CHILDRENS' RESPONSES TO INTEREST ITEMS

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Abstract

The purpose of this report is to provide some data on the interests of school pupils. Year 3 and 4 pupils (N=200) responded to the *Inventory of Children's Activities*, a 30-item general interest questionnaire based on the hexagonal interest and personality typology of Holland. Responses to the 5-point Likert scale items were analysed using a Rasch model (RUMM2010). Items conformed partly to the measurement model and the six scales were characterised by moderate separability (.633 to .805). It was considered that children's interests did not conform to an adult typology; that interests may be idiosyncratic; and, an alternative hypothesis of a general interest dimension comprising all 30 items was also explored. This resulted in a dimension with 0.897 separability and Cronbach alpha of 0.828 but still with the interests of many pupils not covered appropriately.

For many years the dominant paradigm for conceptualizing the pattern of adult vocational interests has been within the quasi-circular or hexagonal arrangement developed by Holland (1973, 1985, 1996). It is comprised of Realistic (i.e., outdoor, practical), Investigative (i.e., scientific), Artistic (i.e., creative), Social (i.e., people contact), Enterprising (i.e., business) and Conventional (i.e., clerical) interests and is known popularly by the acronym *RIASEC*. This typology has become almost a worldwide standard within the fields of career information, career education, career guidance and career development. Holland's vocational typology is now one of the most widely cited theories of career development (Borgen, 1991) and has also influenced vocational research in Australia (see Ainley, Robinson, Harvey-Beavis, Elsworth & Fleming, 1994; Athanasou, O'Gorman & Meyer, 1981; Naylor & Care, 1997; Lokan & Taylor, 1986). This interest typology is based largely on research from adolescent and adult groups since 1958. The purpose of this report is to determine whether the interests of primary-school children can be assessed within the RIASEC typology.

In 1998, Tracey and Ward investigated the structure of children's interests with 134 elementary school students (66 male and 68 female) in grades four and five at three schools and concluded that: "The circular model was not an adequate representation of children's' interests… It appeared that the younger samples were using sex-typing and locus of activity (in school *vs*. out)" (1998, p. 296). This study extends the work of Tracey and Ward to an Australian context by applying Rasch scaling to the assessment of children' interests within the Holland typology. It is part of a program of research that is analyzing the longitudinal development of interests from childhood through adolescence.

There have been two earlier investigations that used Rasch measurement in the context of interests. In 1975, Elton and Rose applied Rasch scaling to the *Vocational Preference Inventory,* in which the items are scored Yes/No. This was undertaken in order to produce a sex-free form of the inventory. In 2001, Athanasou applied Rasch scaling to 24 items from a nationally representative adolescent sample of Australian high school students and noted the advantages in using Rasch estimates for interest items, namely that "…interest items can be located on a calibrated interval scale and this is the same scale for the person's own level of interest. Consequently it is possible to determine whether the persons responding to an interest questionnaire are really matched to the items on the interest scale. For developmental studies, changes in interest can also be mapped on a scale. Finally it is possible to predict the chances of a person being interested in items (such as occupations, courses, activities) in addition to those on which he or she has been assessed" (p. 63).

The focus of the present study is on the nature of the item responses that constitute the six interest scales of the *Inventory of Children's Activities* developed by Tracey and Ward (1998). The 30 items for these scales provided a unique and meaningful context for the analysis of responses to interest items in a questionnaire. The original development of these six scales reflected a classical test theory approach with an emphasis on factor analysis of raw scores as the basis for the formation of scales with maximal internal consistency. In this study, the key research issue was to describe how well the

preferences of this sample of primary school pupils on a set of interest items were represented in the six Holland scales of the *Inventory of Children's Activities*.

Tracey and Ward (1998) hypothesised that interests were influenced by gender socialisation and were situated either in-school or out-of-school. While their concern was to explain children's interests, an alternative, complementary and more parsimonious hypothesis to the Holland (1997) categorisation is to consider that there is simply a unitary dimension of interest. This is explored briefly in this report. A hypothesis of a unitary dimension of interest or preferences, proposes interest as a construct or latent trait, but without necessarily reifying the construct. At the very least it may allow one to locate specific likes and dislikes on a continuum and may recognise that some activities are easier to like than others.

