IQ and academic achievement among Australian students from Chinese and Vietnamese backgrounds

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STATEMENT

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

I consent to the thesis being made available for photocopying and loan if accepted for the award of the degree.

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SUMMARY

The aim of the research was to investigate factors influencing the academic achievements of Australian students from Chinese and Vietnamese backgrounds. Based on Flynn's (1989b, 1991a) hypothesis and research conducted with Asian Americans (e.g., Stone, 1992), it was predicted that there would be an IQ/achievement gap for students of Asian background such that IQ would underestimate their academic achievements. It was proposed that there are two possible interpretations of this effect. It is plausible that the gap is the result of IQ test bias such that the tests are not providing an accurate absolute measure of the intellectual abilities of these cultural groups, and their achievements are a better indication of their intellectual potential. On the other hand, a more popular explanation is that socio-cultural motivational factors are serving to boost the achievements of these ethnic groups beyond what would be predicted by IQ. Research from a variety of disciplines has identified potential factors such as a traditional (East Asian) cultural emphasis on the value of education, strong beliefs in the role of effort, and a greater investment of effort in learning and education. It was proposed that Sue and Okazaki's (1990) theory of relative functionalism could accomodate many of the findings from sociological, educational and psychological perspectives. Therefore, socio-cultural motivational factors were investigated under the broad framework of Sue and Okazaki's theory, with particular emphasis on their proposed folk theory of success for Asian Americans: "If I work hard, I can succeed, and education is the best way to succeed" (p. 919).

Three studies were conducted. The first study investigated the IQ, speed of information processing, achievement, time spent studying and causal attributions for a sample (N = 40) of Australian university students from Chinese and Anglo-Celtic backgrounds. The results did not provide evidence for an IQ/achievement gap for the

Chinese Australian students, although the nature of the sample introduced the possibility that ceiling effects had limited the outcome. The results did show the Chinese Australian students spent considerably more time studying than their Anglo-Celtic Australian peers, although all students endorsed effort as the most important determinant of academic success and failure. It was concluded that a sample of primary school students would provide a broader range of abilities and achievements; and hence a better test of the relationship between these factors.

The second study was a more comprehensive investigation of Flynn's hypothesis with a sample of Australian school children (N = 160) from Chinese, Vietnamese and Anglo-Celtic backgrounds. Variables were those included in the initial study. The main results of this study revealed that the Chinese and Vietnamese Australian children had significantly higher mathematics grades, spent more time doing homework and were more likely to desire an occupation that required tertiary qualifications than their Anglo-Celtic Australian peers. Moreover, there was evidence of an IQ/achievement gap for mathematics achievement for the students from Asian backgrounds, such that these students received higher maths grades than their Anglo-Celtic Australian peers with the same levels of ability. However, time spent studying and occupational aspirations did not account for the group differences in achievement and it was concluded that these factors are part of a more complex socio-cultural package that contributes to these children's achievements. In particular, it was argued that parents play an important role in both studying and aspirations and these factors may interact to produce high achievement.

Therefore the third study was an investigation of Chinese and Vietnamese parents' expectations and aspirations. Based on North American research and Sue and Okazaki's theory, it was predicted that Chinese and Vietnamese parents would set higher standards for their children's academic performance and would have higher aspirations for their children's education, compared with Anglo-Celtic Australian parents. It was also predicted that Chinese and Vietnamese parents would provide a home environment that is more conducive to studying. These hypotheses were largely supported by a survey of approximately 240 Chinese, Vietnamese and Anglo-Celtic Australian parents.

It was concluded that the high achievements exhibited by students of Asian background in the U.S. and in the present research are due to a combination of cultural, sociological and psychological factors. Consistent with Sue and Okazaki's theory, it appears that Chinese and Vietnamese families place a strong emphasis on the value of education, and have high educational aspirations for their children, who in turn invest considerable effort in their studies. These values and behaviours combine to enhance the academic achievements of Chinese and Vietnamese students.

CHAPTER 1

1.1 Introduction

The measurement of human intelligence has been surrounded by controversy since the first attempts to assess this construct objectively were made by Sir Francis Galton and James Cattell late last century. Following the development of the precursor to the modern IQ test by Binet in 1905, the psychometric (IQ testing) method has been the dominant approach. Standardized individual and group tests of intelligence such as the Wechsler scales and the Standard Progressive Matrices have been shown to be reliable and relatively stable measures, as well as moderately valid predictors of variables such as academic achievement and occupational status (Gottfredson, 1997; Jensen, 1980). Research has also revealed intelligence test scores to be at least partly determined by genetic factors, with 50% of the variance in IQ due to genetic variation as a broadly accepted average outcome across different ages but predominantly middle-class socio-economic samples (Neisser et al., 1996), and some researchers suggesting higher levels of shared variance (Bouchard, 1996).

Yet despite the apparent reliability, stability and validity of IQ tests within relatively homogeneous cultural settings, there are several issues concerning the tests that remain unresolved. In some individuals there is evidence of instability of IQ over the lifespan and research has been unable to provide an adequate explanation for this (Moffitt, Caspi, Harkness & Silva, 1993). Another problem for IQ testing is posed by the recent discovery that IQ scores are increasing, exhibiting a gain of up to one standard deviation (15 points) in a single generation (Flynn, 1983, 1984, 1987a, 1998, 1999; Lynn, 1982; Lynn & Hampson, 1986). Flynn is convinced that this gain cannot be the result of change in factors traditionally proposed to influence intelligence such as genes (see Loehlin et al., 1975; cited in Flynn, 1984), socioeconomic status or test sophistication (Flynn, 1984). Furthermore, attempts to explain the approximately 15 point gap between the mean IQ of Anglo-Americans and African Americans have heightened the debate concerning the respective roles of genes and the environment in relation to IQ, and led several researchers (e.g., Flynn, 1987b) to question the use of IQ tests to compare ethnic or racial groups. A recent development in this debate about the cross-cultural validity of IQ is the discovery of a considerable gap between the average IQ and achievements of Asian Americans. This suggestion has been based on the observation that much of the previous cross-cultural research using IQ tests has used tests norms that have become obsolete, due to generational gains in IQ. In correcting for obsolescence of norms in previous research on Asian Americans' intelligence test performance, Flynn (1989a) discovered that the higher achievements of this subgroup of the American population were not due to higher (mean) IQ than Anglo-American Americans, as was previously thought. Instead Flynn (1989a) determined that the mean IQ of combined Chinese and Japanese Americans is around 98, indicating that these groups have been achieving at a level much higher than would be predicted on the basis of IQ. Although the tests have been shown to have good predictive validity for the educational achievements of Anglo-European American, British, and European samples, the IQ/achievement gap of Asian Americans has further cast doubt on the validity of IQ as a measure of intelligence, at least in terms of its usefulness when comparing groups across temporal and cultural boundaries.

1.2 Advantages of IQ Tests

1.2.1 Reliability and Stability

The internal consistency of a test is measured by a reliability coefficient and is generally determined using split-half correlations or correlations between alternate forms of the test. Reliability varies according to the number of items in the test (more items increases reliability) and the age of the subject at testing, such that reliability is lower with subjects under four or five years of age (Jensen, 1980). Many of the intelligence tests designed for use with individuals, such as the Stanford-Binet and the Wechsler Scales, have been found to have high reliability (internal consistency above $r = .9$; Jensen, 1980). Group tests such as the California Test of Mental Maturity and the IPAT Culture Fair Intelligence Test have an average reliability around $r = .9$ (Jensen, 1980).

Of equal interest to clinicians and researchers is the stability of intelligence test scores across time. This form of reliability is measured by correlating the scores between two administrations of the test and is often referred to as test-retest reliability. This form of relative stability varies according to the amount of time between test administrations and like internal consistency, is lower for young children (Jensen, 1980; Neisser et al., 1996). Intercorrelations for scores on the Stanford-Binet for children aged $2^1/_2$ to 15 years ranged from $r = .36$ to $r = .93$, where the former coefficient was between administrations across a 14.5 year interval and the latter across a six month interval (Jensen, 1980). Absolute stability is acknowledged to be influenced by small practice effects and most test manuals make allowances for this effect (Jensen, 1980). Nonetheless, a comprehensive longitudinal study conducted by Moffit et al. (1993) revealed that for the majority of the 794 New Zealand children studied over a seven year period, IQ (as measured by the revised

Wechsler Intelligence Scale for Children - Revised or WISC-R) was remarkably stable. These researchers found that only approximately 13.5% of the sample (107 participants) exhibited genuine IQ changes. Moreover, for most (approximately 85%) participants, the lability of test scores was shortlived, exhibiting what the authors refer to as elasticity of performance; "a rebound to initial levels" (Moffit et al., 1993, p.496).

1.2.2 Validity

Much of the debate concerning intelligence tests has focussed on their usefulness or validity. A test may be said to have high validity in several ways although four of the most common are: content, criterion, concurrent and construct validity (Jensen, 1980). Concurrent validity refers to how well a new test compares with existing tests already determined to have high validity and is of little relevance to this discussion. Similarly, according to Jensen (1980), content validity is mainly of concern with respect to tests of performance other than IQ such as achievement tests. However, criterion and construct validity are more important from a practical and theoretical point of view and are at the heart of the controversy surrounding the practical application of the tests.

Criterion or predictive validity is the degree to which test scores can be used to predict performance in other areas, such as academic achievement and occupational status. In so far as these areas or criteria are considered by theorists and/or the wider community to be (at least partly) products of intelligence, the test's ability to predict them is also a reflection of the test's construct validity. This form of validity refers to whether the tests used do in fact measure intelligence, an issue that has proved extremely difficult to determine, in part due to the extent of disagreement concerning the definition of intelligence itself.

1.2.3 Correlates of IQ - Educational achievement

While there is difficulty in ultimately demonstrating the construct validity of an IQ test, there has been a vast amount of research concerned with the relationship between IQ scores and a number of psychologically useful variables such as academic achievement and occupational prestige. Overall, this research has indicated a significant positive relationship between IQ and indices such as school grades, achievement test performance, SAT performance (Scholastic Aptitude Test, used for US college entrance), University grades and, to a lesser extent, income and occupation (Neisser et al., 1996). Generally the strength of this relationship decreases throughout schooling, from primary to high school to University, partly due to the fact that at higher educational levels the range of IQ scores becomes more restricted. According to Jensen (1980) the average correlation (across studies) between IQ and academic achievement during schooling is around $r = .5$, a figure recently confirmed by the American Psychological Association's (APA) Task Force on the meaning of intelligence test scores and the nature of intelligence (Neisser et al., 1996).

1.2.4 Other correlates of IQ - Occupation and Income

Positive correlations between IQ and occupational level and income have also been obtained by a number of researchers (e.g., Jensen, 1980; see also Gottfredson, 1997). For individual scores the correlations tend to be somewhat lower than the estimated average for all members of a particular occupation, the latter showing correlations in the range of $r = .5$ to $r = .7$ (Jensen, 1980). The U.S. Department of Labor (1970, cited in Jensen, 1980) compared the "frequency distribution of the average intellectual requirements of existing occupations" with "the distribution of general intelligence in the working adult population" and found they were very similar (Jensen, 1980, p. 343). The gifted children (IQ 140+) in Terman's research had much higher than average occupational status and income on follow-up in middle-age (Terman & Oden, 1959; cited in Jensen, 1980). In a recent review of research on IQ and indices of occupational outcome, Gottfredson (1997) concluded that general mental ability (g) is a moderate to strong predictor of occupational outcomes such as job complexity, status, performance, and income. Moreover, she argued that across the full range of occupations in the USA, g is a better predictor than any other trait, and cited evidence that although other variables such as training and knowledge predict job performance these factors are in turn, predicted by IQ. That is. several studies have shown that IQ predicts trainability and the acquisition of knowledge, particularly more abstract and complex forms of knowledge (Gottfredson, 1997). According to Gottfredson's review, the effect of general mental ability on occupational outcomes increases at higher occupational levels.

