International Research Summary

Introduction

Over a period of thirty five years, the JIIG-CAL system has been extensively researched, developed and used by millions of young people and adults in Australia and overseas. During this period the system has benefitted from more than $20 million (AUD) worth of research and development. Original work has been conducted by the Careers Research Centre of Edinburgh University in conjunction with education authorities throughout the UK. Throughout the 1990s JIIG-CAL Australia collaborated with the Careers Research Centre to harness the power of the extensive UK careers research and development, to produce truly Australian career guidance software.

For the past twenty five years, JIIG-CAL Australia has been a totally independent organisation, with outright ownership of all software, underlying code, algorithms, copyright and intellectual property rights. It is wholly Australian owned and operated for the benefit of Australian students and other Australian career seekers of all ages and abilities.

It is not possible to present thirty years of research here. Below are some of the highlights of outstanding achievements over this period.

Intra-individual Approach

There are two important issues in the scoring and interpretation of results. Firstly, the aim of the OIG is to enable understanding of the pattern of interests within an individual. Comparison of one person with others is the basis of the normative interpretation of many psychometric instruments. Such inter-individual comparisons is not what the OIG is intended for.

Secondly, where preference scores are involved, as is the case for the OIG it is not appropriate to use the common test strategy of converting raw scores to percentiles, stanines or some similar standardised scores. Normative scoring is appropriate where raw scores for different factors are independent of each other, eg exam results in English, Math, Science, etc. On the other hand, when scores on dimensions are related, as is the case with forced choice instruments, an ipsative approach needs to be taken.

Thorndike and Hagen (1969) define an ipsative instrument as:

'...a test yielding multiple scores, in which the sum of the scores for all individuals is the same, so that an individual who is high on some scales of the test must be low on others. A test in which the individual's profile is expressed in relation to his own average, rather than in relation to an outside group.'

It is this property of yielding multiple scores which sum to a constant that is also regarded by Horst (1966) as the defining characteristic of an ipsative test. The question of how such scores should be interpreted has been a matter of controversy for many years. Most psychometric tests do not yield ipsative scores and are interpreted by reference to sets of 'Norms'. Misinterpretations arise when scores from ipsative tests are treated as if they were from normative tests. This section outlines the nature of normative score interpretation and explains why it is inappropriate to use it with ipsative tests such as Occupational Interest Test Guides.

Normative interpretation of test scores

The normative method of interpreting scores from psychometric tests was originally evolved for use with tests of intelligence and abilities. Such tests typically involve answering questions at varying levels of difficulty. The greater the number of questions that are correctly answered, the more intelligence or ability the person is said to have. The rationale is not unlike that used in conventional examinations: the higher the mark, the greater the ability.

A 'score' is typically arrived at by counting the number of correct answers. Correctly answering 75 questions gives a score of 75. This is termed the 'raw' score. Raw scores can seldom be easily interpreted, for reasons similar to those arising with exam marks. One cannot assume that a mark of 75 in one exam is better than a mark of 70 in another. A mark of 70 in a difficult exam may indicate a better level of performance than a mark of 75 in an easy exam. Likewise, tests are not all of uniform difficulty. A raw score of 70 in a difficult test may show a higher level of ability than a raw score of 75 in an easier one. They also vary in length. Scoring 75 out of 100 questions is different from scoring 70 out of 70 questions.

The approach taken to dealing with the limitations of raw scores in psychometric tests also parallels that often used with exams, which is to take 'position in class' as the yardstick. A mark of 70 in a difficult exam might place a student in, say 10th place out of a class of 50 students. If a mark of 75 on an easy exam also put the student in 10th place in the class, performance in the two exams would appear to be the same, regardless of the difference in raw scores.

In psychometrics, the 'class' is replaced by a representative sample of the population with which the test is to be used. This is called the 'standardisation' sample. Raw scores for the standardisation sample are statistically analysed to provide a table of 'Norms'. These can take various forms but the simplest are called 'percentiles'. A person at the 90th percentile has obtained a raw score which is better than those obtained by 89% of the standardisation sample. This is like being in the 'top ten' of the class. The 50th percentile may be regarded as 'average'; scores higher than this are above average.

Normative interpretation and 'Liking'

Interest tests do not involve questions with right and wrong answers. They usually ask respondents to state what they like and dislike, or to indicate a preference. The resulting scores are interpreted on the basis that the higher the score, the more the person likes the activities in that particular area of interest. Normative interpretation is frequently applied to scores from interest tests, so that a person scoring above the 50th percentile is regarded as having above average liking or interest.

The same logic is often applied to deciding which is the person's strongest interest. Someone achieving the 90th percentile for Scientific interest and the 70th percentile for Artistic interest is regarded as having above average interest in both areas but liking the Scientific interest more than the Artistic.

Independence of scores

One of the requirements for normative interpretation to be valid is that the scores being compared should be independent. For example, a battery of aptitude tests might contain scales for Verbal, Numerical, Spatial, and Mechanical aptitudes, each of these being measured by a separate subtest. The score obtained on one subtest would be entirely independent of the scores obtained on the others. There would be nothing to prevent a candidate who made a high percentile score on the Verbal scale from making an equally high score on the Numerical scale. It would be possible to make high scores on all four scales, and indeed one would expect good all round candidates to do this. In these circumstances it is quite appropriate to convert the raw scores for each of the four scales into percentiles and these should accurately reflect the individual's level of aptitude on each scale.

This, however, is not the case with ipsative tests. As we have seen, scores on such tests must sum to a constant value. It is therefore impossible to have high scores on all scales. High scores on one scale can only be gained by lowering scores on the others. The percentile scores obtained on an ipsative test would not accurately reflect the level of aptitude.

Normative interpretation is only valid when the scores being compared are independent. With ipsative scores, the logic underlying normative interpretation breaks down.

Normative interpretation applied to Guide scores

Applying this logic to the Guide would mean converting the raw scores to percentiles for each of the six Interest Types, and taking the Types with the highest percentile scores as the strongest interests.

The JIIG-CAL Guide yields two basic sets of scores, viz the Like-Dislike (L-D) and Preference (AvB) scores (see Chapter 5). Because the Preferences scores are derived from forced choice (paired comparisons) they are a classic example of ipsative scores. They sum to 60, and high scores on one Interest Type must mean low scores on some or all of the others. Thus they are interrelated, not independent. Normative interpretation should not be applied to these scores as it makes neither logical nor mathematical sense, and can lead to quite misleading interpretations of clients' interests.