METHOD

Participants

The participants in this study comprised 200 years 3 and 4 pupils from two inner western Sydney parochial schools (boys=120; girls=80). The mean age of the sample was 8.9 years (range = 7.3 to 10.2 years). No claim is made for the representativeness of the sample.

Instrument

The interest inventory used in this study was the 30-item questionnaire, *Inventory of Children's Activities* (Tracey & Ward, 1998) which assesses the Holland typology of

interests. It was developed especially for administration to primary school pupils. One question was repeated as an indicator of stability of responding. Children were asked to indicate how much they liked each of the activities and responded on a five point scale from 'don't like at all' to 'don't like' through to 'so-so' to 'like' and 'like a lot' for items such as: build things (R), understand how things work (I), draw pictures (A), talk with friends (S), sell things to others (E) and add numbers (C). The questionnaire was limited to five items per scale and the reported levels of internal consistency (alpha coefficients, N=138) for the six RIASEC scales were 0.80, 0.66, 0.60, 0.74, 0.65, and 0.64 respectively; and the reported one-week stability estimates (N=23) were 0.66, 0.65, 0.60, 0.67, 0.58, and 0.58 respectively. In this study, the contingency coefficient (N=200) for the single item ('Be a group leader') that was repeated was 0.70 (test-retest correlation = 0.60).

Analysis

A Rasch measurement model was applied through the rating scale analysis program, *RUMM2010* (see Andrich, 1978; Andrich, Sheridan & Luo, 2004). Results from the analysis are reported as logit values and further details of the analysis will be described in the relevant sections of the results.

RESULTS

The results are set out in Figures 1(a) – 1(f) and Tables 1-2. Table 1 includes the statistics for the six interest scales and Table 2 includes the items and their difficulties. Results are reported in terms of logits, which represent the log odds of pupils agreeing and with zero

representing the mean of the item. Positive logit values indicate persons with a higher level of interest and items that required higher levels of interest. The results are presented graphically in an item map (Figure 1) on which both items and people are calibrated on a logit scale. The tables and figures are described in greater detail below.

TABLE 1

Statistics relating to the sub-scales

	Realistic	Investigative	Artistic	Social	Enterprising	Conventional
Mean[1]	.000	.000	.000	.000	.000	.000
SD	.444	.354	.277	.341	.356	.213
Separability[2]	.805	.743	.716	.633	.682	.754
Cronbach alpha	.660	.559	.533	.735	.486	.652

[1]Means and SD refer to the mean and standard deviation of the scores in logit; [2]separatibilty is an index of reliability (the proportion of observed variance that is considered true).

Interest scales

Table 1 lists the basic psychometric statistics relating to the six scales. Means and standard deviations are reported in logits. Firstly, the variation within each scale was reasonably constant (the standard deviations for the scales varied from 0.213 to 0.444 logits). The separability reliability index is the Rasch analogue to the Cronbach alpha. It focuses on whether each scale was defined by a distinct hierarchy of items. In this sample separability was considered adequate for all scales.

Items

The mean values for each item are also indicated as logits and are listed in the second column of Table 2. Examination of the chi-square values in Table 2 showed that there were some item response inconsistencies with the model for all scales except Enterprising. It was not clear that the ratings for each item represent an ordered category of responses and the threshold values for each item are available from the author upon request.

TABLE 2
Threshold values (logits) for items on the interest questionnaire and fit (chi-square)