However, the relationship between IQ and income is somewhat more tenuous and complex than that between IQ and occupation, and appears to be mediated by a number of factors including amount of education (Jencks, 1979, cited in Neisser et al., 1996; Jensen, 1980). Based on the results of the National Adult Literacy Survey Gottfredson (1997) argued for a moderate relationship between psychometric cognitive ability and economic outcomes, although this argument was largely evidenced by comparisons of the very top and bottom of the distributions (commensurate with, for example, IQ scores less than 85 and greater than 125). Moreover, although it is evident that the literacy assessment used in the survey is strongly related to IQ, the tests are not pure measures of general mental ability but are more closely related to verbal intelligence which is at least partly affected by learned content and academic skills.

1.3 Heritability

The degree to which IQ is determined by genetic and environmental factors has also been the source of much controversy, mainly due to the socio-political implications of the research. Attempts to determine the heritability of intelligence date back to the origins of mental testing, although many early researchers such as Galton assumed that intelligence was inherited. Today all theorists and researchers would agree that both genes and the environment influence the development and expression of intelligence, and the disagreement centres on which of these is of greater significance and how they interact. Studies of monozygotic (single ovum) twins raised in separate and unrelated environments would provide the best estimates of heritability as these individuals share the same genes, making the difference in environments the most likely source of differences in ability. Existing studies do not meet the presumably unattainable requirement of literally independent environments, but recent studies of monozygotic twins reared apart in which confounding variables such as age at separation and degree of contact between twins were measured, suggest an index of heritability for IQ between 0.6 and 0.75, which increases with age during adulthood (Bouchard, 1996; McGue, Bouchard, Iacono & Lykken, 1993). However, in their report Neisser et al. (1996) concluded that the heritability of IQ is around 0.45 for children, and approximately 0.75 for adults. Furthermore, these authors commented that exactly how genes influence IQ, and the reasons for the increased influence of genotype with age remain unknown.

1.4 Problems for IQ Tests

1.4.1 Instability of IQ for some people

While for the majority of people IQ appears to be fairly constant throughout the later childhood-adult lifespan - at least in terms of one's relative standing within the population - there are some cases in which genuine IQ change is evident. In Moffitt et al.'s (1993) sample approximately 13.5% (107 children) exhibited reliable changes in IQ over a seven-year period, with a mean change score of 16 points across a two-year interval. The authors concluded that this lability is indicative of the elasticity rather than malleability of IQ, because the average cumulative (signed) change for these 107 children was only 5.3 IQ points, indicating that for most the scores tended to "bounce" back to their original level (Moffitt et al., 1993, p. 485). A comparison of the children with labile IQ with those with stable IQ yielded few consistent differences between the two groups, with the exception of variables such as gender (60% of the labile group were male compared to 49% of the stable group), motor ability at age 5 years (labile IQ children tended to perform slightly more poorly), and number of changes of address (labile children had had more changes of residence). However, the authors questioned the clinical significance of the results concerning motor ability, as the difference was only one point and was not evident at age 3. Furthermore, they argued that the group differences should be interpreted cautiously due to the number of analyses conducted. Therefore it is difficult to assess whether there was a genuine difference between the groups which was linked to lability. The labile children did not differ from those with stable IQ in factors such as intellectual ability, socioeconomic status or family relations. Therefore the authors concluded that the cause of the lability remained unknown.

1.4.2 The IQ gap between Anglo-Americans and African Americans

Research has consistently demonstrated that the mean IQ of the African American population is about one standard deviation (15 points) lower than that of the white (Anglo-European) American population (Jensen, 1973, 1980), although the results of more recent studies suggest that the difference may be decreasing (Neisser et al., 1996). This gap has enormous social implications because it results in differential selection of African and Anglo-European Americans in areas where decisions are made on the basis of IQ scores, such as eligibility for special education and college entrance (Brody, 1992), as well as in the identification of persons with an intellectual disability. Many researchers have claimed that the lower (average) performance of African Americans on intelligence tests is due to cultural bias of the tests (e.g., Mercer, 1979, 1984; cited in Brody, 1992). However, studies in which potential *measurable* sources of psychometrically based bias have been examined have generally conceded few differences between participants of African and Anglo-European descent, and proposed sources of bias do not account for the observed group differences (Neisser et al., 1996). For example, Quay (1971, 1972, 1974; cited in Brody, 1992) found that African American children did not perform appreciably better on a form of the Stanford-Binet translated into language with which the African American children may be more familiar (referred to as "black dialect"), and Jensen (1974, cited in Jensen, 1980) failed to find ethnic background of the examiner to significantly influence the IQ of African American participants. Similarly, item difficulty did not appear to differ for children of African American and Anglo-European American backgrounds in a study by Jensen (1980). Nonetheless there is clear evidence of what Neisser et al. (1996, p.93) refer to as *outcome* bias, in the sense that African Americans are disadvantaged relative to Anglo-European

Americans in terms of outcomes affected by IQ such as education, income, and occupational status.

Despite the fact that group differences account for considerably less of the variance in IQ than do individual differences within ethnic/cultural groups, many attempts have been made to explain this gap and it has been a highly contentious issue. Generally the debate has been framed in terms of the relative contribution of genetic and environmental influences, although, as discussed earlier, this is not a simple dichotomy. Proponents of the genetic hypothesis, such as Jensen, base their argument on the apparent failure of extensive research on environmental variables to account for a substantial proportion of the gap, as well as the putative finding of high degrees of heritability of IQ within racial groups (Jensen, 1973, 1980). However, as Mackenzie (1984) and others (e.g., Brody, 1992) have identified, the failure to identify or quantify environmental variables that account for the lower average IQ among African Americans does not constitute evidence for the genetic hypothesis. Moreover, as noted by Jensen's critics such as Mackenzie (1984), Flynn (1987b), and Brody (1992), there is a logical inconsistency in Jensen's argument concerning the evidence on heritability. It does not follow that IQ differences between groups are due to genetic factors, even if it was established that within group differences in IQ were largely inherited. Brody (1992) has also commented that "there is considerably less data on the heritability of IQ in black samples" (p. 298).

Jensen's argument is also undermined by his use of indirect estimates of the influence of environmental factors on IQ, obtained by comparing IQ in African American and Anglo-European American samples while trying to control for environmental differences between them (Flynn, 1987b). Mackenzie (1984) and others (e.g., Flynn, 1987b) have justifiably argued that the best sources of evidence for this debate are studies of jointly genetic/environmental influence. Such research is very rare, and the most convincing example is research conducted by Eyferth more than thirty years ago (Eyferth, 1959, 1961; Eyferth, Brandt & Hawel, 1960, all cited in Brody, 1992). Eyferth's studies of children from African American backgrounds raised in 'white' (Anglo-European) environments generally supported an environmental interpretation of the gap. Participants in this research were the offspring of (white) German mothers and African American, Anglo-American, and French fathers, conceived during and after World War II while their soldier fathers were stationed in Germany. These children were matched for characteristics such as age, gender, socio-economic status (SES) and family characteristics, such that they had been raised in similar Anglo-European environments. Eyferth found the children to have virtually identical average IQs, irrespective of their fathers' racial/ethnic background. Moreover, this effect could not be explained by factors such as differential selection of soldiers or sexual selection effects (Flynn, 1980; Mackenzie, 1984).

1.4.3 Generational gains in IQ

The fairly robust finding of generational gains in IQ in several countries poses yet another problem for intelligence testing. Lynn (1982) compared the Japanese and American standardization samples of the revised version of the Wechsler Intelligence Scale for Children (WISC-R), obtained in the early 1970s in the USA and in 1975 in Japan. He found that the mean performance IQ (PIQ) of the Japanese sample was approximately 11 points higher than that of the U.S. sample, and had been increasing relative to the U.S. mean. Flynn (1984) had also determined that the U.S. mean had increased by about 15 IQ points from 1932 to 1978. In an extension of these studies, Lynn and Hampson (1986) examined data from 16 studies conducted in Britain and Japan since 1932 and the standardization samples used in the USA during this period, and determined that IQ had been increasing in all three countries. The greatest increase of approximately 7.7 IQ points per decade was evident in Japan, while the USA and Britain exhibited gains of 3 and 1.71 points per decade respectively.

In an extensive survey of data from 14 countries including the USA, Japan, Great Britain, Australia, France and the Netherlands, Flynn (1987a) found evidence of IQ gains ranging from 5 to 25 points in a generation. Some of the largest gains were evident on 'culturally-reduced' tests such as the Raven Standard Progressive Matrices, while verbal tests such as the Mill Hill Vocabulary Scale show considerably smaller or minimal gains (Flynn, 1998). Flynn (1987a) also found that while IQ has been increasing in the USA, scores on the Scholastic Aptitude Test (SAT), which is widely used for College entrance, have been decreasing. However, this latter effect may be partly attributable to sampling differences, as the range of ability of students taking the test in more recent years has increased (Neisser et al., 1996). More recently Flynn (1994) has expanded the sample to include data from 20 nations. The results of this analysis generally confirmed the earlier findings, and in particular demonstrated a relatively consistent increase in scores on Raven's Matrices for five nations "as if some unseen hand is propelling scores upward at rate of 6 IQ points per decade, with individual nations scattering randomly around that value" (Flynn, 1999, p. 6).

It is clear that the gains are too large and the time span too short (a single generation or approximately 45 years) for them to be the result of genetic factors, although Lynn (Lynn & Hampson, 1986) suggested that genetic factors may influence the countries' differing rates of gain, claiming that birth rates in the US may have been more 'dysgenic' (detrimental to the hereditary constitution of the race) than in Japan. However, there is little empirical evidence to support this. Lynn also proposed that the gains are indicative of a genuine increase in intelligence and suggested that environmental factors, particularly improvements in health and nutrition are primarily responsible, pointing out the positive correlations between height, head size, and IQ and the finding that physical characteristics such as height have also increased during this period (Lynn, 1989, 1998; Lynn & Hampson, 1986). However, the evidence concerning the effect of enhanced nutrition on IQ suggests that it is greatest at low levels (i.e., malnourished individuals) while the gains in IQ are evident across the IQ distribution (Flynn, 1998). Moreover, as Martorell (1998) has identified, the patterns of generational gains in height and IQ have not mirrored one another as one might expect if both were due to improvements in nutrition and healthcare. Instead, generational height increases in developed countries have plateaued since around the 1960s to 1970s while IQ scores have continued to increase, further questioning the claim that IQ gains are due to enhanced nutrition.

Flynn (1987a, 1998, 1999) has also discounted the possibilities that the IQ increases are due to either improvements in living standards or increased test sophistication, although he has acknowledged that in some cases a small proportion (approximately five points) may be accounted for by a combination of increased socio-economic status, test sophistication and education. He has also suggested that it is unlikely that the increases are due to increased knowledge or familiarity with the learned content of the tests, because of the American evidence of decreases in scores on the SAT and the cross-national finding of smaller or no gains on Wechsler subtests such as Arithmetic, Information and Vocabulary. These measures are largely tests of achievement and rely fairly heavily on learned content. Moreover, there appears to be a saturation level with regard to practice effects, beyond which little improvement occurs. Flynn (1987a, 1998) also argued that there is little evidence in the community of a 'real-world' increase in intelligent behaviour, such as increases in the number of geniuses and original inventions and patents and decreases in intellectual disability. Instead he argued that the IQ gains indicate that the tests are not actually measuring intelligence but rather a correlate thereof, which he calls 'abstract problem solving ability'.

The implications of the IQ increases for intelligence testing are clearly enormous and have sent many psychometricians scrambling to re-examine the tests and find an explanation for this phenomenon. If, as Flynn (1989a, 1998) suggested, the tests are not measuring intelligence then the validity of their use for purposes such as the identification of intellectual disability, the efficacy of compensatory education, and selection for special education and University entrance is in serious doubt. Moreover, this discovery means that intelligence tests with norms that have become obsolete have been used in past research on intelligence and clinical practice, because infrequent standardizations of the tests have failed to keep pace with the IQ increase. There are also implications for cross-sectional studies, such as research into ageing and intelligence that has generally indicated a decrease in fluid abilities (e.g., abstract reasoning ability) beyond around 50 years of age. In part, this decline may reflect a rising IQ effect. For example, due to the increase in IQ, an 80 year old is disadvantaged by existing standardization samples, thus making the comparison with a 50 year old an unequal one. Therefore the decline in abilities may not be as marked as it appears from a cross-sectional comparison. The finding that the greatest increases are evident on tests of fluid intelligence and general mental ability also has serious implications for theories of intelligence, particularly what Flynn (1998) refers to as “the Spearman-Jensen theory of intelligence” (p. 39).