Intra-individual assessment

The key element in normative score interpretation is that it involves *inter-individual* comparison. Norms tell you where the person stands in relation to others, particularly to people in the standardisation sample. Where the objective is to make comparisons between individuals, the normative approach is appropriate. For example, in personnel selection, the aim is to identify the most suitable candidates, which implies inter-individual comparison.

In assessing interests for careers guidance, the primary concern is to find out what are the *client's* strongest interests, regardless of how these compare with those of other people. Guidance should be based on what the client finds most interesting, whether or not that interest is 'stronger' or 'weaker' than in other people. For this purpose, *intra-individual* assessment, as exemplified by the Guide, is more appropriate.

A continuing controversy

Unfortunately, despite the fact that eminent psychometricians (Cattell, 1944; Guilford, 1959) have warned that normative interpretation of ipsative scores is inappropriate and misleading, some test authors have persisted in using it. The result has understandably been confusion. For example, Kirk, writing in Buros 1972, vol II, p 1421, reviewing the Kuder Preference Record, one of the best known examples of an ipsative test, made the following observation:

'One of the most striking things about earlier, similar forms of the Kuder is the controversy which has existed over a period of 25 years as to how the scores are to be understood and appropriately interpreted to people completing the inventory. .... For example, a person who gets a higher percentile score on the Scientific than on the Social Service scale ***cannot*** *confidently conclude that he has more of a Scientific interest than a Social Service interest or that he has more Scientific interest than a friend whose Scientific score is lower. ....it is essential to repeat the fact that a given individual's results are* ***far*** *more complicated than the apparently simple and straightforward scales and percentile values suggest."*

Kirk also pointed out that the question of whether the young people who complete tests like the Kuder benefit from the experience rather than being harmed by it, depends entirely on the adequacy of the interpretation.

The controversy surfaced again with regard to a range of ipsative measures commonly used for personnel selection (Johnson, Wood, Blinkhorn 1988)[1], who comment that:

'Failure to take account of the mathematical properties of ipsative measures leads users to treat them as if they are normative measures, with startling consequences which ought to be obvious but are not.'

[1]Johnson C E, , Wood R, Blinkhorn S F, Spuriouser and spuriouser: The use of ipsative personality tests. J. Occupational Psychology, 1988, 61, 153-162.

Ipsative Conclusion

The use of percentiles, or any other form of norms, to interpret either the preference scores, or the Summary scores which are partly derived from them, is statistically and psychologically inappropriate. It leads, in many instances, to gross misinterpretations of a client's interests, and hence to mistaken advice which, if acted on, could lead them into unsuitable careers.

Reliability

UK Research Conducted by Edinburgh University's Careers Research Centre

The first of two UK studies concerned internal consistency reliability, as measured by Cronbach's Coefficient Alpha. The second involved the use of parallel forms of the Guide, with students being re-tested after a one year interval.

1 Internal Consistency Reliability - Coefficient Alpha

The following table gives Cronbach's Coefficient Alpha. Data for a total of 1441 cases were analysed using the SPSSX package. The results show a high level of internal consistency reliability, with lowest coefficients being 0.892 and 0.899, and twenty eight of the 30 coefficients in the table being greater than 0.90.

Section Combination	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	No of Cases
A&B	0.953	0.905	0.908	0.913	0.966	0.929	274
B&C	0.952	0.914	0.913	0.901	0.954	0.908	283
C&D	0.945	0.899	0.932	0.917	0.962	0.892	295
D&E	0.943	0.909	0.952	0.953	0.960	0.926	293
E&F	0.958	0.957	0.958	0.952	0.961	0.936	296

2 Retest/Parallel Forms Reliability

Reliability over time was examined by comparing Guide scores with those obtained a year earlier using the Subject Choice Questionnaire (Closs & Miller, 1984). The Questionnaire and the Guide were compared as part of a longitudinal research project.

The Subject Choice Questionnaire is a shortened and simplified version of the Guide which was developed for use with students making subject choices at ages 13-14 years. The Questionnaire covers the same Occupational Interest Types as the Guide and may be regarded as a 'parallel form' instrument, although the two instruments do not give scores in precisely the same form. The Questionnaire gives only Preference scores. It does not give Like-Dislike scores.

Students were asked to record the top two, i.e. most preferred, Interest Types in the profile which they received from the Subject Choice Questionnaire. In the following school year they completed the Guide and recorded the Interest Types which were in the 'Like' and 'Strong Like' Bands of their profile. For 669 of the 813 students involved in the project, the two most preferred Interest Types from the Questionnaire were also among the Types identified the following year as Likes or Strong Likes by the Guide. The strongest interests were therefore the same in 82% of the cases.

These two sets of results confirm that the Interest Profile derived from the Guide shows a high level of reliability.

Discrepancies and Measurement Error

Reliability is related to the question of measurement error in a psychometric instrument. A test which is perfectly reliable has zero measurement error. In practice, no psychometric tests are perfectly reliable, and hence an allowance has to be made for measurement error in the scores.

The customary method of doing this is through use of the statistic known as the *Standard Error of Measurement*. The formula for this is:

$$\textbf{SEM} = \sigma \sqrt{(1 - r)}$$

Where σ is the standard deviation of the scale scores, and r = the coefficient of their reliability.

The SEM is used in determining the allowance to be made for measurement error in the L-D (LIKE minus DISLIKE) scores, when checking for discrepancies. Since there are six Interest Types and five Section combinations, there are thirty standard deviations and thirty reliability coefficients to the considered, and clearly it is impractical to derive thirty different allowances for measurement error. A compromise figure is required.

The reader will see from the table of reliability coefficients above, that it is not unreasonable to take a figure of 0.9 to represent the reliability coefficient for all thirty scales. Similarly, the distributions of the various scales of L-D scores suggest that it is reasonable to take a figure of 10 to represent the standard deviation of these scores. This allows us to complete the right hand side of the equation, thus:

$$\begin{aligned} \textbf{SEM} &= 10 \sqrt{(1 - 0.9)} \\ &= 10 \times 0.316 \\ &= 3.16 \end{aligned}$$

In practice, it is customary to allow up to 2½ SEMs, and this gives us approximately 7 points - which is the figure used when dealing with discrepancies in the L-D scores.

Discrepancies in the preference scores cannot be handled in this way, because they are ipsative. Previous research has shown that in these, the top score - ie first in rank, does not change by more than one place in re-test studies. Hence, an allowance of one rank place is made with regard to the preference scores, when checking for discrepancies.

