation") with the frequency of visits as a variable.

## 7.1 Overall Factor Analysis

In this research, the factor analysis was used for exploration purposes and to identity aspects of forest use and experience which seem to be significant in people's experience of recreational forests. The resulting analysis indicates that there were seven factors, which account for 46.19% of the total variance in the questionnaire scores.

## 7.2 Choosing the Number of Factors Retained

If the straight factors from the factor analysis were used, then there would be an excessive number of items loaded into the first factor, making the outcome difficult to interpret: thus "... researchers are usually interested only in the rotated factor matrix" (Dancey & Reidy, 2007, p.473). The normal solution is to use a Principal Components Analysis (PCA) with Varimax rotation, and this was the approach used in this case. The resulting scree plot (Figure 7.1) reveals a

large numbers of factors. The normal procedure is to use only the factors above the 'elbows' in the plot. Elbows are points just before a drop in the eigenvalues. There appears to be two elbows within this data set (Figure 7.1) and there are eight factors above these elbows. The first factor represents only 33% of the variance, the second 48%. The final factor tends to be less significant. In this case, the items in the eighth factor seem not to fit into other factors, hence factor eight was not included in the discussion. All the first seven factors had eigenvalues over Kaiser's criterion of 1.0 (Pallant, 2007) and in combination, explained 46.19% of the variance.

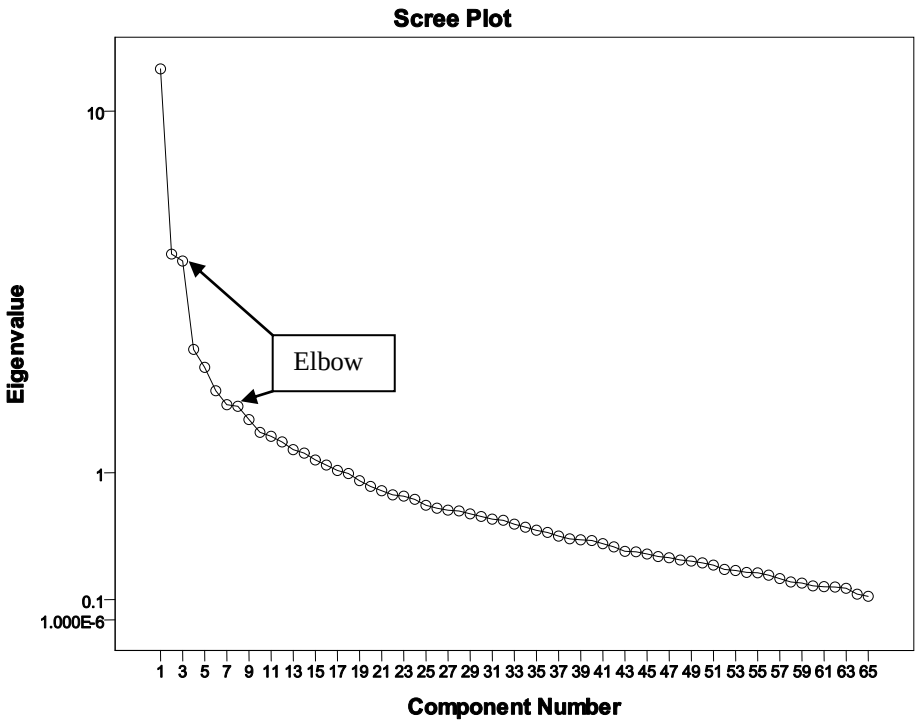


Figure 7.1: Scree plot

The seven factors and their component items were analysed and given names that reflected the commonalities among the clustered motives: "Forest amenities", "Restorative experience", "Intergenerational values", "Self-actualisation", "Incivilities", "Natural threats in the forest" and "Younger activity preference". Appendix 6 lists the full details of all the items loading onto the seven factors. These factor items consisted of the 57 items in the questionnaire (derived from the sections on attitudes towards physical features, motives for forest use and feelings when in the forest). Tabachnick and Fidell (2001), cited in Costello and Osborne (2005), stated that 0.32 is a good rule of

thumb for the minimum loading of an item, which corresponds to approximately 10% overlapping variance with the other items in that factor. Thus, items with loadings below 0.3 were excluded in this study.