1.5 The Achievement and IQ of Asian Americans

In his discussion of the implications of the generational gains in IQ, Flynn (1989a) identified another problem for IQ testing; the disparity between the mean IQ and the achievement level of Asian Americans.[1] The remarkable academic and occupational success of this group is widely recognised in the community, as evidenced by the number of magazine and newspaper articles devoted to the 'Asian success story', (e.g., *Time* magazine, 31 August 1987). However, until recently there were few attempts to examine empirically this phenomenon. In an analysis of previous research on the intelligence test performance of Asian Americans Flynn (1989a, 1989b) determined that the mean IQ of combined Chinese and Japanese Americans is around 98, much lower than would be expected on the basis of their high achievements. These results led Flynn (1989b, 1991a) to conclude that IQ lacks predictive validity for these groups.

Until recently, research on group differences in intelligence has predominantly focused on the difference between African Americans and Anglo-Americans and gender differences. The Coleman Report (Coleman et al., 1966) provided one of the earliest indications of the high achievements and intellectual abilities of Asian Americans, particularly in terms of their achievement in mathematics and nonverbal ability. However, Vernon's (1982) survey of the literature from the 1920s through to the 1970s was the first comprehensive documentation of the extraordinary academic and occupational performance of this

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[1] There appears to be no universally accepted definition of the term Asian American. Vernon (1982) used the term Orientals to refer to persons of Chinese and Japanese descent while Hsia (1988) noted that much research has used Asian American without specifying the ethnic composition of the sample. However, in the psychological and educational literature the classification generally refers to American-born or US-resident persons of East Asian descent (e.g., Chinese, Japanese, Korean, Vietnamese, and Cambodian), although sometimes it is extended to include persons of South Asian background e.g., from India, Sri Lanka, and Pakistan, and also Filipino and Pacific Islander groups.

subgroup of the North American population. Vernon's (1982) review also confirmed Coleman et al.'s (1966) finding of superior performance of Asian Americans on tests of nonverbal reasoning ability, suggesting that their educational attainments were due to superior intelligence. This interpretation is also supported by more recent research conducted by Jensen and Whang (1993, 1994) in which Chinese Americans scored significantly higher on Raven's Progressive Matrices than 'white Americans'. However, in a detailed investigation of 16 studies comparing the intelligence test scores of Chinese or Japanese Americans with Anglo-Americans, Flynn (1989b) demonstrated that the mean IQ of these Asian Americans is actually less than 98. The five studies in his review which showed higher IQs for Asian Americans, including the Coleman Report (Coleman et al., 1966), had data based on tests with obsolete norms or used non-representative 'white' samples. Thus, while it is evident that the academic achievements of Asian Americans have been and continue to be disproportionately higher than those of any other American group (Suzuki, 1980), the results concerning their intelligence test performance are ambiguous, and the reasons for their outstanding educational attainments remain unclear.

1.5.1 Review of research on Asian Americans and IQ

i) The Coleman Report

In 1965 a team of researchers led by James Coleman conducted a comprehensive investigation of the public educational system in the USA, under the auspices of the Department of Education (Coleman et al., 1966). Thousands of schoolchildren completed a number of measures including tests of academic achievement and intellectual ability, and questionnaires assessing attitudes to school and achievement. The central aim of the research was to compare the educational experience of minority (ethnic) groups with that of 'white Americans'. The ethnic minority groups included in the enormous sample were 'Blacks', 'Mexican Americans', 'Puerto Ricans', 'American Indians', and 'Oriental Americans'.[2] The results indicated that Asian Americans were the only minority group to match or exceed the performance of 'whites' on the achievement and IQ tests - all of the other minority groups scored below the Anglo-American mean(s). On tests of achievement in mathematics and nonverbal ability Asian American students significantly outperformed Anglo-American students at every level. It was also evident that, of the minority groups, the Asian American school children were the most similar to Anglo-American students with respect to their attitudes to school and achievement and their future aspirations, indicating for example similarly strong beliefs in their ability to affect their own environments and futures. It was evident that as the Anglo- and Asian American children got older, control of the environment became a less important variable in relation to achievement, and self-concept emerged as more important. The reverse appeared to be true for the other minority

[2] Because some of these ethnic category labels are no longer used, these groups will be referred to hereafter as : 'African Americans', 'Mexican Americans', 'Puerto Ricans', 'Native Americans', and 'Asian Americans' respectively. Similarly the term 'white American' will be replaced with 'Anglo-American' or 'Anglo-European American'. These descriptive labels are more commonly used in

groups. More Asian American students (64%) than any other group indicated that they intended to complete a College degree and/or do professional or graduate work (Coleman et al., 1966, p. 283). This emphasis on education was confirmed by data from the 1960 United States Census which showed that Japanese American and Chinese American children were "more likely than average to begin school at the minimum age" and also more likely to remain in school at ages 16 and 17 when many others begin to drop out (Coleman et al., 1966, p.449). Finally, although Coleman et al. (1966) found a positive relationship between the educational aspirations and family background of fellow students and academic achievement, the strength of this effect was weakest for Anglo-Americans and Asian Americans, indicating that the achievement levels of these students were least affected by peer characteristics.

ii) Vernon's (1982) Review

Vernon (1982) compiled an extensive survey of the literature on Asian immigrants to North America and their descendants, including studies of cognitive ability, academic achievement, and personality factors such as values, attitudes and beliefs. Like Coleman et al. (1966) he found that most of the research assessing performance on intelligence tests and academic achievement revealed Chinese Americans and Japanese Americans to be on-a-par with or above Anglo-Americans.

Vernon (1982) concluded that the superior educational performance of Asian Americans was due to a combination of both genetic and cultural factors, such as family upbringing, values and attitudes, and he noted the similarities between the Chinese and Japanese cultures and their dissimilarity from white Anglo-Saxon American culture. Vernon also pointed out that these sorts of socio-cultural factors had often been proposed to distinguish between 'achieving' and 'non-' or

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current discourse.

'underachieving' groups. More recently, others have suggested that they are simply middle class values such as thrift and hard work (e.g., Lee & Rong, 1988).

While Vernon (1982) admitted the difficulty in ultimately proving or disproving the hypothesis that people of Asian background are genetically superior in intelligence, he did claim there was some evidence to suggest that genetic factors may play a role. He argued that studies showing differences in temperament between Chinese or Japanese and Caucasian babies, and the finding of superior intelligence test performance of Asians in many countries including their homelands, supported the notion of a genetic basis to their outstanding achievements in the USA. However, Vernon generally supported the popular thesis that the educational record of Asians was due to a family upbringing that emphasises social conformity, family cohesion and the importance of kin, "discouragement of egocentricity..., loyalty and obedience to the authorities, employers and the state, motivation for educational achievement..., firm control" [of children], and "the need for hard work to gain success and honor the family" (pp. 273-274).

iii) The Verbal/Nonverbal IQ Disparity

A consistent finding of the early studies of Asian Americans' intelligence test performance has been a gap between performance on verbal and nonverbal measures. As described earlier, Coleman et al.'s (1966) comparisons showed the Asian American children had higher scores on tests of nonverbal ability compared to Anglo-American children but similar performance on verbal tests. Similarly, most of the studies in Vernon's review found Asian American children to be slightly below the North American mean of 100 on verbal measures (e.g., Jensen's Chinatown studies, cited in Vernon, 1982). However, Vernon noted that the disparity was usually small and appeared to be diminishing since the 1960s. For example, Jensen and Inouye (1980 cited in Vernon, 1982) revealed the verbal performance of Asian Americans to be very similar to the Anglo-American mean. Moreover, the effect appeared to be primarily a function of familiarity with speaking English and North American culture. For example, the Chinatown studies also revealed a significant negative correlation between being born outside of the USA and all verbal measures, with a similar but weaker pattern for language spoken at home (speaking Chinese at home was associated with lower verbal IQ performance). These findings, and similar results observed with Asian Canadians, led Vernon to conclude that contact with members of the majority culture (white North American) had a greater effect on verbal development than language spoken at home. Similarly, Flynn (1991a) argued that research findings over the past approximately 50 years reveal a pattern according to migration trends; after several generations the gap between scores on verbal and nonverbal tests decreased then increased with a new wave of migrants.

1.5.2 The lack of predictive validity of IQ for Asian Americans

In a more recent meta-analysis, Flynn (1989b) suggested that the evidence for the cognitive superiority of Asian Americans is far from convincing. Flynn re-examined much of the previous research on Asian Americans and intelligence and determined that the obtained data were based on either tests with obsolete norms or using nonrepresentative samples. However, the extraordinary achievements of Asian-American students are evident in school grades, SAT scores (performance on the Scholastic Aptitude Test is used by many U.S. colleges for admission), high rate of participation in highly competitive University courses (e.g., medicine, business and law) and prestigious American Universities, and high academic achievement at University (Flynn, 1989a, 1989b, 1991a). Using a method derived from the theories and applications of Gottfredson (1987) and Weyl (1969, cited by Flynn, 1989a), Flynn (1989a) determined that on the basis of their outstanding achievements Chinese Americans and Japanese Americans *should* have mean IQs of 118 and 108 respectively. These estimates yield an IQ/achievement gap of some 20 points for Chinese Americans and around 10 points for Japanese Americans. Flynn (1989a) proposed that this apparent lack of predictive or criterion validity of IQ [for Asian Americans] can only be the result of two things: "either IQ tests cannot compare these groups with whites for intelligence; or they can, but intelligence has little causal effect on group potential" (p. 60). Either way, the IQ/achievement gap seriously threatens IQ testing, for the use of the tests is largely justified on the basis of their predictive validity.

Flynn (1991a, 1999) argued that the 20 point IQ/achievement gap for Chinese Americans is split between individual and group factors, claiming that, at the individual level, Chinese American students enter University courses and professions with a lower IQ 'threshold' than Anglo-Americans students, while at the group level the Chinese American communities "capitalize more effectively on their available pool of talent" (p. 1). As a consequence, for example, a greater proportion of doctors and scientists emerge from the potential medicine and science students in the Asian American communities, than in the Anglo-American community. Flynn (1991a) also referred to these two factors as a threshold and a capitalization factor, and suggested an aetiology of the IQ/achievement gap of the form: 3-5 IQ points at school, increasing in later high school (as evident in scores on the SAT) to reach approximately 10 points on entry to University, increasing to approximately 15 points on entry into postgraduate study and ultimately producing a 20 point gap on entry into occupation. The IQ/achievement gap appears to be evident at low as well as high IQ levels (Flynn, 1991a) and Flynn suggested that the gap between IQ and school grades may be higher than that evident between IQ and standard achievement tests.

Like Flynn, Stone (1992) proposed that intelligence test performance may differentially predict achievement for Anglo-American and Asian American groups, therefore indicating test bias. Using the battery of ability and achievement tests that comprise the Differential Ability Scales, Stone (1992) found that the Asian American students performed at the same level or better than Anglo-Americans on every scale, significantly outscoring Anglo-Americans on tests of nonverbal reasoning ability. To assess test bias Stone (1992) compared the groups' regression equations, in which a composite ability score was used to predict performance on the achievement measures. He found significant group differences in the regression equations when the composite ability score was used to predict both Word Reading and Basic Number Skills, such that "If the common regression line were to be used, Asian-American Word Reading [and Basic Number Skills] scores would be underpredicted ..." (Stone, 1992, p. 97). In the case of Basic Number Skills, the intercepts of the equations were significantly different, indicating that the Asian American students scored higher on this achievement measure than their Anglo-American peers with the same composite ability. Moreover, the slope coefficients predicting Word Reading differed significantly, such that the underprediction of Asian American students' scores increased at higher composite ability levels. These results were therefore consistent with Flynn's (1989b, 1991a) hypothesis that Asian Americans achieve at a higher level than would be predicted on the basis of their omnibus intelligence test scores.