Validity

The validity of the job suggestions produced by the system has been examined in a series of projects which have approached this topic from different standpoints. The first approach involved comparison with 'expert opinion', where the experts were experienced careers advisers. The second involved follow up of students into their first jobs and assessing their satisfaction with these jobs. The third examined the degree to which students and their parents regarded the job suggestions as appropriate.

Expert Opinion Comparison

One approach to assessing the suitability of the job suggestions produced by the JIIG-CAL system is to compare them with those that would be suggested by experienced careers advisers. Three studies of this kind were carried out by the Careers Research Centre of Edinburgh University.

Judging the Matching Algorithm

A group of 37 careers advisers were asked to act as 'experts' in judging the adequacy of the matching algorithm. Each adviser was sent reports for the same eight students. These reports gave all of the student information fed to the matching algorithm, but the adviser had no other knowledge of the students.

In addition, the advisers were provided with three job suggestions for each student, which the system had produced, one rated as suitable by the algorithm, one unsuitable, and one in between. The advisers were, informed that there was not necessarily one of each. Advisers were then asked to grade each job suggestion as either *Suitable*, *Unsuitable*, or *In-between*. These gradings were then compared with the actual ratings given to the jobs by the matching algorithm. At that time, the algorithm gave ratings on a 9 point scale, which were translated into the same three categories as follows:

Suitable	ratings of 7, 8, or 9
In-between	ratings of 4, 5, or 6
Unsuitable	ratings of 1, 2, or 3

The algorithm ratings were assessed as correct, if the adviser gave the same grading, eg if both rated the job as suitable. Otherwise the ratings could be either one or two grades out. With 37 advisers each rating 24 job suggestions, this gave a total of 888 ratings. The results are shown in the following table.

	Correct	**One grade out**	**Two grades out**
Experts assessment of 888 job suggestions produced by the matching algorithm.	71.00%	28.99%	0.01%

In over 70% of these assessments, the advisers gave the same gradings as the matching algorithm.

Careers Advisers Survey

Every effort had been made, during the design of the system, to ensure that all of the major factors relevant to career choice were included in the details sought from the client. This study examined whether or not this information sought about the client was sufficiently comprehensive.

The experts in this instance were UK Careers Officers. Each of these advisers was asked to select from their records, 20 students, of all levels of ability, that they had interviewed **before** the students had received their JIIG-CAL job suggestions. They were then asked to examine the 20 job suggestions for each student and to rate these as either suitable or unsuitable, in the light of their knowledge of the student. This knowledge was derived from the student's school record and comments made by staff, together with the information and impressions gained through the careers interview, all of which were additional to the details given in the JIIG-CAL reports themselves. Thirteen Careers Officers participated in the project, making 260 reports to be assessed. With 20 job suggestions on each report, this gave a total of 5200 assessments. The results are shown in the following table:

	Suitable	Unsuitable
Career Advisers ratings of job suggestions	73%	27%

Of the job suggestions rated as "Unsuitable" by the Careers Officers, two thirds were because of inappropriate choice of educational/training levels by students. It is arguable that these should not be included here, since this is a decision made by the student, not the matching algorithm.

During the careers interviews, the Careers Officers had noted any jobs which they had suggested as suitable careers for each student. The JIIG-CAL reports were examined to see how many of these had also been suggested by the matching algorithm. Of a total of 1049 job suggestions made by the Careers Officers, 625 (60%) were subsequently suggested by the matching algorithm.

These results indicate that in at least 60% to 70% of cases, the system does produce job suggestions which an expert adviser regarded as suitable, even when the adviser had access to much more information about the student than was available to the system. Moreover, in the majority of cases where job suggestions were regarded as unsuitable, this was judged as being due to students choosing inappropriate education/training levels, rather than to any fault in the matching algorithm.

Peer Adviser Interviews

During four professional development courses held for experienced careers advisers, sessions were organised in which each adviser was asked to pair up with another who they had not known before coming on the course. Each had the full client information for the other person, and was able to supplement this with a thirty minute interview during which they obtained further background details. The advisers were issued with an Index covering all of the jobs in the JIIG-CAL database and asked to select up to twenty jobs from the Jobfile, as suggestions which would suit their partners. These were then mutually agreed as suitable jobs, which were of interest to the partners. These job suggestions were recorded and compared with those later printed in their clients' reports.

Over the four courses, 123 advisers took part in this exercise, and a total of 1162 jobs were suggested. Of these, 767 (66%) appeared in the clients reports from the system. The advisers were then asked to record the ratings (1 to 9) given to these jobs by the Matching Algorithm, and these were then categorised as Suitable, Unsuitable, or In-between, as in APP.6.1.1 above. Of the 767 job suggestions, 70% were rated by the Algorithm as Suitable, and 30% as In-between. None were rated as unsuitable.

Again, the results showed that in at least two thirds of the cases, the system produced job suggestions which the careers advisers regarded as suitable.

Expressed Job Satisfaction

It is often assumed that those who receive career guidance should be more satisfied with their jobs than those who don't. While there is some justification for this, it is important to appreciate that the relationship between the guidance given and subsequent job satisfaction is far from simple. Indeed, the concept of job satisfaction itself is very far from simple.

Job satisfaction in students who had used the JIIG-CAL system was investigated in a four year evaluation project (Closs, MacLean, & Walker). This involved students from eighteen schools in the UK. Twelve schools acted as an 'Experimental' group, whose students completed a programme of careers education using the JIIG-CAL system. Students from the other six schools acted as a 'Control' group.

Both groups were followed up by postal survey when many had entered their first jobs. The postal survey covered many issues, including the student's expressed satisfaction with their jobs. It is worth noting that this period saw some of the worst youth unemployment Britain has experienced, so that many students were not able to enter jobs of their choice but had to take what was available. This naturally could have coloured their feelings of satisfaction or otherwise with these jobs, and this needs to be borne in mind when interpreting the outcomes of this research.

First, it is necessary to clarify what outcomes should be expected from a study of this kind. For example, it would be naive to expect all of the experimental group to be satisfied with their jobs and all of the control group to be dissatisfied. Many studies of job satisfaction show that the majority of people, when asked, say that they are satisfied with their jobs. Hence we should expect students from both groups to express job satisfaction, though it is perhaps not unreasonable to anticipate that a higher proportion of those in the experimental group would do so.