How do you feel about each of these activities?	Mean (SE)	Fit $c^2(2)$
Realistic(N=186)		
1. Build things	.015(.06)	2.171 ns
7. Hammer nails	.481(.06)	1.706 ns
13.. Watch construction	.362(.06)	7.127 **
19. Fix a toy	-.259(.07)	2.070 ns
25. Watch someone fix a TV	-.599(.07)	4.450 ns
Investigative		
2. Understand how things work	-.127(.07)	3.771 ns
8. Take things apart	.594(.06)	9.974 ***
14.. Watch a science show	.007(.06)	0.661 ns
20. Look in a microscope	-.137(.07)	6.840 **
26. Mix things together to see what happens	.338(.07	14.470 ***
Artistic		
3. Draw pictures	-.355(.08)	.774 ns
9. Listen to music	-.192(07)	2.796 ns
15.. Make up a story	.333(06)	3.662 ns
21. Play with clay or clay dough	.181(.06)	9.487 ***
27. Sing along with music	.034(.06)	7.950 ***
Social		
4. Talk with friends	-.495(.09)	12.762 ***
10. Teach someone to read	.435(.07)	1.850 ns
16.. Help others feel comfortable	.158(.07)	.359 ns
22. Help sick people	-.067(.07)	.563 ns
28. Take care of young children	-.031(.07)	3.125 ns
Enterprising		
5. Sell things to others	.404(.06)	4.468 ns
11. Be a group leader	-.151(.06)	.754 ns
17.. Tell others what to do	.362(.05)	2.433 ns
23. Plan games for others	-.316(.07)	2.340 ns
29. Try talking your parents into something you want	-.299(.06)	2.262 ns
Conventional		
6. Add numbers	.008(.06)	3.386 ns
12. Keep things tidy	-.242(.06)	1.217 ns
18.. Count and sort things	-.078(.06)	7.543 ***
24. Make charts	-.028(.06)	2.215 ns
30. Organise a wardrobe	.340(.06)	2.833 ns

ns not significant;*p<.05 **p<.01 ***p<.001

Item-interest maps

It may be helpful to take the five item Realistic scale as an example for interpretation of the item-interest maps. In Figure 1(a) the numbers on the far left are from –3.0 (low Realistic interest) to +3.0 (high Realistic interest). These are the logit scale values on which the items and persons are calibrated. Each X in Figure 1(a) represents 2 students and the left had side shows the distribution of students across these calibrated logit values. On the right hand side of Figure 1 are the items. The items are also displayed in

terms of interest on the same calibrated scale from easiest to endorse to those more difficult to endorse. The positive logit values represent the items that demand the highest levels of Realistic interest. The number represents the item number (see Table 2).

Pupil's Realistic interests ranged from around –3 to +3 logits. Inspection of Figure 1(a) shows that it did not take much Realistic interest to indicate a liking for item 26 – "mixing things together to see what happens". On the other hand, one would need a higher Realistic interest to like item 7, 'hammer nails'. Some pupils had Realistic interests that were generally above or below the level of Realistic interest of the five items. The placement of students and items on the same scale allowed one to consider how well the different items and each of their ratings (don't like at all to like a lot) matched the pupils' range of interests. Each of the subsequent charts (b) to (f) can be interpreted in a similar manner.