1.5.3 Summary of Research on Asian Americans' IQ

It is evident that the early research on Asian Americans provided evidence for their superior performance on intelligence tests, suggesting that this was the source of their outstanding academic and occupational achievements. It was not until Flynn's (1989a, 1989b) re-analysis, which questioned the accuracy of much of the previous data, that the issue of Asian Americans' success became one of renewed empirical interest.. Flynn's (1989a) discovery led him to suggest that IQ lacks predictive validity for this cultural group, a hypothesis supported by Stone's (1992) research. However, contrary findings of higher intelligence test performance for Asian Americans compared to Anglo Americans have recently been reported (Jensen & Whang, 1993, 1994), further muddying the waters concerning Asian Americans' intellectual ability. Therefore, two important questions remain unanswered; a) Do Asian Americans have a higher mean IQ than the Anglo majority?, and b) If not, then how can their extraordinary educational success be explained?

1.6 Explanations for Asian Americans' academic and occupational achievements

Although conclusions from the research on Asian Americans' IQ remain unclear, there is little doubt that this cultural group is better educated than any other American group, including the Anglo-American majority (Hsia, 1988; Suzuki, 1980). Since the 1970s a number of researchers, including educational psychologists, sociologists and social historians have tried to explain this phenomenon. The factors proposed can be roughly divided into three groups, although these are not necessarily mutually exclusive categories. Moreover, researchers disagree on their relative importance in predicting Asian Americans' academic achievement;

1. Intellectual superiority
2. Sociological or socio-political factors
3. Cultural factors - macro and micro-level

Proponents of a genetic explanation (e.g., Lynn, 1987) argue that the high levels of achievement exhibited by Asian Americans are the result of (genetically determined) superior intelligence. This interpretation arises from the consistent finding of a high degree of heritability for intelligence within racial/ethnic groups (Bouchard, 1996; McGue, Bouchard, Iacono & Lykken, 1993), and is supported by research showing higher IQs for Asian groups relative to the North American mean (Lynn, 1982: Lynn & Hampson, 1986). However, neither of these findings constitute evidence for the genetic hypothesis as it relates to Asian Americans, and Flynn (1989a, 1989b, 1991a) has demonstrated that the evidence for higher IQs of Asian Americans is far from convincing.

The study of migrant and minority groups has traditionally been the domain of the sociologist or social historian. Flynn (1989b, 1991a) argued that in order to gain a better understanding of Asian American achievement psychologists must now turn to these approaches and consider the phenomenon from a wider perspective. Using a sociological approach, researchers consider the social, economic and political circumstances surrounding Asian migration to the USA and subsequent generations' position in American society (e.g., Barringer, Takeuchi, & Xenos, 1990; Hirschman & Wong, 1986; Lee & Rong, 1988; Nagasawa & Espinosa, 1992; Sue & Okazaki, 1990).

Cultural explanations focus on cultural or ethnic values, beliefs and attitudes and their impact on academic achievement. Analyses of cultural factors may be divided into two levels; macro and micro, examining, for example, traditional ‘Asian’ values (macro), or the role of family attitudes and expectations (micro). Although generally many factors are evident at both levels, (for example, parents have a vital role in transmitting cultural values through socialization practices as well as a direct influence on their children's academic and extra-curricular behaviours), there has been some debate concerning the relative merits of each approach in terms of its usefulness in predicting achievement. For example, in their review of 20 years of research on the schooling and achievement of African American and Asian American children, Slaughter-Defoe, Nakagawa, Takanishi, and Johnson (1990) commented that much of the research involving Asian Americans has considered cultural values and beliefs and neglected micro-level factors such as socioeconomic status, family structure and "neighbourhood and community factors" (p. 375). Similarly, Sue and Okazaki (1990) claimed that research attempts to provide a cultural explanation for the high achievement of Asian Americans have been largely unsuccessful and argued that investigation of "proximal values such as the importance of study and working hard" may offer greater insight into this phenomenon. Schneider and Lee (1990) argued that consideration of factors at both the macro (sociocultural) and micro (psychological and interpersonal) levels is necessary. Moreover, Hirschman and Wong (1986) noted that, while the cultural hypothesis has been the most popular, exactly how cultural values impact upon group or individual educational attainment is still unclear and subject to much debate.

1.6.1 Intellectual superiority (genetically determined)

One explanation for the educational attainments of Asian Americans is the thesis that people of Chinese and East-Asian backgrounds are genetically superior in intellectual ability to persons of European/Anglo-Saxon ancestry (Lynn, 1987, 1991). This explanation is largely based on the results of cross-national studies. For example, Vernon (1982) suggested that research comparing the temperament of Chinese/Japanese babies with Caucasian babies implies a genetic interpretation of Asian Americans' academic achievement levels. Similarly, Lynn's research on generational gains in IQ revealed that the mean IQ in Japan has been rising at a faster rate than in the USA and Britain, yielding a gap of around 11 IQ points in favour of the Japanese (1982, Lynn & Hampson, 1986). A similar result was reported by Flynn (1984, 1987a). Lynn, Paglieri, and Chan (1988) found Hong Kong Chinese children outperformed British children on the Raven Progressive Matrices, and in a comparison of Japanese and British school children Lynn and Shigehisa (1991) found the Japanese mean on the Matrices to be about 10 points higher than the British mean. The Japanese children in Lynn and Shigehisa 's (1991) study also had a faster mean reaction time than the British, further convincing Lynn that the differences were biological in nature.

A consistent finding of this cross-national research has been the high performance of Asian groups on tests of nonverbal ability or performance IQ (PIQ), with scores on verbal measures around the mean. Thus the high IQ scores are largely due to superior scores on tests of nonverbal abilities, particularly visuo-spatial abilities. For example, Lynn, Paglieri, and Chan (1988) found Hong Kong Chinese children had significantly higher scores on space relations, and Lynn (1982) determined that the Japanese children's superior performance on the Wechsler Intelligence Scale for Children (WISC) relative to the U.S. standardization sample was "most pronounced in the tests of block design, mazes, picture arrangement and object assembly", which are tests of nonverbal abilities (p.222). Lynn (1987, 1991) claimed that this bias in favour of nonverbal abilities strengthens his case for Asian genetic superiority in intelligence.

The results of these cross-national studies and within-group heritability data led Lynn (1987, 1991) to conclude that people of East Asian ancestry have been selectively bred for higher intelligence, particularly nonverbal reasoning ability. He proposed an evolutionary theory to account for what he regarded as genuine racial differences in neurological capacity and structure, and intelligence. A similar position was taken by Jensen (1969) in relation to the IQ gap between African Americans and Anglo-Americans. However, there are several problems with Lynn's hypothesis. Flynn (1983) identified flaws in Lynn's methodology in comparing data from cross-national studies and other researchers (e.g., Vernon, 1982; Jensen & Whang, 1993) have suggested that there is insufficient evidence to conclude that Asians are genetically more intelligent. For example, Jensen noted a number of significant inconsistencies between Lynn's (Lynn & Shigehisa, 1991) research comparing the performance of British and Japanese children on intelligence tests and measures of speed of information processing, and his own (Jensen & Whang, 1993), despite the fact that the two studies included many of the same measures. This led Jensen to conclude that a genetic interpretation was "problematic" (p.409).

Moreover, although research by Stevenson and colleagues found significant differences between Chinese, Japanese and American children in terms of their mathematics achievement, there was little evidence to suggest that this was due to superior cognitive ability (Stevenson, Stigler, Lee, Lucker, Kitamura, & Hsu, 1985; Stevenson, Lee, & Stigler, 1986). Finally, the results of cross-national studies provide little insight into explanations for Asian *Americans* who may be selected for a number of characteristics including motivation and education, and whose achievements have been demonstrated within the context of the North American culture and education system.

With regard to the verbal-nonverbal disparity, Flynn (1991a) conceded that there might be something more to the phenomenon; perhaps a cultural preference for spatial visualisation that is "partly genetic in origin" (p.113). However, this leads us into the debate concerning specific cognitive abilities versus overall general ability (g). As Flynn (1991a) commented, evidence of superior, highly specific abilities does not necessarily contribute to the debate concerning the interpretation of the high achievements of Asian Americans, because it seems unlikely that superior performance in such specific abilities is solely responsible for the high achievements of a cultural group.

1.6.2 Sociological Factors

In sociological (or socio historical) approaches the economic, social and historical context of Asian Americans' educational success is emphasised. These interpretations examine the influence of factors such as the circumstances surrounding migration, the economic and social position the migrant group enters upon arrival to the host country, and the opportunities available for social mobility (Hirschman & Wong, 1986). Three sociological explanations frequently proposed to have contributed to Asian Americans' academic achievement are selective immigration (Hirschman & Wong, 1986; Lee & Rong, 1988), the middleman minority thesis (Bonacich, 1973) and the role of education in social mobility (e.g., Hsia, 1988; Schneider & Lee, 1990; Sue & Okazaki, 1990).

i) Selective Migration

It has been proposed that selectivity of immigration has been a factor in the high achievements of Asian Americans (Hirschman & Wong, 1986; Lee & Rong, 1988). Most migrant groups are not representative samples of the population of their country of origin. Early Chinese and Japanese migrants to the US were mostly labourers who emigrated to work in the Goldfields or on the Railways (Hirschman & Wong, 1986). However, inter-ethnic tension resulting from the perceived cheaper labour rates offered by the Asian workers led to the introduction of discriminatory legislation designed to restrict the Asian immigration, particularly working class immigrants (e.g., the Chinese Exclusion Act of 1882 and the 'Gentlemans' Agreement' with Japan in 1908) (Hirschman & Wong, 1986). Consequently, Asian migrants entering the US in the early and mid-twentieth century were mainly middle class and many were highly skilled and/or educated, especially immigrants from Hong Kong. Moreover, Hirschman and Wong (1986) noted that although the 1965 Immigration Act constituted a more open policy than earlier legislation, it tended to encourage highly educated immigrants, such that many foreign-born migrants entering the US in the late 1960s and 1970s were professionals and had tertiary qualifications.

However, while this selectivity may partially explain the outstanding achievements of more recent Asian immigrants, it does not necessarily explain the achievements of American born and educated Asians (Hirschman & Wong, 1986;

Sue & Okazaki, 1990). Similarly, Lee & Rong (1988) identified that high educational aspirations among Asian Americans were evident before the bias of the immigration policies of the 1960s became evident. Strong (1970, cited in Lee & Rong, 1988) reported that Japanese children in California were outscoring Anglo-Americans on tests of mathematics as early as the 1920s, despite coming from a more disadvantaged background in terms of socio-economic status and education, relative to current Asian immigrants. Similarly, high educational achievements have also been exhibited by the children of Indochinese refugees, many of whom (children and parents) had little or no education prior to their emigration (Caplan, Choy, & Whitmore, 1992).

ii) The Middleman Minority thesis

There are certain historical parallels between the economic and educational success of Asian Americans and other minority groups. One characteristic common to many immigrant groups is that they tend to occupy a certain economic niche in their new country (Lee & Rong, 1988). While factors such as racial discrimination, lack of proficiency in the language of the new country, and lack of education and training force many ethnic minority groups to enter low status/low income occupations, it is evident that some migrant groups such as Jewish groups in Europe and the USA and the Chinese in South East Asia, occupy an economic middleground and comprise what Blalock referred to as 'middleman minorities' (1967, cited in Bonacich, 1973). It has been proposed that Asians in the USA, particularly Chinese, Japanese and Koreans, fit the description of 'middlemen', as they are frequently found in intermediate occupations such as trade, commerce and small business ownership (Bonacich, 1973). The success of achieving a middle position in the economy is usually associated with group solidarity. This has economic benefits as money is kept within the group and the united group front favours members in competition with rival organisations. The stereotype of the Italian family business, familiar to many Australians, is an example of some aspects of this model. However, in recent years this stereotype seems to have shifted in favour of the Asian family business, due to the increasing number of small businesses owned and run by Asian families, for example restaurants and groceries, particularly in Melbourne and Sydney. Indeed, Bonacich (1973) suggested there may be a cultural component to small business ownership among recent immigrants as it is more common among persons from Asian and the Near East.