Factor 1 was named "Forest amenities" and accounted for 19.12% of the variance with Cronbach's alpha 0.91 (See Table 7.9). "Forest amenities" received its main contribution from 14 items: "boards telling me about the forest", "basic facilities", "signs that lead me through the forest", "tidy appearance", "available parking spaces", "free of rubbish", "fenced off and secure environment", "easy to get into", "clearly indicates that visitor are welcome", "streams, rivers or waterfall", "paths free from obstruction", "areas of open space" and "accessible by car, bus or motorcycle". Smaller contributions came from "to view the scenery", "to experience the calm and comfort", "to get fresh air", "to enjoy the sights, smell and sounds of nature" and "to spend quality time with my family" but these had lower factor loadings under Factor 1 compared to Factor 2 ("Restorative experience"). Therefore, these items were deemed more appropriate for Factor 2. Furthermore, the item "to spend quality time with my family" was considered more suitable for Factor 3 ("Intergenerational values"), because the item loading was higher under Factor 3 compared with Factors 1 and 2.

Table 7.1 Items retained under Factor 1 ("Forest amenities"), loadings ≤ 0.30 not shown

| **Motives for forest use and experience**** *I prefer to visit a recreational forest:* | **Factor 1 loadings Forest amenities** |
|---|---|
| Where there are boards telling me about the forest | 0.75 |
| That has basic facilities (e.g: toilet, shelter, prayer room) | 0.74 |
| Where there are signs that lead me through the forest | 0.74 |
| Where there are signs that lead me to the forest | 0.74 |
| That is tidy in appearance | 0.70 |
| That has available parking spaces | 0.67 |
| That is free of rubbish | 0.65 |
| That is fenced off and has secured environment | 0.64 |
| That is easy to get into | 0.62 |
| That clearly indicates that visitors are welcome | 0.60 |
| Where there are streams, rivers or waterfall | 0.59 |
| Where the paths are free from obstruction | 0.57 |
| That has areas of open space | 0.54 |
| That I can get to by car, bus or motorcycle | 0.50 |

**Originally coded on a 5-point Likert-type scale where: (1) = strongly disagree, (2) = disagree, (3) = not sure, (4) = agree, (5) = strongly agree.

Factor 2 was named "Restorative experience" and accounted for 7.1% of the variance with Cronbach's alpha 0.84. Factor 2 combined many aspects that are familiar from the literature such as fascination, extent, compatibility (Kaplan and Kaplan, 1989; Berto et al., 2010), being away (Kaplan & Kaplan, 1989; Hammitt, 2000; Laumann et al., 2001), reduce stress (Ulrich, 1981; Hartig, 2003) and social interaction between lifespan (Scopelliti & Vittoria Giuliani, 2004). These aspects relate both to the respondents' motivation for visiting the forest and to the facets of their experience whilst in the forest. These suggest that restoration is a cyclical experience, with each restorative experience contributing to future expectations regarding the next one. "Restorative experience" received its main contribution from 11 items: "to relax and forget my worries", "to view the scenery", "to go walking", "to experience the calm and comfort of a forest", "to experience the silence", "I feel alive", "to lift my spirits", "to watch birds and animals", "to get fresh air", "to enjoy the sights, smell and sounds of nature" and "to be alone". Other contributions came from "tidy in appearance", "clearly indicates that visitors are welcome", "there are streams, rivers or waterfall", "to spend quality time with family", "to go running/jogging/take exercise", "bringing back childhood memories of play" and "I feel peaceful in the forest". However, item loadings on "to spend quality time with family", "to go running/jogging/take exercise", and "bringing back childhood memories of play" were higher in Factor 3 ("Intergenerational values") than in Factor 2. Therefore, those items were deemed to belong to Factor 3.

Table 7.2 Items retained under Factor 2 ("Restorative experience"), loadings ≤ 0.30 not shown

| **Motives for forest use and experience**** *My reason for visiting the forest is:* | **Factor 2 loadings Restorative experience** |
|---|---|
| To relax and forget my worries | 0.63 |
| To view the scenery | 0.60 |
| To go walking | 0.60 |
| To experience the calm and comfort of a forest | 0.58 |
| To experience the silence of the forest | 0.53 |
| I feel alive: I can be in contact with the elements of nature | 0.52 |
| To lift my spirits when I am depressed | 0.49 |
| To watch birds and animals | 0.45 |
| To get fresh air | 0.43 |
| To enjoy the sights, smell and sounds of nature (e.g. insects, birds, water etc.) | 0.39 |
| To be alone in the forest | 0.34 |

**Originally coded on a 5-point Likert-type scale where: (1) = strongly disagree, (2) = disagree, (3) = not sure, (4) = agree, (5) = strongly agree.