Figure 1 Item-interest maps
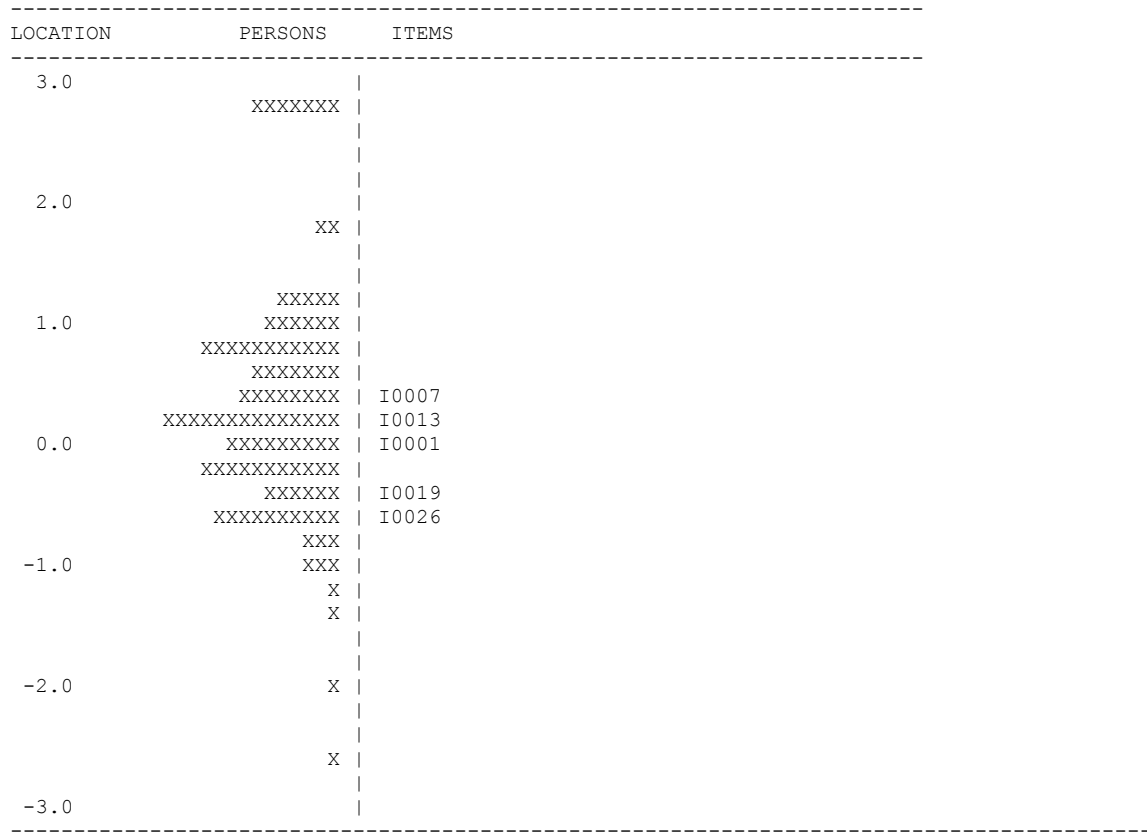
```
(a) REALISTIC ITEMS
-------------------------------------------------------------------
LOCATION           PERSONS      ITEMS
-------------------------------------------------------------------
  3.0                        |
                 XXXXXXX     |
                            |
                            |
                            |
  2.0                        |
                     XX     |
                            |
                            |
                 XXXXX      |
  1.0            XXXXXX      |
            XXXXXXXXXXX      |
               XXXXXXX       |
               XXXXXXXX      | I0007
          XXXXXXXXXXXXXX     | I0013
  0.0           XXXXXXXXX    | I0001
            XXXXXXXXXXX      |
                 XXXXXX      | I0019
            XXXXXXXXXX       | I0026
                    XXX      |
 -1.0                XXX     |
                       X     |
                       X     |
                            |
                            |
 -2.0                  X     |
                            |
                            |
                       X     |
                            |
 -3.0                       |
-----------------------------------------------------------------------------------------
X = 2 Persons
```

```
(b) INVESTIGATIVE ITEMS
-------------------------------------------------------------------------
LOCATION          PERSONS      ITEMS
-------------------------------------------------------------------------
   3.0                       |
                  XXXXXXX    |
                             |
                             |
                             |
   2.0                       |
                    XXXX     |
                             |
                             |
                  XXXXXX     |
   1.0         XXXXXXXXXX    |
            XXXXXXXXXXXXXX    |
                XXXXXXXXX     |
               XXXXXXXXXX    | I0008
           XXXXXXXXXXXXXXXX   |
   0.0            XXXXXX     | I0014
              XXXXXXXXXXX    | I0020   I0002
                  XXXXXX    | I0026
                      X     |
                      X     |
  -1.0               XX     |
                             |
                             |
                             |
                             |
  -2.0                       |
                             |
                             |
                             |
                      X     |
  -3.0                       |
-------------------------------------------------------------------------
            X = 2 Persons
```

11

(c) ARTISTIC ITEMS

```
------------------------------------------------------------------------
LOCATION          PERSONS      ITEMS
------------------------------------------------------------------------
3.0                          |
               XXXXXXXXX |
                             |
                             |
                             |
 2.0                         |
                             |
           XXXXXXXXXXXX |
                             |
               XXXXXXXXX |
 1.0                         |
               XXXXXXXX |
               XXXXXXXX |
      XXXXXXXXXXXXXXXXXX |
               XXXXXXXXX | I0015
 0.0       XXXXXXXXXXXXXX | I0027   I0021
               XXXXXXXX | I0009
                XXXXXXX | I0003
                      X |
                      X |
-1.0                         |
                             |
                             |
                             |
-2.0                         |
                             |
                    X |
                             |
                             |
-3.0                         |
------------------------------------------------------------------------
          X = 2 Persons
```