Within the experimental group itself, however, we need to differentiate those who accepted the advice offered by the JIIG-CAL system from those who rejected it. If students accepted the system's job suggestions, entered those jobs, and were dissatisfied, it would be right to criticise the system for having produced inappropriate careers advice. On the other hand, where students reject the system's suggestions and enter entirely different jobs, it is not reasonable to attribute any subsequent dissatisfaction to the system's advice. For this reason, the experimental group was subdivided into Groups A and B. Group A were those who had aimed for and entered jobs which had been suggested to them in their JIIG-CAL reports. Group B were those who had not seriously considered trying to enter the jobs which the system had suggested.

The expected outcome was that the majority of students in all three groups would show a reasonable level of job satisfaction, with Group A showing highest level of satisfaction, and Group B being very similar to the control group. Two simple approaches to assessing job satisfaction were used to investigate this.

Rating of Satisfaction

First, each student was asked to rate their satisfaction with their job on a scale from 1 to 9, where 1 was the lowest and 9 the highest level of satisfaction, with 5 as the 'in-between' position. Of the 908 students in the experimental group, for whom data were available, 117 were in Group A - those who were in jobs suggested by JIIG-CAL, and 791 in Group B - those not in jobs suggested by JIIG-CAL. Data were also available for 286 students from the control group. The average (arithmetic mean) job satisfaction ratings for all three groups were as follows:

Mean Job Satsifaction Ratings	**Mean**	**Standard Deviation**	**No of Cases**
Group A -Those in jobs suggested by JIIG-CAL	7.84	1.30	117
Group B -Those not in jobs suggested by JIIG-CAL	6.91	2.00	791
Control Group	6.93	1.98	286

The results are more or less as expected. All three groups show an average level of job satisfaction above the mid point of the scale (5). Group B and the control group show very similar distributions, with the mean around 6.9 and a standard deviation around 2.0. The 117 students in Group A show the highest average level of satisfaction, with a mean of 7.84, and the smaller standard deviation at 1.3 reflects the greater homogeneity of this group, nearly all of whom appear to be satisfied. Indeed only one student from this group showed a low level of satisfaction, with a rating of 2 on the scale.

The difference between the means for Group A and the control group (0.91), is small but statistically significant ($Z = 5.45$, $p < 0.0001$). That is, the probability of a result like this arising by chance is less than one in ten thousand.

Same job again ?

The second approach asked the question, *If you were starting again, would you still choose this job?* Those in jobs that they enjoy should be quite happy to repeat the experience, while those who have chosen unsuitable jobs will not. The results for the three groups were as follows:

	Group A	Group B	Control group
Would you choose the same job again?	Yes - 87% No - 13%	Yes - 61% No - 39%	Yes - 65% No - 35%

The difference between Group A and the control group is pronounced, with 22% more saying *Yes*, and is again statistically significant ($Z = 4.31$, $p < 0.0001$). The overall picture conveyed by these two sets of results is that in all three groups, most students expressed satisfaction with their jobs. Nevertheless, those who had entered jobs suggested to them by the system, Group A, showed a significantly higher level of job satisfaction than their counterparts in the other two groups. It is perhaps interesting that in both of these approaches, Group B - those who received the advice but rejected it - showed marginally lower job satisfaction than the control group.

Views of Students and Parents

The third approach to examining the validity of the job suggestions, was based on whether or not the students and their parents perceived them as appropriate. The data for this study came from a longitudinal project. In this project, 1108 students aged 14-15 years, were asked to select from the 20 job suggestions produced for them by the system, up to five jobs which most appealed to them. These jobs may be regarded as the ones which the students, at this age and stage, regarded as most appropriate to themselves. The ratings given by the system to these jobs were again graded into the Suitable, Unsuitable, and In-between categories, and the results were as follows:

	Suitable	In-between	Unsuitable
Students perceptions of Job Suggestions at age 14-15 years. n = 1108	94.8%	4.4%	0.8%

Thus, of the jobs which most appealed to students at age 14-15, around 95% were also rated by the system as suitable. In other words, there was a high degree of concurrence between the student's perceptions of these jobs, and the ratings given to them by the matching algorithm.

The next stage of this project involved students aged 15-16 years in a further programme of careers education, during which they undertook in-depth studies of the jobs in which they were most interested, and where possible, were placed on work experience related to these jobs. At the end of this programme, students were asked to select up to four jobs in which they were seriously interested.

For the four jobs they had short-listed, each student was asked: *Are you sure that these jobs will suit you?* Ther answers were to be expressed as,

Yes - definitely   Yes   Not sure

Not all students mentioned four jobs. A total of 946 students specified a first choice, and this fell off to 805 who made four choices. The results were as shown in the following table:

Students' satisfaction with their career plans *Are you sure that these jobs will suit you?*	**Not sure**	**Yes, or Yes definitely**
First job choice	7.6%	92.4%
Second job choice	16.6%	83.4%
Third job choice	34.6%	65.4%
Fourth job choice	60.0%	40.0%

The Parents' Assessment

A questionnaire was circulated to parents of the students, seeking their views on the career plans which their children had arrived at, after following the JIIG-CAL careers education programme. Parents were asked if they felt that the career plans of their son/daughter were sensible or not. A total of 530 replies to this questionnaire were obtained, giving the following results:

Do you think that your son's/daughter's career plans are sensible?	**Yes**	94%
	Not sure	4%
	No	2%

Nearly all of parents felt that the career intentions which their children had arrived at by the end of the JIIG-CAL careers education programme, were choices which they were willing to endorse.

Validity Conclusion

From the evidence of these studies, it can be concluded that the job suggestions produced by the JIIG-CAL system were perceived as valid by students and their parents, and by experienced careers advisers, and that those who acted on the system's advice showed a high level of job satisfaction.

Summary Score Algorithm

Student Responses to Items

There are basically two forms of response which are used in interest tests, viz Rating and Ranking. Ratings are expressions of liking or disliking which most commonly involve a three point 'scale' of 'Like - Indifferent - Dislike', but five, seven, and even nine point scales are also used. Ranking involves placing a number of items in order of preference, and in practice this varies from two to twelve items.

Rating scales have the advantage of showing how much the respondent likes or dislikes any activity but also have their drawbacks. In particular they are susceptible to what psychologists refer to as response 'Sets' or 'Styles'. These are tendencies for people to give high proportions of particular responses. For example, some answer 'Dislike' to almost every activity. Others tend to 'Like' everything, or to answer 'Don't mind'. These response tendencies can complicate the process of interpreting scores. In extreme cases (eg a negative student who says “Dislike” everything), no useful information on the individual is obtained.