Factor 3 (Table 7.3) was named "Intergenerational values" and accounted for 6.8% of the variance with Cronbach's alpha 0.73 (Table 6.9). This cluster of items suggests that, apart from providing opportunities for respondents to spend time together with their family, the recreational forest has the potential to provide a sense of emotional continuity and existential fulfilment, connected to the ability to pass on aspects of the forest experience to one's children, and to feel secure in the knowledge that this experience will continue to be shared in future. "Intergenerational values" received its main contribution from seven items namely: "to teach my children about the outdoor environment", "so my children can play", "it links me to the future", "to be with my family members", "to spend quality time with family", "to go running/jogging/take exercise" and "it brings back childhood memories of play". Other contributions came from "to experience the silence of the forest" and "I feel attached to nature". However, "to experience the silence of the forest" was considered more relevant to Factor 2 and the item "I feel attached to nature" was more appropriate for Factor 4 ("Self-actualisation").

Table 7.3 Items retained under Factor 3 ("Intergenerational values"), loadings ≤ 0.30 not shown

| **Motives for forest use and experience**** *My reason for visiting the forest is:* | **Factor 3 loadings Intergenerational values** |
|---|---|
| To teach my children about the outdoor environment | 0.751 |
| So my children can play | 0.603 |
| It links me to the future: I used to play, now my children do so as well | 0.583 |
| To be with my family members | 0.558 |
| To spend quality time with my family | 0.500 |
| To go running/jogging/take exercise | 0.472 |
| It brings back childhood memories of play | 0.395 |

**Originally coded on a 5-point Likert-type scale where: (1) = strongly disagree, (2) = disagree, (3) = not sure, (4) = agree, (5) = strongly agree.

Factor 4 (Table 7.4) was named "Self-actualisation" and accounted for 3.9% of the variance with Cronbach's alpha 0.81. "Self-actualisation" reflects a sense of the forest as an alternative space in which normal pressures and constraints do not apply, allowing people both to be themselves and to feel more aware of the natural world going on around them. This factor received its main contribution from seven items: "I feel equal to everyone", "I feel free from human influences", "I feel peaceful in the forest", "I feel joyful", "I feel safe", and "I feel attached to nature" and "to be myself". Other contributions were from "I

feel alive", "to lift my spirits when I am depressed" and "it brings back childhood memories of play". However, as previously mentioned, the item "it brings back childhood memories of play" was assigned to Factor 3.

Table 7.4 Items retained under Factor 4 ("Self-actualisation"), loadings ≤ 0.30 not shown

| **Motives for forest use and experience**** *What is your perception and feeling when you are in the forest?* | **Factor 4 loadings Self-actualisation** |
|---|---|
| I feel equal to everyone else here | 0.65 |
| I free from human influences | 0.64 |
| I feel peaceful in the forest | 0.61 |
| I feel joyful in the forest | 0.58 |
| I feel safe in the forest | 0.57 |
| I feel attached to nature, here there is order and a sequence of events (life cycle) | 0.55 |
| To be myself, here no one expects anything from me | 0.42 |

**Originally coded on a 5-point Likert-type scale where: (1) = strongly disagree, (2) = disagree, (3) = not sure, (4) = agree, (5) = strongly agree.

Factor 5 was named "Incivilities" and accounted for 3.5% of the variance with Cronbach's alpha 0.71. "Incivilities" received its main contribution from eight items: "a place for vandalism", "a place people can hide", "a place for rubbish dumping", "I feel isolated in the forest", "I feel lonely", "a place for drug addicts", "it is boring in the forest" and "I don't like being in the middle of dense vegetation". It is interesting to note that this factor attracted a cluster of items that related mainly to concerns about human threats in the forest, and a feeling that the forest is not compatible with one's needs "it is boring in the forest".

Table 7.5 Items retained under Factor 5 ("Incivilities"), loadings ≤ 0.30 not shown

| **Motives for forest use and experience**** *My reason for visiting the forest is:* | **Factor 5 loadings Incivilities** |
|---|---|
| It is a place for vandalism | 0.60 |
| It is a place people can hide | 0.59 |
| It is a place for rubbish dumping | 0.56 |
| I feel isolated in the forest | 0.55 |
| I feel lonely in the forest | 0.55 |
| It is a place for drug addicts | 0.55 |
| It is boring in the forest | 0.46 |
| I don't like being in the middle of dense vegetation | 0.34 |

**Originally coded on a 5-point Likert-type scale where: (1) = strongly disagree, (2) = disagree, (3) = not sure, (4) = agree, (5) = strongly agree.