(d) SOCIAL ITEMS

```
----------------------------------------------------------------------
LOCATION          PERSONS     ITEMS
----------------------------------------------------------------------
 4.0                        |
                            |
                            |
                            |
                            |
 3.0            XXXXXXXXX    |
                            |
                            |
                            |
                            |
 2.0            XXXXXXXXXX   |
                            |
                            |
             XXXXXXXXXXXX    |
                            |
 1.0            XXXXXXXXXX   |
                XXXXXXXXX    |
             XXXXXXXXXXXX    |
                XXXXXXX      | I0010
                  XXXX       |
 0.0         XXXXXXXXXXXXX   | I0016
                XXXXXXX      | I0022   I0028
                 XXXXX       |
                   XX        | I0004
                            |
-1.0                 X       |
                     X       |
                            |
                            |
                     X       |
-2.0                        |
----------------------------------------------------------------------
          X = 2 Persons
```

```
 (e) ENTERPRISING ITEMS

 -----------------------------------------------------------------------
 LOCATION            PERSONS     ITEMS
 -----------------------------------------------------------------------
 3.0                      |
                       XX |
                          |
                          |
                          |
  2.0                     |
                       XX |
                          |
                          |
                      XXX |
  1.0                     |
                     XXXX |
                   XXXXXXX |
               XXXXXXXXXXX | I0005
             XXXXXXXXXXXXXX | I0017
  0.0              XXXXXX |
                  XXXXXXX | I0011
                    XXXXX | I0023  I0029
                       XX |
                       XX |
 -1.0                   X |
                          |
                          |
                          |
                          |
 -2.0                     |
                          |
                          |
                          |
                          |
 -3.0                     |
 -----------------------------------------------------------------------
           X = 3 Persons
```

```
(f) CONVENTIONAL ITEMS

--------------------------------------------------------------------
LOCATION          PERSONS     ITEMS
--------------------------------------------------------------------
3.0                           |
                        XX |
                           |
                           |
                           |
2.0                           |
                         X |
                           |
                           |
                     XXXXX |
1.0                           |
                       XXX |
                      XXXX |
         XXXXXXXXXXXXXX |
                      XXXX | I0030
0.0            XXXXXXXX | I0006
               XXXXXXXXXX | I0018   I0024
                   XXXXXXX | I0012
                         X |
                      XXXX |
-1.0                         X |
                           |
                         X |
                           |
                           |
-2.0                          |
                           |
                           |
                         X |
                           |
-3.0                          |
--------------------------------------------------------------------
         X = 3 Persons
```
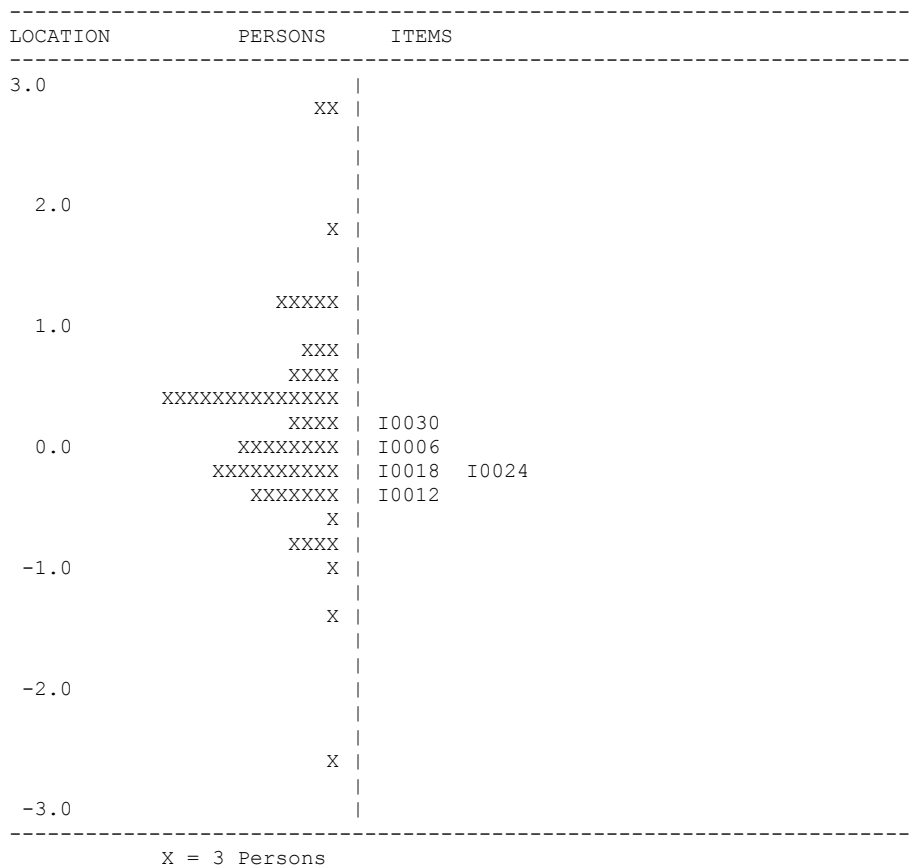
A combined interest dimension