On the other hand, Ranking items avoids this problem: respondents are forced to put their choices into order from most to least preferred. However a penalty has to be paid, in that this approach gives no indication as to whether an activity is preferred because it is liked more than another or because it is disliked less! For this reason, some people react negatively to making preference responses.

JIIG-CAL software is unique in that it uses the best features of both Rating and Ranking to derive reliable and valid scores showing both the rank order, as well as the degree of Liking for each Occupational Interest, for each and every individual.

The Summary Score Algorithm is designed to integrate the information contained in the Like-Dislike (L-D) and Preference (AvB) responses into a single set of scores on a *Summary Score Scale* from 0 to 100, which preserves the essential order of preference while simultaneously reflecting the pattern of likes and dislikes. The mid-point of the scale (50) represents neutral feeling. The top of the scale (100) represents what is most liked, and the bottom (0) what is most disliked. The scale is *intra-individual*. There is no normative element in the algorithm (See also Attachment 1.)

Identifying the neutral point

A first step is to identify a 'neutral' point in the profile of scores. This is perhaps best illustrated by following specific examples. Within the L-D scores, zero is the logical equivalent of complete neutrality. This would arise if a *Not mind* response were given to all twenty activities of the same Type, or if equal numbers of *Like* and *Dislike* responses were given so that, on balance, the dislikes cancelled out the likes.

Consider the following three examples:

Dick

In this example, there is no actual L-D score of zero. However, the neutral point corresponding to a zero score obviously lies between the scores for Type 3, at 7, and Type 5, at -1. The neutral point must lie between the Interest Types marking this transition from positive to negative scores.

The next step is to identify the corresponding point within the Preference scores. Clearly it must lie somewhere between the 10 for Type 3 and the 7 for Type 5.

Type	L-D	Pref
4	*19*	*19*
6	*17*	*16*
3	*7*	*10*
5	*-1*	*7*
2	*-2*	*5*
1	*-6*	*3*

In developing the algorithm, it is important to allow for the logical extremes. The algorithm must continue to function in cases like those shown below, and profiles of scores quite close to these are sometimes found in practice, as Case 11 in chapter 7 illustrates.

Tom

In this case the neutral point clearly ought to lie somewhere *below* the least preferred Interest Type, since even it is *liked.*

Type	L-D	Pref
4	*20*	*20*
6	*20*	*16*
3	*20*	*12*
5	*20*	*8*
2	*20*	*4*
1	*20*	*0*

Harry

Here the neutral point ought to lie *above* the most preferred Interest Type, since even it is *disliked.*

Type	L-D	Pref
4	-20	*20*
6	-20	*16*
3	-20	*12*
5	-20	*8*
2	-20	*4*
1	-20	*0*

Quantifying the Neutral Point

It is necessary to quantify the equivalent of the neutral point within the Preference scores. In the Dick example above, it could be achieved by simple interpolation, but this would not work with the Tom and Harry examples where the neutral point lies outwith the actual scores so that interpolation is not possible.

To quantify the neutral point and relate it to the Preference scores, two indices were chosen. The first is the Range of the Preference scores; ie the highest minus the lowest. This is related to the degree of logical consistency, which will be 0 when there are six equal scores of ten, and 20 when perfect logical consistency results in scores ranging from twenty down to zero. The second is the Sum of the L-D scores. This varies between +120 and -120, as in the Tom and Harry examples above.

Using these indices, the following formula yields a value within the range of possible Preference scores, which is the logical equivalent of the neutral point in the L-D scores. The formula is generalised and can be applied to data other than scores from the Guide.

$$Z = \frac{Rmax}{2} - \left(\frac{SumL\text{-}D}{T \times L\text{-}Dmax} \times \frac{AvBmax - AvBmin}{2} \right)$$

Where:

Z	= Value corresponding to the neutral point
SumL-D	= Sum of the L-D scores
L-Dmax	= Highest possible L-D score
AvBmax	= Highest actual Preference score
AvBmin	= Lowest actual Preference score
Rmax	= Maximum possible value of AvBmax - AvBmin
T	= The number of Interest Types

In the case of the Guide, *L-Dmax* = 20, *Rmax* = 20, *T* = 6

Applied to the Tom, Dick, and Harry examples above, the neutral points work out to be:

	Tom	Dick	Harry
Z =	0	7.73	20

In the Dick example, the Z value does fall between 7 and 10 as expected. In the Tom and Harry examples it is placed at the bottom and top of the Preference scores respectively, since it cannot fall outwith them.

Relating Preference Scores to Z

Z corresponds to a value of 50 on the Summary Score scale, and is the reference point to which all Summary Scores are to be related. The next step in the algorithm is therefore to subtract Z from each Preference score *(AvB - Z)*. Those Preference scores with values higher than Z will have positive differences; those with values lower than Z will have negative differences.

This preserves the rank order of the preferences unaltered but fixes them in relation to the value 50 in the Summary Scale. A Preference score which is exactly equal to Z will have a Summary Score of 50.

Scaling the Scores

The final step is to 'scale' the differences so that they fit into the Summary Score Scale. This is achieved by allocating each Interest Type a proportion of 50, which is the number of points between the middle and the end of the scale - top or bottom. The proportion to be allocated to each Type is determined by the difference between its Preference score and Z, worked out in APP.2.3, together with the L-D score for that Type. The formula for this part of the algorithm is as follows:

$$S = 50 + 50\left(\frac{AvB - Z}{Rmax} + \frac{L\text{-}D}{L\text{-}Dmax}\right) \div 2$$

where S is the Summary Score: *Z, Rmax*, and *L-Dmax* are as previously defined.

This formula is applied to the Preference score *(AvB)* and the L-D score *(L-D)* for each of the six Interest Types in turn. The expression within the brackets takes vaues between +2 and -2, according to the AvB and L-D scores, so that the highest Summary Score is scaled to 100 and the lowest to 0.

The Algorithm applied

The following tables show the results of applying the algorithm to the Tom, Dick, and Harry examples.

Tom

Type	L-D	Pref	S	Band
4	20	20	100	SL
6	20	16	95	SL
3	20	12	90	SL
5	20	8	85	SL
2	20	4	80	SL
1	20	0	75	SL

Dick

Type	L-D	Pref	S	Band
4	19	19	88	SL
6	17	16	82	SL
3	7	10	62	L
5	-1	7	48	N
2	-2	5	44	N
1	-6	3	37	D

Harry

Type	L-D	Pref	S	Band
4	-20	20	25	SD
6	-20	16	20	SD
3	-20	12	15	SD
5	-20	8	10	SD
2	-20	4	5	SD
1	-20	0	0	SD

It is worth mentioning here that JIIG-CAL Australia's software is continually up dated with Australian information and standards. The programs have been re-written and updated many times using latest technologies. Software is professionally managed and carefully maintained. Occupational information as well as education and training information is constantly updated here in Australia by our research team.