Factor 6 was named "Natural threats in the forest" and accounted for 3.0% of the variance with Cronbach's alpha 0.79. Factor 6 reflected more negative feelings in the forest than motives for forest use. "Natural threats in the forest" received its main contribution from five items: "I am afraid of seeing a snake", "I fear having an accident in the forest", "I am afraid of getting bitten by insects", "the

pathway is slippery, I might fall" and "I might get lost". Other contributing items were "there are streams, rivers or waterfall" and "it is a place for drug addicts". However, these were deemed more relevant to other Factors, namely Factors 1 ("Forest amenities") and 5 ("Incivilities"). This factor grouped items that were related to the natural threats which are associated with the fabric of the forest environment and the animals and insects it contains.

Table 7.6 Items retained under Factor 6 ("Natural threats in the forest"), loadings ≤ 0.30 not shown

| **Motives for forest use and experience**** *My reason for visiting the forest is:* | **Factor 6 loadings Natural threats in the forest** |
|---|---|
| I am afraid of seeing snake | 0.77 |
| I fear having an accident in the forest | 0.77 |
| I am afraid of getting bitten by insects | 0.77 |
| The pathway is slippery, I might fall | 0.63 |
| I might get lost | 0.49 |

**Originally coded on a 5-point Likert-type scale where: (1) = strongly disagree, (2) = disagree, (3) = not sure, (4) = agree, (5) = strongly agree.

Finally, Factor 7 was named "Younger activity preference" and accounted for 2.70% of the variance with Cronbach's alpha 0.73. "Younger activity preference" received its main contribution from five items: "to take photographs", "to bathe/go swimming", "stalls that sell food and drinks" and "having a picnic". This factor was named "Younger activity preference" because the items were preferred by younger people aged 19-25 years, (who were also from the Malay ethnic group). However, the ethnic dimension needs to be treated with caution because, overall, there were more Malay users compared with Chinese and Indian users.

Table 7.7 Items retained under Factor 7 ("Younger activity preference"), loadings ≤ 0.30 not shown

| **Motives for forest use and experience**** *My reason for visiting the forest is:* | **Factor 7 loadings Younger activity preference** |
|---|---|
| To take photographs | 0.65 |
| To bathe/go swimming | 0.63 |
| That has stalls that sell food and drinks | 0.53 |
| To play (e.g: kicking a ball, jumping into the water, etc.) | 0.51 |
| To have a picnic | 0.44 |

In order to establish whether there were any differences in the scores on the items loading onto the various factors between the two recreational forests, a t-test was carried out on each factor. Table 6.8 shows that the forests differed significantly in terms of Factor 2 ("Restorative experience"), 4 ("Self-actualisation"), 5 ("Incivilities"), 6 ("Natural threats in the forest") and 7 ("Younger activity preference").

Table 7.8 T-test results

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | |
|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) |
| Overall Forest amenities | Equal variances assumed | .769 | .381 | -1.685 | 294 | .093 |
| | Equal variances not assumed | | | -1.684 | 293.663 | .093 |
| Overall **Restorative experience** | Equal variances assumed | .099 | .753 | 3.400 | 294 | **.001** |
| | Equal variances not assumed | | | 3.400 | 294.000 | .001 |
| Overall Intergenerational values | Equal variances assumed | 1.459 | .228 | 1.502 | 294 | .134 |
| | Equal variances not assumed | | | 1.502 | 291.461 | .134 |
| Overall **Self-actualisation** | Equal variances assumed | 1.633 | .202 | 2.249 | 294 | **.025** |
| | Equal variances not assumed | | | 2.251 | 292.007 | .025 |
| Overall **Incivilities** | Equal variances assumed | 9.772 | **.002** | 2.202 | 294 | .028 |
| | Equal variances not assumed | | | 2.204 | 285.859 | **.028** |
| Overall **Natural threats in the forest** | Equal variances assumed | .005 | .942 | -2.639 | 294 | **.009** |
| | Equal variances not assumed | | | -2.639 | 294.000 | .009 |
| Overall **Younger activity preference** | Equal variances assumed | 5.620 | **.018** | -4.220 | 294 | .000 |
| | Equal variances not assumed | | | -4.214 | 279.954 | **.000** |