Extending on the middleman minority thesis, it has been proposed that small business propriety is associated with educational attainment (Hirschman & Wong, 1986; Sanchirico, 1991). The attractions of running one's own business for immigrants are clear; it does not rely on formal qualifications, it provides a degree of independence for the individual and family, and it enables financial rewards that are more controllable and less subject to ceiling effects evident in occupations in which one is working for an (external) employer. Moreover, one's income is less affected by factors such as racial discrimination and prejudice, and this enhanced earning potential allows for greater social mobility. However, there is little doubt that working for oneself is very hard as it usually involves long hours in order to maximise income, and many small business owners do not desire such an occupation for their children (Sanchirico, 1991). Instead, they prefer high status, high income professions that require university education, such as medicine and law. Moreover, Sanchirico (1991) argued that small business owners are more successful in communicating these aspirations to their children due to the close connection between the business and family life inherent in small business. Sanchirico's (1991) survey of Chinese Americans in Washington, DC generally supported his hypothesis that small business proprietors have high educational aspirations for their children. In particular, he found that small business ownership was a significant positive predictor of children's educational attainment, and in contrast with professionals and managers (whose offspring also exhibited high levels of educational achievement) this effect was independent of parents' educational background.

iii) Education as a means for social mobility

It is evident that the perception of education as a means for social mobility is not limited to small business owners (Caplan et al., 1992; Fuligni, 1997, Hirschman & Wong, 1986). Many immigrants regard the country to which they have emigrated as a land of opportunity in which they and their children can achieve wealth and status, the likes of which were not possible in their country of origin. In the United States, migrants' faith in the opportunities for success is further reinforced by the philosophy of the American Dream, which according to Spence (1985) incorporates "the belief that this is a land not only of material abundance but also of political and economic opportunity", where "with hard work and perseverance ... anyone with the proper moral fiber could succeed" (pp. 1286-1287). Moreover, like small business ownership, education is generally regarded as a meritocracy that is less affected by the racial discrimination and prejudice encountered by immigrants in other areas. Hence, it is perceived to provide the best means for social advancement (Hirschman & Wong, 1986; Schneider & Lee, 1990; Sue & Okazaki, 1990).

Although many Asian Americans have clearly adopted education as the most effective means for social mobility, there is evidence to suggest that it is not a sufficient condition to place them on a level playing field with Anglo-Americans (e.g., Barringer, Takeuchi, & Xenos, 1990; Hirschman & Wong, 1986; Hsia, 1988; Nagasawa & Espinosa, 1992; Schneider, Hieshima, Plank, & Lee, 1994). Generally Asian Americans are overqualified and underpaid for the jobs they are performing (e.g., the U.S. Commission on Civil Rights, 1978, cited in Barringer et al., 1990). Nagasawa and Espinosa (1992) suggested that there is a glass ceiling on Asian Americans' income and status, so that they do not, on average, receive the same financial returns for education as Anglo-Americans, especially in the case of recent immigrants. Hurh and Kim (1989) demonstrated that when factors such as years of education and working hours were taken into account, the economic returns for working for Asian Americans were lower than for Anglo-Americans. However, despite this disadvantage relative to Anglo Americans, it is evident that education is the key determinant of occupational prestige for Asian Americans (Barringer et al., 1990). This suggests that although they may not be receiving the same financial reward for studying as Anglo-Americans, for Asian Americans education remains one of the best ways to get any reward.

iv) Immigrant Status (Generation)

The discussion concerning the role of education for social mobility points to an important factor in understanding immigrants and achievement, that is, immigrant status or generation. Generally, individuals who are foreign-born and emigrate are referred to as first generation, the second generation are the offspring of those immigrants, and the third generation are their grandchildren; that is, they and their parents were born in the US (or Canada or Australia etc.) but their ethnic background is other than the (Anglo-European) majority. Generation has both sociological and cultural characteristics, as it affects the economic and social position of immigrant groups, as well as the degree of identification with traditional cultural values and practices versus acculturation to the values and norms of the majority culture[3].

As described earlier, the influence of small business ownership on Chinese Americans' participation in higher education has a generational component; Chinese small business owners are more likely to be first generation and desire their second generation children to achieve higher social status through education (Sanchirico,

[3] However, it should be noted that in more recent research these are not regarded as a unidimensional construct with, for example, 'Chinese identity' at one pole and 'American' at the other, but rather as two separate but related processes (See Tanaka, Ebreo, Linn & Morera, 1998, for a discussion of ethnic identity and acculturation as they relate to Asian Americans).

1991). Generation also appears to be an important factor in educational aspirations and achievement. A number of studies (e.g., Fuligni, 1997; Rong & Grant, 1992) have indicated that high educational attainment tends to be most pronounced in the first and second generations and diminishes with successive generations. Fuligni (1997) also found generation to be a strong predictor of school grades, even after factors such as ethnicity and socioeconomic status were controlled for, such that first generation immigrant students had significantly higher grades than the third generation. Goyette and Xie (1999) investigated the educational expectations of Asian Americans using the National Educational Longitudinal Study (NELS) data and found that first generation Asian Americans had significantly higher expectations than the third generation. Finally, Sue and Zane's (1985) study of College students found that more recent immigrants (resident in the US for six years or less) spent more time studying than American-born Asians and Asians who had been resident for longer than six years.

This generational effect has been used as evidence to support several different explanations for the achievements of Asian Americans. Lee and Rong (1988) pointed to Chiswick's (1970, cited in Lee and Rong, 1988) suggestion that the effect is evidence of regression to the mean, claiming that Asian migrants tend to be highly selected for factors that are related to achievement, such as ability and motivation, and with subsequent generations these characteristics will approach the mean. Rong and Grant (1992) made a similar argument, claiming that selectivity results in the second generation rapidly reaching the desired educational achievement level and the peak in the second generation may therefore be evidence of a ceiling effect. However, as discussed earlier, the evidence for selectivity of migration is less than convincing and this argument offers little to explain the high achievements of involuntary migrants such as Vietnamese refugees.

A more popular explanation of the effect has been the cultural thesis (see the following section for a detailed description of this position). Proponents of this hypothesis (e.g., Kao, 1995) argue that generational changes in the achievements of Asian Americans are due to cultural factors. Specifically, it is proposed that greater acculturation to American norms and practices results in the gradual weakening of cultural values with subsequent generations, who exhibit aspirations and achievement that are similar to the Anglo-American majority. However, as discussed in the following section, the cultural thesis is not a sufficient explanation for the achievements of Asian Americans and the evidence for a purely cultural interpretation of the achievements tends to be mixed.

Although the findings of generational change in educational attainment demonstrate the need to take into account the role of generation, the results should be interpreted with caution. Only a few studies have included a sufficiently large and broad sample in order to investigate the role of generation. Furthermore, it is clearly practically very difficult to conduct longitudinal research to examine changes over generations, so that these data derive from cross-sectional studies, and in some cases ethnicity and generation are confounded. For example, Kao's (1995) hypothesis is based on comparing the results of Pacific Islanders with other Asian subgroups that have emigrated more recently. Finally, Goyette and Xie (1999) found that after controlling for the effects of generation, ethnicity remained a significant predictor of educational expectations, suggesting that the achievements cannot solely be attributed to an immigrant-generational effect.

1.6.3 Macro-level cultural factors: The influence of Confucianism

It has been proposed that traditional East Asian values have played an important role in determining Asian Americans' educational success (e.g., Mordkowitz & Ginsburg, 1987). Of the cultural factors assumed to influence Asian students' academic achievement, traditional Confucian values emphasising the importance of both the family and education are most frequently cited in the literature. Moreover, in traditional China, knowledge of Confucian doctrine was the primary means of social mobility for the lower classes (Flynn, 1991a). Although Confucius (Chung-ni K'ung) was a Chinese scholar, his teachings also influenced social mores and attitudes toward education in Japan, Korea, Taiwan and Vietnam. Despite the fact that in China the institutional influence of Confucianism began to decline with the collapse of the Qing dynasty (1911) and was virtually outlawed with the Communist victory in 1949, many Confucian ideas are maintained in ethnic Chinese communities today (Hayhoe, 1984).

Confucianism is a philosophy; a moral code for human behaviour. Its central goals are the maintenance of social harmony and the promotion of education and learning. In order to prevent social discord Confucian teachings concentrated on preserving a fairly rigid social structure based around the family and kin. The foundation of this structure is the fundamental notion of interrelatedness; the "assumption that man exists in relationship to others" (Bond & Hwang, 1986, p. 215), in contrast to the highly individualistic Western concept of humankind. One of the key precepts is filial piety; respect for, and loyalty and obedience to one's parents (Ho, 1994). Connected with this is the moral obligation offspring feel toward their parents, to whom they are indebted for raising them. Similarly, in traditional Japanese culture repaying one's obligation to others is of utmost importance (Caudill, 1973, cited in Vernon, 1982). According to Confucian doctrine, an ideal way in which to repay this debt is to gain a good education and occupation, a tradition which is evident among Asian Americans today (Mordkowitz & Ginsburg, 1987; Schneider, Hieshima, Plank, & Lee, 1994).

In this way the Confucian emphasis on virtue and family honour is inextricably tied to education, as the latter is also imbued with moral connotations. The role of the family also reflects an emphasis on the collective rather than the individual, a fundamental difference from the ethos of Western, particularly North American cultures. The harmony of the group is considered to be more important than the happiness of the individual (Caudill, 1973, cited in Vernon, 1982), hence 'individual' academic success is seen as a product of the family, and contributing to family honour (Caplan, Choy & Whitmore, 1992). Confucianism also emphasises diligence and perseverance in relation to learning, which is supposed to be hard work but enjoyable. Obedience to and respect for one's teachers are also highly valued.

1.6.4 Micro-level (psychological) cultural factors

Micro-level cultural explanations concern factors that operate at the individual level, such as the attitudes, beliefs and behaviour of the individual, although many of the factors proposed are assumed to have a cultural basis, such as the Confucian values described above. The role of the family in relation to the academic achievement of Asian American students has been one of the most popular explanations considered (Caplan et al., 1992; Lee & Rong, 1988; Mordkowitz & Ginsburg, 1987; Reglin & Adams, 1990; Schneider & Lee, 1990; Vernon, 1982). This research has concentrated on family factors such as parental pressure and commitment to education, including strict regulation of after-school time, and group homework. Other micro-level cultural influences considered include the importance of studying hard, high teacher expectations, peer support, and attributions and beliefs about the causes of academic success and failure.

i) The role of the family

Reglin and Adams (1990) determined that in general the role of parents was the most important cultural factor that contributed to Asian American students' high achievement levels and distinguished them from non-Asian American students. Similarly Hess, Chih-Mei, and McDevitt (1987) found that Chinese and Chinese American families emphasised the role of the family environment in relation to children's maths achievement more than did Caucasian American families. It is also evident that Asian American families have a high commitment to education and high aspirations for and expectations of their children (e.g., Fuligni, 1997; Goyette & Xie, 1999; Mordkowitz & Ginsburg, 1987; Okagaki & Frensch, 1998; Reglin & Adams, 1990; Rigsby, Stull, & Morse-Kelley, 1997; Schneider & Lee, 1990). For example, Schneider and Lee (1990) reported that all of the East Asian parents in their study said that "C or 'satisfactory' grades were not acceptable" (p. 370). Mordkowitz and Ginsburg (1987) found that Asian American parents tended to emphasise the importance of hard work and perseverance.