The results from the Rasch analysis of all 30 items combined are set out in Table 3 and

Figure 2. The separation index of this dimension at .897 (Cronbach alpha = .828) was

excellent, yet a number of items showed poor fit and these statistically significant items

are indicated in column three of Table 3. As expected, the most popular item (Item 4 –

'talk with friends') that was endorsed as 'like' or 'like a lot' by some 86% of respondents

had the lowest logit value. The most unpopular activity (Item 7 – 'hammer nails') that

was endorsed as 'don't like at all' or 'don't like' by some 50% of respondents had the

highest logit value of .469.Figure 2 indicates clearly that the dimension of interest is

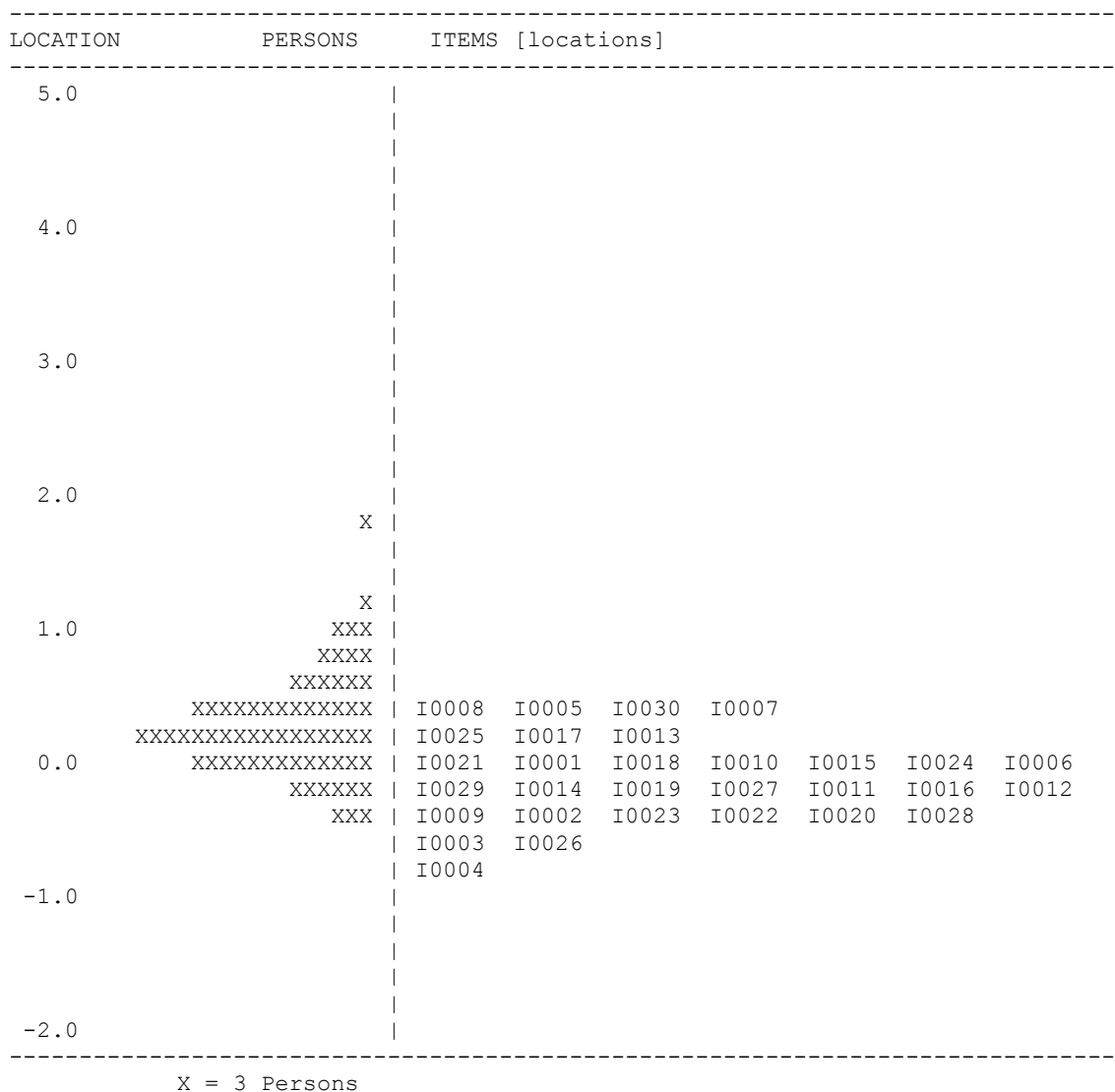skewed with only a small proportion having extreme interest in a variety of activities; that