Complementing up to date Australian data and standards are the scientifically established and proven algorithms which drive critical career planning ideas for each and every Australian individual. The successful algorithm model indicated above has been used for over twenty years. It has been applied in literally millions of individual cases both hear and the UK, and has proved to be outstandingly robust and successful.

Item Analysis

In 1980 Edinburgh University's Careers Research Centre released the basic framework around which the first edition of the career guidance system was constructed. In 1990 and 2003 in Australia, detailed reviews were undertaken. For this purpose, fresh 'pools'of questions were created and then subjected to the process which psychometricians call *Item Analysis*.

Constructing the Item Pool

The questions making up a psychometric test or questionnaire are called 'items'. In the Guide, the items are job related activities. Typically, some of the items constructed for use in a test will prove unsatisfactory in practice, and allowances have to be made for this. It is therefore customary to create a 'Pool' of potential items which contains more than the number required for the finished test. The research described here concerned revising and extending the original set of items by removing or rewording some of the questions which had dated, and introducing new questions more appropriate to contemporary circumstances.

The structure of the Guide requires 10 items of each Type per Section of the finished version. To allow for anticipated wastage, a set of 16 items of each Type were compiled for all six Sections, giving a pool of 96 potential items per Section. This figure was rounded up to 100 by adding four extra items to cover those Interest Types for which difficulty in meeting the quota of suitable items was anticipated.

Thus a total of 600 job related activities were compiled to form the Item Pool for the research, 100 for each of the Sections A to F.

Checking the Item Pool - Equal Opportunities Issues

During compilation of the Item Pool, attention is focused on ensuring representative coverage of the concepts underlying each of the six Occupational Interest Types at the five Levels. Other important concerns are dealt with after this stage has been completed. Chief among these is that words and phrases which might influence respondents in terms of gender, or ethnic, or cultural background, are identified and either removed or reworded so that the possible effects are minimised. This was achieved by recruiting the help of career advisers who had an interest in and experience of these issues. A total of twenty experienced JIIG-CAL Trainers assisted with this aspect of the research. Some circulated the items to Equal Opportunities Advisers and other staff in their education authorities, to ensure a wide range of comments from varying perspectives.

Ethnic, Cultural, and Gender Issues

All of these respondents felt that the majority of items in the pool were satisfactory. Suggested amendments were implemented wherever possible, though not all could be accommodated. For instance, the issue of **status** was seen as important to some ethnic and cultural groups, but it was difficult to see what could be done about this. Activities like, 'Cut grass' and 'Grow vegetables' were perceived to be low status tasks. However, if all such activities were to be removed from the Guide, there would be little left to represent unskilled and semi-skilled jobs.

With regard to gender, there were few suggested changes. The one most commonly mentioned was the use of the word 'manager', which was not seen as gender-neutral. Wherever possible, items were reworded to refer to 'management', which was felt to be more acceptable.

Special Needs

Comments were also sought from users with experience of advising students with special needs. The majority of their suggestions dealt with simplification of the vocabulary used, and avoiding wording which implied labelling or categorisng people.

Responding to the Items

As in the research described in Attachment 5, it was imperative that in this analysis each item was evaluated independently, so that ipsative forms of response had to be avoided. Hence the Like-Dislike form of response alone was used, employing the same nine point scale used for the earlier factor analysis, as follows:

> Look at each activity and circle the number that shows how you feel about it.
> You can circle the 'in-between' numbers if you wish.
>
> Grow flowers 1 2 3 4 5 6 7 8 9

The sample

The initial UK research focussed on seventy five LEA's (Local Education Authorities) throughout all parts of the UK which used JIIG-CAL software. Each of these LEA's was allocated a number, and a random sample of 30 was selected. Of these, twenty nine agreed to take part in the research, 16 from England, 4 from Wales, 2 from Northern Ireland, and 7 from Scotland. 75 schools from these LEA's took part in the project, yielding a sample of 1441 students, of whom 737 were male and 704 were female.

Item Analysis Methodology

The methodology used in the analysis was that known to psychometricians as *Item-Total Correlation*. This involves correlating the responses given to each item, on a 1 to 9 scale, with a 'total score' derived by summing the responses to all of the items keyed to each Interest Type. The anticipated outcome of this approach is that each item correlates highly with the total score for the Interest Type to which it is keyed (where 'high' means close to 1 on a scale from -1 to +1) while also showing low to zero correlation with the total scores for the other five Interest Types to which it is not keyed.

Correction for Part-Whole Overlap

An essential element of this form of analysis is the avoidance of spuriously high correlation through what is known as 'part-whole overlap'. The 'part' is the contribution of each individual item to the 'whole', ie the total score for the Interest Type to which it is keyed. For example, if a student circles a 9 for an item which is keyed to, say the Type 4 Interest, this contributes 9 points to the total score for the Type 4 Interest - *of which the item is itself a part*. This means that the item is, in part, being correlated with itself, giving rise to the risk of spuriously high correlation. The same is not true of the total scores for the other five Interest Types to which the item is not keyed and therefore does not contribute. Spurious correlation is avoided by removing the contribution of each item to the total score for the Interest Type to which it is keyed. This can be done in a number of ways. The method employed in this instance was that adopted by the SPSS-X computer package used for this analysis.

Results of the Item Analysis

The results of the Item Analysis are too voluminous to report in full here, since they involve thirty tables, each containing 120 item-total correlation coefficients. The tables in the following pages present a summary of the results, showing the *Highest*, *Average*, and *Lowest* item-total correlations for the items in each Section combination. The item- total correlations for each set of items with the total score for the Interest Type to which they are keyed: that is, the Type 1 items with the Type 1 total score etc, are shown in bold. All coefficients are corrected for part-whole overlap. The pattern expected from these results is for the items keyed to each Interest Type (bold figures) to correlate highly (close to 1) with the total score for that Type, while showing low correlation with the total scores for the other five Interest Types. This pattern is borne out fairly well by the results for the Section combinations E&F, D&E, and C&D, where the results for all six Interest Types are in line with expectations. The results for B&C and A&B are satisfactory with regard to Interest Types 1, 2, and 5, but less so with Types 3, 4, and 6, which show a higher degree of overlap than would have been anticipated. This is also reflected in the correlation matrices shown in the Tables below.