Table 7.8 shows that for Factors 2 (“Restorative experience”), 4 (“Self-actualisation”) and 5 (“Incivilities”), Ampang Forest scored higher than Kanching Forest. On the other hand, Kanching Forest scored higher than Ampang for Factors 6 (“Natural threats in the forest”) and 7(“Younger activity preference”). The site observations suggest that these differences were probably related to the different level of provision of forest amenities and different landscape and topography in the two forests. For example, Ampang Forest is less developed than Kanching Forest and therefore perhaps perceived as being more restorative, attracting a greater number of older people. Kanching Forest, on the other hand, has its own distinctive characteristics with many steeply sloping areas, seven levels of waterfalls and jungle trails, contributing to the perception that it is more likely to harbour natural threats for forest users. Furthermore, there are larger areas of forest that people can access compared to Ampang Forest, perhaps contributing to a feeling of exposure to threats such as snakes or accidents related to the terrain and topography.

Table 7.9 The overall means and standard error of the items loading onto the seven factors

| Forest location | | N | Mean | Std. Error Mean |
|---|---|---|---|---|
| Forest amenities | Ampang | 147 | -.098 | .083 |
| | **Kanching** | 149 | **.096** | .081 |
| Restorative experience | **Ampang** | 147 | **.195** | .081 |
| | Kanching | 149 | -.192 | .081 |
| Intergenerational values | **Ampang** | 147 | **.087** | .086 |
| | Kanching | 149 | -.086 | .078 |
| Self-actualisation | **Ampang** | 147 | **.130** | .078 |
| | Kanching | 149 | -.128 | .085 |
| Incivilities | **Ampang** | 147 | **.127** | .074 |
| | Kanching | 149 | -.126 | .088 |
| Natural threats in the forest | Ampang | 147 | -.152 | .081 |
| | **Kanching** | 149 | **.150** | .082 |
| Younger activity preference | Ampang | 147 | -.240 | .088 |
| | **Kanching** | 149 | **.236** | .071 |

## 7.3 Reliability Test

A reliability test was performed to examine how reliable each component would be if the results from the factor analysis were used when the relevant items have been summed up (Table 6.10). Nunally (1978), cited in De Vellis (2003) categorised Cronbach's alpha value as follows: below 0.60 (unacceptable to use), between 0.60 and 0.65 (undesirable), between 0.65 and 0.70 (minimum acceptable), between 0.70 and .80 (respectable), between 0.80 and 0.90 (very good), 0.90 and 1.0 (reducing the items). Using the Nunally (1978) categories, Factors 2 and 3 are "very good". Factors 4, 5, 6 and 7 are "respectable".

Table 7.10 Reliability results according to Nunally (1978)

| Factor | Title | No of items | Cronbach's alpha | Remarks |
|---|---|---|---|---|
| 1 | Forest amenities | 14 | 0.91 | Just indicating that there still might be too many items in this area |
| 2 | Restorative experience | 11 | 0.84 | Very Good |
| 3 | Intergenerational values | 7 | 0.81 | Very Good |
| 4 | Self-actualisation values | 7 | 0.73 | Respectable |
| 5 | Incivilities | 8 | 0.72 | Respectable |
| 6 | Natural threats in the forest | 5 | 0.79 | Respectable |
| 7 | Younger activity preference | 5 | 0.73 | Respectable |

Factor 1, "Forest amenities", pulled a lot of items in even with the Varimax rotation. If this questionnaire is used again, some consideration should be given to dropping some of the items with lower loadings.

## 7.4 Analysis of Variance (ANOVA)

For further analysis, a one-way between-groups Analysis of Variance (ANOVA) was conducted to explore the significance of the relationship between the seven factors and the respondents' age, ethnic group, employment and education. The T-test was used for gender. A post hoc test was used for a multiple comparison. For post hoc tests of pairwise differences, the Tukey HSD test was used.