some activities were relatively easy to like; and that the 30-items did not sample the full

extent of the interests of the group.

TABLE 3
Threshold values (logits) for items on the interest questionnaire and fit (chi-square)

How do you feel about each of these activities?	Mean(SE)	Fit $c^2(2)$
1. Build things	.123(.06)	2.244 ns
2. Understand how things work	-.304(.07)	2.776 ns
3. Draw pictures	-.445(.07)	0.898 ns
4. Talk with friends	-.694(.09)	2.999 ns
5. Sell things to others	.444(.06)	2.642 ns
6. Add numbers	.192(.05)	1.043 ns
7. Hammer nails	.469(.05)	7.322***
8. Take things apart	.407(.05)	8.432***
9. Listen to music	-.322(.06)	1.061 ns
10. Teach someone to read	.156(.06)	0.282 ns
11. Be a group leader	-.079(.06)	0.319 ns
12. Keep things tidy	.000(.05)	0.504 ns
13. Watch construction	.396(.05)	0.144 ns
14. Watch a science show	-.134(.06)	5.128 ns
15. Make up a story	.164(.05)	1.461 ns
16. Help others feel comfortable	-.058(.06)	4.827 ns
17. Tell others what to do	.382(.05)	29.925***
18. Count and sort things	.129(.06)	10.350***
19. Fix a toy	-.132(.06)	1.926 ns
20. Look in a microscope	-.232(.06)	1.847 ns
21. Play with clay or clay dough	.026(.05)	6.977**
22. Help sick people	-.262(.07)	3.771 ns
23. Plan games for others	-.268(.06)	9.198***
24. Make charts	.165(.06)	4.571 ns
25. Watch someone fix a TV	.370(.05)	1.162 ns
26. Mix things together to see what happens	-.434(.07)	8.500***
27. Sing along with music	-.105(.06)	0.927 ns
28. Take care of young children	-.226(.06)	6.194 *
29. Try talking your parents into something you want	-.192(.06)	2.383 ns
30. Organise a wardrobe	.465(.05)	1.026 ns

ns not significant;*p<.05 **p<.01 ***p<.001

Figure 3
BOYS AND GIRLS INTERESTS

```
-------------------------------------------------------------------------
LOCATION        PERSONS    ITEMS [locations]
-------------------------------------------------------------------------
 5.0                     |
                         |
                         |
                         |
                         |
 4.0                     |
                         |
                         |
                         |
                         |
 3.0                     |
                         |
                         |
                         |
                         |
 2.0                     |
                     X   |
                         |
                         |
                     X   |
 1.0               XXX   |
                  XXXX   |
                XXXXXX   |
          XXXXXXXXXXXX   | I0008  I0005  I0030  I0007
       XXXXXXXXXXXXXXXX  | I0025  I0017  I0013
 0.0      XXXXXXXXXXXX   | I0021  I0001  I0018  I0010  I0015  I0024  I0006
              XXXXXX     | I0029  I0014  I0019  I0027  I0011  I0016  I0012
                 XXX     | I0009  I0002  I0023  I0022  I0020  I0028
                         | I0003  I0026
                         | I0004
-1.0                     |
                         |
                         |
                         |
                         |
-2.0                     |
-------------------------------------------------------------------------
          X = 3 Persons
```