Results for Sections E&F

Item-Total Correlation coefficients

Interest Type 1	**Type 1**	Type 2	Type 3	Type 4	Type 5	Type 6
Highest	**0.83**	0.69	0.50	0.41	0.08	0.12
Average	**0.71**	0.36	0.35	0.14	-0.03	0.03
Lowest	**0.55**	0.18	0.18	-0.06	-0.17	-0.06

Interest Type 2	Type 1	**Type 2**	Type 3	Type 4	Type 5	Type 6
Highest	0.60	**0.83**	0.26	0.37	0.63	0.31
Average	0.37	**0.71**	0.16	0.15	0.35	0.19
Lowest	0.18	**0.59**	0.01	0.01	0.18	0.05

Interest Type 3	Type 1	Type 2	**Type 3**	Type 4	Type 5	Type 6
Highest	0.50	0.25	**0.83**	0.25	0.37	0.43
Average	0.35	0.15	**0.72**	0.09	0.15	0.28
Lowest	0.14	-0.01	**0.60**	0.00	0.02	0.13

Interest Type 4	Type 1	Type 2	Type 3	**Type 4**	Type 5	Type 6
Highest	0.42	0.34	0.26	**0.81**	0.39	0.57
Average	0.15	0.17	0.06	**0.69**	0.23	0.38
Lowest	-0.16	0.03	-0.10	**0.57**	0.02	0.16

Interest Type 5	Type 1	Type 2	Type 3	Type 4	**Type 5**	Type 6
Highest	0.18	0.56	0.30	0.32	**0.82**	0.46
Average	-0.03	0.35	0.17	0.23	**0.73**	0.39
Lowest	-0.20	0.27	0.01	0.09	**0.58**	0.24

Interest Type 6	Type 1	Type 2	Type 3	Type 4	Type 5	**Type 6**
Highest	0.31	0.34	0.50	0.52	0.48	**0.74**
Average	0.01	0.18	0.26	0.37	0.34	**0.64**
Lowest	-0.18	0.04	-0.01	0.17	0.23	**0.40**

No of Cases = 296

Results for Sections D&E

Item-Total Correlation coefficients

Interest Type 1	**Type 1**	Type 2	Type 3	Type 4	Type 5	Type 6
Highest	**0.79**	0.43	0.43	0.31	0.13	0.24
Average	**0.67**	0.31	0.31	0.15	-0.05	0.09
Lowest	**0.51**	0.06	0.16	-0.01	-0.21	-0.01

Interest Type 2	Type 1	**Type 2**	Type 3	Type 4	Type 5	Type 6
Highest	0.50	**0.71**	0.29	0.28	0.56	0.31
Average	0.24	**0.57**	0.13	0.12	0.28	0.14
Lowest	-0.10	**0.39**	-0.03	0.00	0.04	0.06

Interest Type 3	Type 1	Type 2	**Type 3**	Type 4	Type 5	Type 6
Highest	0.42	0.24	**0.80**	0.25	0.24	0.48
Average	0.32	0.13	**0.71**	0.08	0.09	0.35
Lowest	0.18	0.03	**0.52**	-0.05	-0.11	0.29

Interest Type 4	Type 1	Type 2	Type 3	**Type 4**	Type 5	Type 6
Highest	0.36	0.36	0.25	**0.85**	0.22	0.53
Average	0.14	0.15	0.11	**0.70**	0.05	0.35
Lowest	-0.17	0.03	-0.08	**0.43**	-0.13	0.20

Interest Type 5	Type 1	Type 2	Type 3	Type 4	**Type 5**	Type 6
Highest	0.08	0.49	0.26	0.14	**0.81**	0.44
Average	-0.05	0.34	0.10	0.03	**0.72**	0.26
Lowest	-0.26	0.22	-0.05	-0.12	**0.56**	0.11

Interest Type 6	Type 1	Type 2	Type 3	Type 4	Type 5	**Type 6**
Highest	0.27	0.32	0.50	0.62	0.45	**0.71**
Average	0.10	0.17	0.34	0.33	0.22	**0.60**
Lowest	-0.14	0.03	0.12	0.15	0.06	**0.42**

No of Cases = 293

Results for Sections C&D

Item-Total Correlation coefficients

Interest Type 1	**Type 1**	Type 2	Type 3	Type 4	Type 5	Type 6
Highest	**0.77**	0.34	0.35	0.33	0.10	0.18
Average	**0.67**	0.22	0.24	0.20	-0.15	0.05
Lowest	**0.48**	0.12	0.13	0.08	-0.28	-0.09

Interest Type 2	Type 1	**Type 2**	Type 3	Type 4	Type 5	Type 6
Highest	0.40	**0.62**	0.32	0.37	0.48	0.30
Average	0.21	**0.52**	0.13	0.24	0.23	0.18
Lowest	-0.11	**0.38**	-0.03	0.13	0.01	0.09

Interest Type 3	Type 1	Type 2	**Type 3**	Type 4	Type 5	Type 6
Highest	0.47	0.21	**0.73**	0.32	0.21	0.57
Average	0.22	0.11	**0.62**	0.16	0.06	0.39
Lowest	0.00	0.02	**0.33**	0.08	-0.07	0.29

Interest Type 4	Type 1	Type 2	Type 3	**Type 4**	Type 5	Type 6
Highest	0.38	0.42	0.29	**0.75**	0.45	0.51
Average	0.18	0.26	0.18	**0.59**	0.16	0.33
Lowest	0.01	0.19	0.06	**0.44**	0.00	0.17

Interest Type 5	Type 1	Type 2	Type 3	Type 4	**Type 5**	Type 6
Highest	0.06	0.48	0.17	0.27	**0.85**	0.44
Average	-0.14	0.29	0.10	0.19	**0.73**	0.35
Lowest	-0.32	0.11	-0.01	0.13	**0.62**	0.23

Interest Type 6	Type 1	Type 2	Type 3	Type 4	Type 5	**Type 6**
Highest	0.23	0.30	0.63	0.41	0.49	**0.63**
Average	0.07	0.18	0.35	0.30	0.29	**0.52**
Lowest	-0.09	0.07	0.02	0.16	0.09	**0.39**

No of Cases = 295

Results for Sections B&C

Item-Total Correlation coefficients

Interest Type 1	**Type 1**	Type 2	Type 3	Type 4	Type 5	Type 6
Highest	**0.76**	0.37	0.13	0.22	-0.03	0.12
Average	**0.69**	0.23	0.02	0.05	-0.10	0.03
Lowest	**0.59**	0.06	-0.10	-0.07	-0.20	-0.08