However, it is unclear whether Asian American parents influence their children's achievement by direct control of their activities or through socialization of values such as the importance of self discipline. Some researchers have reported direct control, for example, parents regulating the time children spend on homework and television viewing (Caplan, Choy & Whitmore, 1992; Mordkowitz & Ginsburg, 1987; Schneider & Lee, 1990), and allowing them to avoid household chores (Caplan et al., 1992; Garfinkel, 1983; Schneider et al., 1994). Others have suggested that Asian American children's socialization concerning education and their future includes internalization of beliefs in the importance of hard work and perseverance (Asakawa & Csikszentmihalyi, 1998; Mordkowitz & Ginsburg, 1987) and have found that this results in self regulation (Schneider et al., 1994).

These differences in research findings may be partly accounted for by the age of the child and/or immigration status (generation). For example, Reglin and Adams (1990) found that Asian American high school students restricted their own extra-curricular activities such as dating, sport and casual employment, whereas studies such as Caplan et al.'s (1992) generally focused on primary school aged children. Moreover, Schneider et al. (1994) found that communication about school between parents and their offspring was similar among Japanese-Americans and European-Americans, which they attributed to greater acculturation to American values and practices among the Japanese families, most of whom were third or fourth generation Japanese Americans. Finally, the results of Asakawa and Csikszentmihalyi's (1998) research suggest that Asian American parents may create a home environment that is conducive to studying by removing impediments such as chores, although they may be less directly involved in specific academic activities such as homework.

Another familial factor that has been found to influence Asian American students' academic achievement is family size, which Caplan et al. (1992) determined to be positively related to grade point average. This finding is contrary to Zajonc and Markus' (1975) Confluence model, which is based on findings of a negative association between IQ, and family size and birth order. It is also inconsistent with research indicating a negative relationship between number of siblings, and verbal IQ and achievement (Blake, 1989). Caplan et al. (1992) suggested that the discovery of the reverse effect with Indochinese families in the USA is indicative of the "distinctive family characteristics" that play a role in the children's academic achievement (p.21), although it is not entirely clear how a larger family contributes to educational prowess. Caplan et al. (1992) proposed that it is linked with traditional [Confucian] values such as "mutual, collective obligation" (p.21), and is partly a consequence of the way in which homework is done in these families. As the authors noted, not only did the Indochinese students spend more time doing homework than their Anglo-American counterparts, they were also distinguished by the fact that in many families homework was done collectively. Following the Confucian principle that teaching as well as learning is a highly valued activity, the children assisted each other with their homework. Caplan et al. (1992) suggested that the learning process is enhanced by the regular opportunity to teach younger siblings.

ii) Student characteristics: Academic beliefs and attributions

The role of self-efficacy beliefs in the achievements of Asian American students was first noted by Coleman et al. (1966). As described earlier, these researchers found that among the minority groups in their survey the Asian American students had the highest sense of control of their environments, although Anglo-Americans had the highest overall. Asian American students' belief in the importance of effort has also received partial support from studies of causal attributions. This avenue of research has been based on the Heider - Weiner model of causal attributions for achievements (Fletcher & Ward, 1988) which has often been used in research comparing high and low achievers. The theory originated with Heider (1958, cited in Fletcher & Ward, 1988), and was expanded by a number of researchers including Rotter (1966) and Weiner (e.g., 1979, 1986). According to Weiner's basic model there are three dimensions to causal attributions people make about events: 1. locus of control (internal versus external), 2. stability (unstable versus stable), and 3. controllability (uncontrollable versus controllable). Additional dimensions such as intentionality (Weiner, 1979), and globality (Abramson, Seligman & Teasdale, 1978) have also been proposed. In the research on academic achievement it appears that locus of control has received the most attention as a factor influencing academic performance. Some studies have indicated that internal attributions for successful events, e.g., 'I did well in the exam because I worked hard' or 'I'm smart'; and external attributions for unsuccessful events, e.g., 'I failed the exam because it was too hard' are associated with high achievement (e.g., Carr, Borkowski & Maxwell, 1991; Peterson & Barrett, 1987). However, other researchers (e.g., Houston, 1994) have found contradictory results and the relationship is a complex one which appears to be mediated by other factors such as expectancy of success and academic self-concept (Platt, 1988).

Despite these inconsistencies a number of researchers (e.g., Chiu, 1986; Hess, Chih-Mei & McDevitt, 1987; Hau & Salili, 1990, 1991; Mizokawa & Ryckman, 1991; Yan & Gaier, 1994) have proposed that the high achievement levels among Asian and Asian American children may be partly explained by attribution theory. In particular, it has been argued that the Asian cultural emphasis on the importance of hard work leads students to make attributions for academic performance that are conducive to high achievement, such as internal, controllable attributions for academic success and failure (e.g., effort).

However, as with the general research relating attributions to performance, studies of causal attributions among students of Asian background have yielded ambiguous results. Some studies (e.g., Hau & Salili, 1991; Holloway, Kashiwagi, Hess, & Azuma, 1986; Mizokawa & Ryckman, 1990) have indicated that Asian students and parents have a strong tendency to endorse internal attributions for academic success, while others (e.g., in Vernon's 1982 review) have shown these students to be more external on measures of locus of control. These inconsistencies are further compounded by the use of different measures of attributions and the fact that some of the cross-national studies (e.g., Hau & Salili, 1991) did not include non-Asian students for comparison. This latter problem makes it difficult to conclude that this tendency toward internal attributions is more characteristic of students of Asian background.

iii) Student characteristics: Academic behaviour

'The sea of learning knows no bounds; only through diligence may its shore be reached'

- Traditional Chinese saying (Ho, 1994, p. 296)

Perhaps the simplest explanation of Asian American students' academic performance is that they work very hard. As noted earlier, traditional Confucian values include an emphasis on perseverance and effort. Research has indicated that Asian Americans students spend considerably more time on homework on average, compared to Anglo-American students (Caplan et al., 1992; Fejgin, 1995; Huang & Waxman, 1995; Peng and Wright, 1994; Reglin & Adams, 1990), and Sue and Okazaki (1990) argued that this may be a key factor in explaining their academic achievements.

It has also been suggested that Asian cultural values result in classroom behaviour that enhances achievement (e.g., Mordkowitz & Ginsburg, 1987; Schneider & Lee, 1990). For example, the Confucian emphasis on obedience to and respect for one's elders, particularly teachers, promotes a classroom in which fewer interruptions for disciplinary action occur, enabling both students and teacher to spend more time on teaching and learning (Mordkowitz & Ginsburg, 1987). U.S. teachers' perceptions of Asian American students as quiet, diligent and intelligent also influence their behaviour toward them (Schneider & Lee, 1990). It has been found that teachers have higher expectations of their Asian American elementary and secondary students than of their Anglo-American students, perceiving, for example Asian American students "as significantly more academically competent ... quicker, more able to concentrate, more organized, more persevering, and as having a better memory than Anglo students" (Wong, 1980, p. 240). Similar results of a tendency for teachers to expect better academic performance of their Asian American students have been reported by other researchers (e.g., Hsia & Peng, 1998; Tom, Cooper, and McGraw ,1984; Schneider and Lee, 1990). Wong (1980) suggested that this bias favouring Asian Americans becomes a self-fulfilling prophecy because high teacher expectations enhance academic performance. This hypothesis is supported by the research of Rosenthal and Jacobson (1968) in which it was demonstrated that teachers categorise their students and behave towards them in such a way that elicits the performance they expect.

It is also evident that friendships among Asian American students are a valuable source of support for academic pursuits, creating a peer group that fosters academic achievement (Fuligni, 1997; Nagasawa & Espinosa, 1992; Steinberg, Dornbusch & Brown, 1992). This peer group usually consists of other Asian American students who are also highly motivated for academic achievement. For example, Steinberg, Dornbusch and Brown (1992) found that Asian American high school students more frequently "belong to a peer group that encourages and rewards academic excellence" than other minority groups (p. 728). These authors also reported that this support extended to studying together, an activity which may be an adaptation of the family homework evident at the primary level (Caplan et al., 1992). At the tertiary level it is common to see Asian students studying together in study rooms and the library (Freeman & Morss, 1995; Ong, 1989; cited in Nagasawa & Espinosa, 1992). Nagasawa and Espinosa (1992) proposed that this behaviour is in response to discrimination against students of Asian background and the byproduct of their group solidarity is a subculture that enables them to concentrate on their studies. This approach to studying may be contrasted with the individual-oriented, 'lone' competitor style common among students from Western cultures, particularly

(Anglo-European) North American culture (Spence, 1985).

1.6.5 Summary of explanations for achievements of Asian Americans

From the preceding review it is evident that the explanations for the exceptional educational achievements of Asian Americans have come from a wide variety of perspectives and disciplines. Much of the empirical research has focussed on the hereditarian or genetic position, dominated by researchers such as Lynn (1987, 1991; Lynn, Chan, & Eysenck, 1991). While the results of some studies have supported this theory (e.g., Jensen & Whang, 1993, 1994), others have not (e.g., Stevenson, Lee & Stigler, 1986; Stevenson et al., 1985). There has also been little empirical support for the selective migration hypothesis, and the cultural thesis in terms of the impact of cultural factors on academic achievement. As Sue and Okazaki (1990) argued, theories based on cultural factors cannot provide a sufficient and exhaustive explanation for this phenomenon. This is partly due to the sheer number of potentially influential cultural values, and also because the interaction between these and the values of the dominant majority (North American) culture cannot be ignored. Despite the maintenance of traditional cultural values and practices by many Asian Americans, the educational achievements demonstrated are within the context of North American society and more specifically, the United States' education system. Moreover, as several researchers including Sue and Okazaki (1990) have commented, similarly high levels of educational attainment are not evident among Asian persons in Asian countries (e.g., the Chinese in China). Therefore, it would seem that a more comprehensive explanation would take into account both Asian cultural values, the social position of Asian American groups (and individuals), and the interaction between them.

It appears that the most fruitful area of research has been the studies of micro-level cultural or psychological factors, as these studies have yielded some consistent findings of factors that are related to Asian Americans' academic achievement, such as time spent studying. However, there is a need for a general theoretical framework in which to place this diverse collection of research findings and provide a coherent structure for future research. Sue and Okazaki's (1990) theory of relative functionalism may provide that framework, as well as accommodating the role of sociological and cultural factors, for explaining the achievements of Asian Americans.

1.7 Relative Functionalism

Sue and Okazaki (1990) proposed an alternative theory to account for the high achievements of Asian Americans. This theory, known as relative functionalism, attempts to accommodate both cultural and sociological factors, and, the authors argued, it provides testable hypotheses within the broader framework of the theory (Sue & Okazaki, 1990). The theory is based on the observation that the desire of many immigrants to countries such as the United States, Canada and Australia is to take advantage of educational, occupational and social opportunities not available in their homelands, with the ultimate goal of (upward) social mobility, usually middle class status. Moreover, the authors argued that education becomes regarded as the primary means for this social mobility when other avenues are, or are perceived to be, blocked (Hsia, 1988; Schneider & Lee, 1990; Sue & Okazaki, 1990). As discussed earlier, the emphasis on education is not limited to Asian immigrants (e.g., Fuligni, 1997), but Sue and Okazaki (1990) argued that the importance of education for 'getting on' may have an additive effect on existing (Asian) cultural ideas about the value of education, thus creating an interaction between cultural values and socio-political factors such as the experience of being a migrant to the USA. Therefore, they claim that for Asian Americans educational attainment is a *functional* means of achieving social status, *relative* to alternatives, and that this emphasis on education also capitalises on existing cultural values such as the high regard for education and learning.

Sue and Okazaki's theory is therefore an extension of cultural and sociological explanations rather than an entirely new thesis. Essentially, these authors have proposed that the interaction of cultural values and sociological characteristics (such as being an immigrant and experiencing or perceiving limitations in the available opportunities for social advancement) has resulted in the phenomenon of high educational attainment among Asian Americans. As Sue and Okazaki noted, such a confluence of factors has been observed previously, most notably with European Jewish immigrants to the US (Steinberg, 1981, cited by Sue & Okzaki, 1990).