Discussion and Conclusions

The analysis of these responses using a Rasch measurement model provided an alternative means of describing and calibrating pupils' interest responses on the six Holland dimensions. The results showed complex relationships between a person's overall level of a Holland interest and the probability of his/her endorsing a particular

item. The findings support the observation of Tracey and Ward (1998) that the Holland dimensions are not reflected perfectly in children's interests.

At the level of the six scales there was a marginal fit of items to the measurement model. The thresholds of agreement within each item were not always consistent with the measurement model and values were not ordered uniformly from 'don't like at all' to 'like a lot'. Across the six RIASEC scales there were additional problems in that the items were not always matched with the level of interest of the sample. A clear example of this was seen in a comparison of the ability-item maps of the Artistic and Social scales (Figures 1c and 1d). On all scales there was a need for items that tap the higher levels of interest and this was obvious in the item-interest maps (Figures 1a-f). Five out of the six scales (except Realistic) had moderate separability and reference to the item maps indicated that the cause may lie in the fact that two out of the five items for these scales have the same average logit value and that there is a need for items that would tap some higher levels of interest. A single dimension of interest or preference was hypothesised and this might be usefully explored in the future in contrast to typologies or categorisations of interest at this relatively early age. Categorisation of interests may impose an artificial perspective that does not account for sufficient variance in preferences and a perspective that is psychometrically weak. The combined dimension showed greater separability of items; it pointed out the need for additional items that map the higher levels of interest; and the assessment of a general latent dimension possibly will provide some heuristic value for future investigations of the development of

interests. In any event, adult classifications of interests may impose artificial constraints on childhood preferences.

Acknowledgement

References

Ainley, J., Robinson, L., Harvey-Beavis, A., Elsworth, G. & Fleming, M. (1994). Subject choice in years 11 and 12. Canberra: Australian Government Publishing Service.

Andrich, D. (1978). Application of a psychometric rating model to ordered categories which are scored with successive integers. Applied Psychological Measurement, 2, 581-594.

Andrich, D., Sheridan, B.E. & Luo, G. (2004). Rasch unidimensional measurement models (RUMM): A windows based computer program. Perth: Murdoch University.

Athanasou, J.A. (2001). Analysis of responses to vocational interest items: A study of Australian high school students. Journal of Career Assessment, 9, 61-79.

Athanasou, J.A., O'Gorman, J., & Meyer, E. (1981). Factorial validity of the vocational interest scales of the Holland Vocational Preference Inventory for Australian high school students. Educational and Psychological Measurement, 41, 523-527.

Borgen, F. (1991). Megatrends and milestones in vocational behavior: A 20-year counseling psychology retrospective. Journal of Vocational Behavior, 39, 263-290.

Elton, C.F., & Rose, H.A. (1975). A vocational interest test minus sex-bias. Journal of Vocational Behavior, 7, 207-214.

Holland, J.L. (1973). Making vocational choices: A theory of vocational personalities and work environments. Englewood-Cliffs, NJ: Prentice-Hall.

Holland, J.L. (1985). Making vocational choices: A theory of vocational personalities and work environments. (2nd edition). Englewood-Cliffs, NJ: Prentice-Hall.

Holland, J.L. (1996). Making vocational choices: A theory of vocational personalities and work environments. (3rd edition). Odessa, FL: Psychological Assessment Resources.

Lokan, J.J. & Taylor, K.F. (1986). Holland in Australia. A vocational choice theory in research and practice. Melbourne: Australian Council for Educational Research.

Naylor, F.D. & Care, E. (1997). The Australian Interest Measure (AIM): A report. Australian Journal of Psychology, 49, 115.

Tracey, T.J.G. & Ward, C.C. (1998). The structure of children's interests and competence perceptions. Journal of Counseling Psychology, 45, 290-303.