Interest Type 2	Type 1	**Type 2**	Type 3	Type 4	Type 5	Type 6
Highest	0.39	**0.69**	0.40	0.44	0.53	0.46
Average	0.21	**0.57**	0.16	0.25	0.19	0.23
Lowest	-0.05	**0.28**	0.02	0.10	-0.03	0.13

Interest Type 3	Type 1	Type 2	**Type 3**	Type 4	Type 5	Type 6
Highest	0.43	0.38	**0.66**	0.61	0.48	0.67
Average	0.20	0.28	**0.55**	0.49	0.34	0.51
Lowest	-0.01	0.10	**0.43**	0.36	0.17	0.38

Interest Type 4	Type 1	Type 2	Type 3	**Type 4**	Type 5	Type 6
Highest	0.30	0.41	0.47	**0.64**	0.37	0.53
Average	0.02	0.22	0.35	**0.54**	0.27	0.40
Lowest	-0.21	0.07	0.22	**0.47**	0.16	0.30

Interest Type 5	Type 1	Type 2	Type 3	Type 4	**Type 5**	Type 6
Highest	0.09	0.36	0.41	0.48	**0.83**	0.51
Average	-0.11	0.24	0.30	0.34	**0.71**	0.41
Lowest	-0.33	0.17	0.19	0.18	**0.61**	0.33

Interest Type 6	Type 1	Type 2	Type 3	Type 4	Type 5	**Type 6**
Highest	0.27	0.42	0.66	0.53	0.51	**0.69**
Average	0.01	0.23	0.54	0.42	0.36	**0.58**
Lowest	-0.13	0.07	0.29	0.32	0.24	**0.37**

No of Cases = 283

Results for Sections A&B

Item-Total Correlation coefficients

Interest Type 1	**Type 1**	Type 2	Type 3	Type 4	Type 5	Type 6
Highest	**0.80**	0.41	0.34	0.24	0.02	0.26
Average	**0.69**	0.26	0.21	0.09	-0.10	0.12
Lowest	**0.52**	0.18	0.08	-0.10	-0.25	-0.06

Interest Type 2	Type 1	**Type 2**	Type 3	Type 4	Type 5	Type 6
Highest	0.50	**0.67**	0.45	0.51	0.50	0.44
Average	0.26	**0.54**	0.23	0.32	0.21	0.27
Lowest	-0.01	**0.47**	0.04	0.12	-0.01	0.05

Interest Type 3	Type 1	Type 2	**Type 3**	Type 4	Type 5	Type 6
Highest	0.43	0.38	**0.66**	0.61	0.48	0.67
Average	0.20	0.28	**0.55**	0.49	0.34	0.51
Lowest	-0.01	0.10	**0.43**	0.36	0.17	0.38

Interest Type 4	Type 1	Type 2	Type 3	**Type 4**	Type 5	Type 6
Highest	0.27	0.50	0.65	**0.67**	0.60	0.70
Average	0.09	0.34	0.47	**0.57**	0.43	0.51
Lowest	-0.16	0.08	0.29	**0.44**	0.29	0.35

Interest Type 5	Type 1	Type 2	Type 3	Type 4	**Type 5**	Type 6
Highest	0.17	0.38	0.52	0.65	**0.82**	0.66
Average	-0.13	0.30	0.45	0.56	**0.75**	0.55
Lowest	-0.34	0.21	0.37	0.45	**0.61**	0.39

Interest Type 6	Type 1	Type 2	Type 3	Type 4	Type 5	**Type 6**
Highest	0.29	0.42	0.64	0.65	0.59	**0.70**
Average	0.16	0.33	0.56	0.55	0.42	**0.62**
Lowest	-0.01	0.16	0.45	0.46	0.30	**0.46**

No of cases = 274

Intercorrelations of the Interest Types

The tables below give the intercorrelations (Pearson Product-Moment) among the total scores for the six Interest Types, for each Section combination. The redundant coefficients have been removed from the top half of the matrix for clarity. The pattern expected for such matrices is that the off-diagonal cells should all have relatively low coefficients, so that there is not too much overlap between the scores for the six Interest Types. This is generally borne out by the results for Sections E&F, D&E, and C&D.

Sections E&F	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6
Type 1	1.00					
Type 2	0.47	1.00				
Type 3	0.46	0.21	1.00			
Type 4	0.20	0.22	0.10	1.00		
Type 5	-0.04	0.47	0.21	0.30	1.00	
Type 6	0.01	0.26	0.39	0.55	0.51	1.00

No of cases = 296

Sections D&E	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6
Type 1	1.00					
Type 2	0.40	1.00				
Type 3	0.42	0.22	1.00			
Type 4	0.21	0.19	0.16	1.00		
Type 5	-0.08	0.46	0.12	0.06	1.00	
Type 6	0.14	0.22	0.50	0.50	0.33	1.00

No of cases = 293

Sections C&D	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6
Type 1	1.00					
Type 2	0.33	1.00				
Type 3	0.33	0.19	1.00			
Type 4	0.29	0.38	0.25	1.00		
Type 5	-0.22	0.37	0.12	0.29	1.00	
Type 6	0.08	0.28	0.59	0.51	0.48	1.00

No of cases = 295

The means of the off-diagonal coefficients has been calculated for each of the tables, and these are 0.29 for Sections E&F, 0.26 for Sections D&E, 0.28 for Sections C&D, making the outcomes for these Section combinations fairly satisfactory. The only relatively high coefficients are those between Type 6 and Types 3 and 4, at around 0.5, which is acceptable.

Sections B&C	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6
Type 1	1.00					
Type 2	0.32	1.00				
Type 3	0.01	0.26	1.00			
Type 4	0.03	0.39	0.57	1.00		
Type 5	-0.15	0.34	0.39	0.44	1.00	
Type 6	0.04	0.37	0.84	0.65	0.54	1.00

No of cases = 283

Sections A&B	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6
Type 1	1.00					
Type 2	0.37	1.00				
Type 3	0.31	0.41	1.00			
Type 4	0.12	0.53	0.77	1.00		
Type 5	-0.15	0.38	0.57	0.70	1.00	
Type 6	0.20	0.45	0.82	0.81	0.67	1.00

No of cases = 274

The item analysis results taken as a whole show the framework on which JIIG-CAL software is based to be scientifically robust, comprehensive and suitable for career seekers of all ability levels.