Sue and Okazaki argued that in addition to the belief in the necessity of getting a good education, the phenomenon of Asian American achievement also reflects a traditional cultural belief in the importance of academic effort, i.e., a belief that effort will be rewarded with success. Therefore, using the concept of folk theories of success, these authors suggested that "the folk theory of success for Asian American may be, 'If I study hard, I can succeed and education is the best way to succeed' " (Sue & Okazaki, 1990, p. 919). Hence, this theory can accommodate the research on psychological factors such as commitment to, and therefore time spent studying and, to a lesser extent, beliefs in self efficacy, i.e., the 'If I study hard, I can succeed' component. The perception of education as 'the best way to succeed' reflects an underlying, motivating faith that educational attainment will be rewarded with financial success, a belief which relies upon perceptions of the educational and social system in the United States. The theory also predicts a decline in educational attainment with subsequent generations, not due to acculturation to American norms or loss of traditional cultural values but rather as a result of real or perceived increases in occupational opportunities that are not dependent on education.

To date, research support for this theory has been primarily qualitative. For example, Steinberg, Dornbusch and Brown (1992) found that the negative consequences of failing to get a good education were particularly salient for Asian American high school students compared to Hispanic, African American and Anglo American students. Similarly, in a study by Schneider and Lee (1990) one East Asian parent was quoted as saying to his/her son: "You have to study hard. To study hard is the only way for Orientals to get a good job" (p. 370).

1.8 Aims of the Research

1.8.1 IQ and achievement among students from Asian backgrounds

Although the success of Asian Americans in terms of educational and occupational achievement is well documented, there have been comparatively few studies that have examined the predictive validity of IQ for the achievements of students from Asian backgrounds. While Vernon's (1982) review provided some evidence concerning the psychometric intelligence of Asian Americans, some of the studies in his survey were affected by obsolescence of test norms due to generational gains in IQ (Flynn, 1989b, 1998). Moreover, many researchers who have addressed the issue of IQ have concentrated on cross-national comparisons that have limited applicability to the abilities and achievements of Asian immigrants (e.g., Lynn, 1982: Lynn & Hampson, 1986). There is clearly a need for an updated investigation of the relationship between IQ and academic achievements of students from Asian backgrounds.

Therefore the primary aim of the research was to examine the influence of IQ in relation to the academic achievement of Asian Australian and Anglo-Celtic Australian students. It was argued that the pattern of Asian migration to and settlement in Australia has been generally similar to that evident in North America (see Chapter 2 for a complete discussion), and therefore that Asian immigrants to Australia would have similar motivations and aspirations to those described in the US literature. Therefore, the research was an extension of research conducted by Flynn (1989b, 1991a) and Stone (1992) to the Australian context. Based on Flynn's hypothesis that IQ lacks predictive validity for the academic achievement of American students from Asian backgrounds, it was predicted that Asian Australian students would have higher levels of academic achievement than their Anglo-Celtic Australian peers of the same ability as defined by widely used IQ tests.

1.8.2 The Model of Intelligence

It is clear from Flynn's publications that the course of his investigations into the validity of IQ tests has been determined by his perception of Arthur Jensen as a formidable scholar and powerful advocate for a theory that Flynn has long held to be philosophically unacceptable (see, for example, Flynn, 1980, 1987b, 1999). From the outset Flynn has operated within a context shaped by Jensen's views about the central importance of 'general intelligence' – specifically Spearman's g – and he has ignored psychometric debate about the multifaceted characteristics of human intelligence (see, for example, Horn & Noll, 1997). Consistent with Flynn's opinion that Jensen's definition of intelligence essentially captures the layperson's view of general intelligence, Flynn's research into rising IQ scores has focussed on the most widely used omnibus and single factor tests, principally Raven's Matrices but also the Wechsler scales and the Stanford-Binet. His central concern has been the inadequacy of these procedures as markers for genotypically determined intelligence.

It was therefore important that the current research be located within a theoretical context that could accomodate putative relationships between global, behavioural expressions of intelligence and psychological or biological process held to underpin intelligence. The approach adopted was derived from Eysenck's (1979, 1982) model of intelligence, in which three concepts of intelligence were proposed. This model added psychometric intelligence to Hebb's (1949) distinction between 'Intelligence A' (biological potential for intelligence; i.e., a genotypic variable) and 'Intelligence B' (intelligent behaviour; i.e., a phenotypic variable). Psychometric intelligence (IQ), identified as Intelligence C in the model, was conceptualised as sampling some aspects of Intelligence B and capturing all of Intelligence A.[4] Researchers such as Eysenck (1987; Eysenck & Barrett, 1985) and Jensen (1985, 1987, 1998) have argued that measures of information processing speed, such as reaction time and inspection time can also serve as reliable estimates of Intelligence A. While the strong version of this position has been strongly and justifiably challenged (e.g., Detterman, 1987; Stankov & Roberts, 1997), there is now considerable evidence to suggest that these measures do tap a potentially important theoretical aspect of general intelligence (Nettelbeck, 1998).

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[4] See Eysenck (1987) for a detailed description of this model.

1.8.3 Explanations for the IQ/achievement gap

Using this model it was assumed that academic achievement is, for most people, the product of Intelligence B; that is, it is influenced by both biological potential and environmental considerations such as cultural factors, personality, motivation and education. It is possible that a poor predictive relationship between IQ and academic achievement for Asian Americans compared with other Americans is due to socio-cultural and/or psychological factors, such as the home environment and study habits, which are serving to boost intellectual abilities to produce high levels of achievement. Alternatively, the inconsistencies in the results of previous research on Asian Americans' IQ test performance may be explained by test bias. That is, it is plausible that the tests used to estimate intelligence are not providing an accurate measure of intellectual abilities for these groups but achievement levels provide a better indication of these students' intellectual potential. This may be especially so because of the possibility of unreliable estimates of verbal abilities among persons for whom English is not the first language. Therefore, in addition to assessing psychometric intelligence, and socio-culturally determined motivational factors, the present research included two chronometric tasks -reaction time and inspection time- as measures of information processing speed. Following the theories of Eysenck (1979, 1982, 1987) and Jensen (1980, 1985, 1987, 1998), Intelligence A was operationalised in terms of these measures of mental speed. Thus, quicker responses among students from Asian backgrounds compared to Anglo-Celtic Australian students would be interpreted as indicating superior abilities.[5]

Alternatively, Flynn has suggested that an examination of socio-cultural

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[5] These measures of information processing speed were included as additional estimates of cognitive ability. However, it should be noted that while they are moderately correlated with IQ, there is considerable argument that they are not free of cultural and/or motivational bias and it is highly questionable as to whether they provide a 'pure' indication of biological potential, as proposed by

factors may help to explain the poor predictive validity of IQ for students from Chinese and Japanese backgrounds. Research conducted with Asian Americans has implicated factors such as time spent studying, group homework, parental emphasis on hard work and perseverance (e.g., Caplan, Choy & Whitmore, 1992), high parental expectations (Fuligni, 1997; Goyette & Xie, 1999; Reglin & Adams, 1990; Schneider & Lee, 1990), and to a lesser extent, causal attributions for academic success and failure (Mizokawa & Ryckman, 1990). However, although there have been many studies that have identified socio-cultural factors that differ between Anglo-Americans and Asian American students, few studies have demonstrated links between these factors and academic outcomes. Moreover, because research in the area has come from such a broad variety of perspectives and disciplines, there have been few studies that have included both cognitive and noncognitive (e.g., socio-cultural) factors in their investigations. Therefore, there is also a need for research that includes socio-cultural variables in addition to traditional predictors of achievement such as IQ. As discussed earlier, studies that have concentrated on proximal or micro-level factors such as academic effort and educational aspirations have been more successful in identifying factors that may account for the achievements of Asian Americans. Therefore, a secondary aim of the present research was to conduct a more detailed investigation of the influence of these factors in relation to the achievements of students of Asian background, under the broad framework of Sue and Okazaki's theory of relative functionalism.

Jensen and others (Nettelbeck, 1998; Stankov & Roberts, 1997).

1.9 Research design

The aim to examine both cognitive and noncognitive factors with particular emphasis on variables such as time spent studying necessitated a relatively small-scale, quasi-experimental design in contrast to the large-scale surveys conducted in the US such as the Coleman Report (1966) and the National Educational Longitudinal Study. While these national databases provided (and continue to provide) valuable data in terms of identifying a range of predictors of achievement for different ethnic groups, they offer little by way of explanation for the relationships observed. This has led researchers such as Schneider et al. (1994) to conclude that the understanding of these relationships may be enhanced by smaller field studies in which more detailed data can be obtained. For this reason, and also due to practical necessity, the general aim of the present research was to provide an in-depth investigation of the relationships between IQ, socio-cultural motivational factors and academic achievement among students from Asian backgrounds.

CHAPTER 2

IQ, time spent studying and academic achievement among Chinese Australian university students (Pilot study)[1]

2.1 Background: Asian Australians

2.1.1 Asian Australians' Academic Performance

While there has been almost no research conducted on the academic achievement of Asian students in Australia, there is a growing community perception of students from Asian backgrounds as high academic achievers. This ethnic stereotype has been primarily evident in reports in the mass media; for example, claims that students with Asian surnames are now over-represented in the top students graduating from high school in NSW (O'Neill, 1995). Moreover, these media reports have taken the stereotype of Asian student as high achievers one step further by providing a number of potential explanations for the (perceived) phenomenon. These explanations include conventional socio-cultural theses such as high educational aspirations (Walker, 1994) and notions of obligation to parents and family ("The Blainey Debate", 1994, p. 5). For example, a national newspaper reported a survey conducted by a Catholic school principal that indicated that 100% of the Vietnamese children in grade 5 wanted a career in the professions, compared to 69.2% for non-Vietnamese children, and this was despite the fact that fewer (only 1.8%) of the Vietnamese children's parents were professionals (Walker, 1994). It is also evident from interviews with Asian students that there is a pattern of motivation for academic success that is similar to that described in research conducted in the USA. For example, Vietnamese medical students are quoted as saying that their

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[1] An article based on this chapter by J.Dandy and T.Nettelbeck and titled "The model student?: An investigation of Chinese Australian students' academic achievement, studying, and causal attributions

parents "sacrificed .... security, friends, jobs to give me a start here" and "I know from my parents that I have to work"(Walker, 1994, p. 4), while a student from Hong Kong endorses the importance of effort; "In my HSC I got 96.45 and I got a scholarship afterwards. I think we work harder. It's probably because you really have to compete and (Asians) are willing to put in the effort." ("The Blainey Debate", 1994, p.5).

However, despite the flurry of media interest in the subject there has been little empirical evidence supporting the claim that Asian Australian students are high achievers. What little evidence does exist consists primarily of descriptive data concerning tertiary enrolments (e.g., Birrell & Khoo, 1995; Burke & Davis, 1986). For example, Birrell and Khoo (1995) reported that the participation of second generation Chinese Australians is disproportionately high, relative to their community numbers. Similarly, Asian-Australian students, particularly Chinese speakers, appear to be attracted to and concentrated in high-status university courses requiring very high performance in the final year of secondary school, such as medicine, dentistry and electrical engineering (Student Records, University of Adelaide, 1993). Similar findings have been observed in New Zealand (Walkey & Chung, 1996), where the history of immigration and settlement of Chinese people is arguably more similar to that in Australia than the North American experience.

2.1.2 Australian research on immigrants and achievement

Australian research on immigration and achievement has generally involved earlier immigrant groups, such as Greek, Southern Italian, and Turkish migrants, and has tended to focus on the influence of environmental factors (e.g., the family and school) on achievement rather than individual characteristics such as academic

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for academic success and failure" has been accepted for publication in the *Australian Psychologist* (in ability. Sturman's (1985) review identified several common findings of Australian research comparing Anglo-Australian and English-speaking migrant groups with families of Non-English speaking backgrounds (NESB) including: (a) higher rates of high school completion among NESB youth, (b) higher educational aspirations among NESB parents and children, irrespective of socio-economic status and ability; and (c) lower performance on verbal measures of achievement and ability for NESB children. For example, Marjoribanks (1980, 1985) found a strong preference among Greek and Southern Italian parents for their children to receive university education, despite coming from low socio-economic backgrounds. Similar results were reported in a more recent study that included Vietnamese Australian students (Bullivant, 1988). Bullivant's study also supported Wong's (1980) findings concerning teachers' perceptions of Asian students, such that they were seen as more hard working, more motivated, and having higher aspirations than their Anglo-Australian peers.