Table 7.11 Summary of associations between socio-demographic variables and factor component items

| **Independent variables** | **Factors** | **Test used** | **Results** | **Remarks** |
|---|---|---|---|---|
| Age group | 1.Restorative experience | Tukey post hoc test | $F = 3.66$, $df = 3$, $p = 0.01$ | Aged 56 years and above more likely to agree |
| | 2.Intergenerational values | Tukey post hoc test | $F = 5.23$, $df = 3$, $p < 0.01$ | Aged 36 and above more likely to agree |
| | 3.Younger activity preferences | Tukey post hoc test | $F = 26.74$, $df = 3$, $p < 0.01$ | Aged 19-25 years more likely to agree |
| Ethnic group | 1.Forests amenities | Tukey post hoc test | $F = 5.15$, $df = 2$, $p = 0.01$ | Malays more likely to agree |
| | 2.Younger activity preferences | Tukey post hoc test | $F = 36.66$, $df = 2$, $p < 0.01$ | Malays more likely to agree |
| Employment status | 1.Restorative experience | Tukey post hoc test | $F = 4.23$, $df = 3$, $p < 0.01$ | Employed more likely to agree |
| | 2.Intergenerational values | Tukey post hoc test | $F = 6.00$, $df = 3$, $p = 0.01$ | Employed more likely to agree than non-earners |
| | 3.Younger activity preferences | Tukey post hoc test | $F = 11.1$, $df = 3$, $p < 0.01$ | Student and employed more likely to agree |
| Gender | 1.Natural threats in the forest | T-test | $t = 3.28$, $df = 294$, $p = 0.01$ | Female respondents more likely to agree |

There is a significant association between Factor 1 ("Forest amenities") and the ethnicity of the respondents (Table 6.11). There is a clear pattern indicating that "Forest amenities" were more important for Malays compared with Chinese and Indians. Respondents at Kanching Forest were more enthusiastic about having forest amenities than respondents at Ampang Forest (Table 7.8).

There are significant associations between Factor 2 (“Restorative experience”) and the age and employment status of the respondents. Respondents aged 56 and above appreciated the recreational forests for their restorative qualities more than respondents in other age groups (Table 7.11). Compared to the non-earners (retired, housewives and others), respondents in employment were highly appreciative of the forests as restorative environments. The Ampang Forest environment scored significantly higher than Kanching Forest on this factor (Table 7.9).

There are associations between Factor 3 (“Intergenerational values”) and age group and employment. Respondents aged 36 and above valued recreational forests for the “Intergenerational values” they provided (Table 7.11). Employed respondents also valued this aspect of the forests more than non-earners.

There are no associations between Factors 4 (“Self-actualisation”) and 5 (“Incivilities”) with the independent variables. There was a significant difference between the respondents in relation to items making up Factor 6 (“Natural threats in the forest”) based on their gender. Overall, the scores of female respondents on the “Natural threats in the forest” items were higher than those of the males (Table 7.11).

Factor 7 (“Younger activity preference”) varied significantly according to the age group, ethnic group and employment status of the respondents. As expected, respondents aged 19-25 years scored high on the items in this factor. Overall, Malays were more likely to agree with these items compared to Chinese and Indian respondents. In addition, students and employed respondents valued forests more for “Younger activity preferences” compared to other categories, namely, “Restorative experience” and “Intergenerational values”.

Further analysis of the factor scores against frequency of visit was carried out using the Chi-Square test. For easy interpretation, the scores for the factors were binned into: low (0-33%), medium (34-66%) and high (67-100%). There is a significant result between factor item scores of “Self actualisation” and the frequency of visit ($\chi^2$ =18.58, df=6, p=0.005). The respondents who visited the forest for “Self actualisation” were more likely to be regular (daily) users.

Table 7.12 Factor score “Self actualisation” by frequency of visits

| Factor score Self actualisation values | Frequency of visits | | | |
|---|---|---|---|---|
| | Daily % | Weekly % | Monthly % | Occasionally % |
| Low | 6.3 | 35.1 | 16.7 | 35.7 |
| Medium | 31.3 | 42.1 | 56.7 | 44.2 |
| High | **62.5** | 22.8 | 26.7 | 20.2 |
| Column total | 100.0 | 100.0 | 100.0 | 100.0 |

## 7.5 Conclusion

This chapter explored the underlying patterns in the respondents’ motives for forest use and forest experience. There were seven factors produced from the factor analysis: “Forest amenities”, “Restorative experience”, “Intergenerational values”, “Self-actualisation”, “Incivilities”, “Natural threats in the forest” and “Younger activity preference”. This chapter also showed associations between the seven factors with socio-demographic variables. There are associations between “Restorative experience”, “Intergenerational values” and “Younger activity preference” with age. There is significant difference between ethnicity and “Forest amenities”, and “Younger activity preference”. Females were more likely to feel “Natural threats in the forest” compared to male respondents. Overall, “Self-actualisation” experience was important for daily users. Chapter 8 will explain the interview results.