In summary, while there is some evidence to suggest that Asian Australians students have high educational and occupational expectations and this is reflected in high rates of participation in tertiary education, there is little empirical evidence to support the perception of *superior* achievement. On the basis of the North American research reviewed in Chapter 1, and in view of anecdotal indicators of a similar pattern in Australia, the general aim of the first study was to investigate cognitive and non-cognitive (socio-motivational) factors influencing the academic achievement of Asian students in the Australian context.

Students of Chinese and Vietnamese background were the particular focus of the research for two reasons. The first was to examine Lynn's (1987, 1991) proposal

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press).

that the success of East Asian cultural groups is due to superior intelligence rather than sociological and/or cultural factors. The second was practical, because these communities are the largest Asian ethnic groups in South Australia (Beer & Cutler, 1995). Furthermore, as the primary concern of the research was the educational experience and success of migrants in Australia, the aim was to study Australian residents of Asian background. This participation requirement was also to avoid the inclusion of International or Overseas students who are highly selected in terms of ability and achievement.[2]

2.1.3 Asian migration to Australia and South Australia

The pattern of immigration of East-Asian persons to Australia is generally similar to that evident in the United States and Canada. Early Asian migration, consisting mainly of Chinese men, was linked to the Gold Rushes in Victoria and New South Wales in the mid-nineteenth century. Little is known about these early migrants and it appears that many of them did not settle in Australia but returned to China or travelled further abroad. The attractions of Australia's education system and political stability brought Asian migrants in larger numbers in the 1960s and 1970s (Beer & Cutler, 1995), while the increase in Chinese students' applications for permanent residence in the 1990s has been linked to the Tianamen Square massacre in 1989 (Birrell, 1994; *Campus Review*, 1994, both cited in Beer & Cutler, 1995). The proportion of new immigrants from Asia has increased in the last twenty years, such that in the period 1992-1993 people born in Hong Kong and Vietnam were the third and fourth ranked groups in a list of major groups of immigrants, eclipsed only by immigrants from the UK/Ireland and New Zealand (Beer & Cutler, 1995).

Migration patterns have differed for the major groups of Chinese immigrants

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[2] Although this restriction reduces the likelihood of sampling bias it does not necessarily remove the

such that there appears to be two migration groups of China-born persons. There have been steady but generally small numbers of persons born in China arriving in Australia since the 1950s, resulting in an older group (the median age of the China-born community is 38 years) than more recently arrived Chinese groups such as people born in Hong King, Taiwan and Vietnam (Bureau of Immigration and Population Research (BIPR), 1994c). The second group appears to consist of younger, recent arrivals (aged between 15 and 34 years).

Vietnamese migration to Australia has generally been more recent and concentrated than the pattern for Chinese groups, beginning with the end of the Vietnam War in 1975. Although refugees have generally constituted a small proportion of the total immigrant population, the majority of Vietnamese migrants entering Australia between 1975 and 1981 were resettled in Australia as part of the Fraser Government's Indochinese refugee policy (BIPR, 1994a). More recent Vietnamese immigration has largely come under the auspices of the Family Reunion Program (BIPR, 1994b).

Immigration to South Australia has differed from national trends, particularly in the relative proportions of immigrant groups (Beer & Cutler, 1995). For example, Vietnamese immigrants constitute a greater proportion of new arrivals, being the second-ranked major group in South Australia. In contrast, the number of Cambodian, Laotian, and Hong Kong migrants to South Australia is comparatively fewer than the national average, although there has been a steady increase in the number of immigrants from Hong Kong (between 1986 and 1991 Census). In 1991 2.4% of the South Australian population were born in Asia, the majority of whom are

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confounding variable of selectivity of migration, which cannot be controlled for.

from Vietnam (9 249 people) and Malaysia (4 148 people)[3]. However, many of the Malaysia-born are students who will probably return home once they have concluded their studies (Andressen, 1993).

2.1.4 Demographic characteristics of the Chinese-speaking communities in Australia

The Chinese-speaking Australian population is quite heterogeneous, consisting of a number of different ethnic, cultural, and language groups.[4] Based on birthplace, ancestry, and language spoken at home, Hon and Coughlan (1997) have identified six major Chinese groups in Australia; people born in: (a) the People's Republic of China, (b) Hong Kong, (c) Taiwan, (d) Malaysia, (e) Vietnam, and (f) Macau. The majority (approximately 60%) of overseas-born Chinese persons in Australia were born in China or Malaysia. There are approximately 250 000 Chinese people living in Australia, constituting 1.5% of the total Australian population (Hon & Coughlan, 1997). Cantonese is the preferred language for the majority of these people, although English is commonly spoken at home among many Hong Kong and Singapore-born people.

i) Educational and occupational characteristics

First generation Chinese Australians tend to be better educated than other non-English-speaking (NES) immigrant groups (BIPR, 1994c). This is partly due to changes in Australian immigration criteria coupled with the recent arrival of many Chinese groups. It is also contributed to by the large proportion of Malaysia-born students in the country (Hon & Coughlan, 1997). The labour force participation rate

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[3] The Census collects data on country of birth and language(s) spoken at home rather than ethnicity. Many of the Malaysia-born persons and some of the Vietnam-born are likely to be of Chinese ethnicity.

[4] More detailed data are available on the characteristics of the Chinese and Vietnamese communities in Australia as a whole, than for the South Australian population in particular. With the exception of the migration pattern (described above), the demographic characteristics of Vietnamese immigrants in

of Chinese persons is higher than that for other immigrants from NES countries, and the unemployment rate is lower. However, unemployment rates are still higher in comparison with the national average (11.6% at the time of the Census), and is highest for the Taiwan-born (27.7%) (Hon & Coughlan, 1997).

ii) Second generation Chinese Australians

There were few data available from the 1991 Census concerning second generation Chinese Australians, mainly due to the small numbers and the recency of settlement in Australia. However, it appears that the North American pattern for high educational attainment holds for the Australian born children of Chinese immigrants, such that a significant proportion (approximately 34%) have obtained a university degree (Birrell & Khoo, 1995). This figure is disproportionately greater than that for Anglo-Celtic Australians, of whom approximately 13% hold a university degree.[5] Therefore it may be considered a rough indication of the educational success of the offspring of these migrants.

2.1.5 Demographic characteristics of the Vietnamese communities in Australia

At the 1991 Census there were 121 813 people born in Vietnam living in Australia, with the vast majority (over 76 %) living in New South Wales and Victoria (BIPR, 1994a). There is also a substantial group of second generation (Australia-born with one or both parents born in Vietnam) Vietnamese in Australia; numbering approximately 25 000 people at the 1991 Census. Because the majority of the first generation arrived after 1980 the median age of these Vietnamese immigrants is lower than the national average (Vietnam-born median age is 29 years compared to

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South Australia do not appear to differ significantly from the national trend (BIPR, 1994). Therefore the national data will be described here.

32 years for the total Australian population). The majority (65%) of the first generation are younger than 35 years old (BIPR, 1994a). There is also a gender imbalance in the community with approximately 5% more males than females; a demographic that is typical of recent immigrants.

i) Educational and occupational characteristics

Characteristics that distinguish the Vietnamese from other immigrant groups include those relating to family, citizenship, education, and employment. For example, Vietnam-born Australian families are more likely than other overseas-born and Australia-born families to consist of two parents with dependent offspring (BIPR, 1994a). Vietnamese immigrants are also more likely to take up Australian citizenship than other immigrant groups, a finding which is common among refugee-immigrants throughout the world (BIPR, 1994a). Similarly, due to the political and social unrest in Vietnam (which resulted in their emigration), many have had little formal education, or skilled or vocational training. Consequently the majority are employed in semi- and unskilled occupations such as labourers, and plant and machine operators (men), and salespersons and clerks (women). The unemployment rate in the Vietnamese community is substantially higher than the national average (39.8% compared to 11.6%).

ii) Second generation Vietnamese Australians

Consistent with the recent (post 1975) migration of their parents, the second-generation Vietnamese community is young; at the 1991 Census over 97% were under 15 years old (BIPR, 1994a). In general, these Australia-born Vietnamese persons are more likely than their parents to have had some form of post-secondary qualification. However, the proportions are lower than the national average as well

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[5] Based on the percentage of Australians with University qualifications from the 1991 Census (Bureau

as lower than the average for the second generation of other overseas-born groups (BIPR, 1994a). At the 1991 Census approximately 6% (39 people) of the second generation aged 15 years and over had obtained a bachelor's degree or higher tertiary qualification. However, these statistics should be interpreted with caution; not only is the population very small but, given that the majority are younger than 15 years of age, it is likely that a number of second generation Vietnamese Australians had not completed their studies at the time of the Census.

2.2 Aims of the study

The aim of the first (pilot) study was to compare the predictive validity of several factors in relation to academic achievement, for Chinese Australian and Anglo-Celtic Australian university students.[6] Following from Flynn's (1989a, 1989b, 1991a) research, a comparison of the relationship between IQ and academic performance for the two ethnic groups was made with the aim of investigating the possibility of an IQ/achievement gap for these students. A university sample was chosen specifically to test Flynn's (1991a) hypothesis that one component of the gap consists of a 'threshold factor' (see **1.5.2**). [Flynn (1991a) suggested that Chinese American students enter university and professions with a lower IQ than their Anglo-American peers.] In addition, a test providing separate measures of both verbal and nonverbal abilities was included to compare the groups' performance on these two hypothesised components of intelligence.

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of Immigration and Population Research, 1994c).

[6] The original aim of the research was to include Vietnamese Australian students in the sample. However, despite numerous and varied attempts to advertise the project (including the introduction of payment for participation) very few students of Vietnamese background volunteered to participate in the study, resulting in a sample of insufficient size (N = 8) for the statistical analyses. Therefore these participants' data are described in Appendix 2.1 but not otherwise included in analyses. Given the age characteristics of the Vietnamese community in South Australia it is likely that few Vietnamese persons had reached tertiary education at the time of the study.

As described in Chapter 1, Flynn has put forward two potential explanations for an IQ/achievement gap. One interpretation is that the gap reflects test bias, such that the tests used to estimate intelligence are not providing an accurate measure of intellectual abilities for these groups but achievement levels provide a better indication of these students' intellectual potential. In order to explore this hypothesis, in addition to assessing psychometric intelligence, the present study included reaction time and inspection time as measures of information processing speed. As discussed in Chapter 1, although these measures of mental speed are not necessarily free of cultural and/or motivational bias, they are related to general intelligence and may be less linguistically biased than conventional pen and paper tests. Therefore they were included in the present study as additional estimates of intellectual ability. As proposed in Chapter 1, quicker responses among students from Asian backgrounds compared to Anglo-Celtic Australian students, would be interpreted as indicating superior abilities.

Alternatively, as Flynn (1989b, 1991a) has argued, the IQ/achievement gap may be the result of socio-cultural motivational factors which are serving to boost the achievements of students from Asian backgrounds. Socio-cultural motivational factors considered in the present study included measures of causal attributions for academic success and failure, and attitudes toward achievement and university education. These measures were chosen to explore Sue and Okazaki's (1990) theory of relative functionalism. Although their model is based on the interaction between cultural factors and social status and opportunities in the United States, it is argued that similar factors are present in Australia. Therefore, a questionnaire investigating causal attributions for academic success and failure was included to compare individuals' and ethnic groups' beliefs concerning the importance of factors such as effort, ability and motivation with regard to academic success and failure. It was predicted that students from Asian backgrounds would be more likely to make internal, controllable (specifically effort) attributions for academic success and failure than their Anglo-Celtic Australian peers. This was intended to assess the 'If I study hard, I can succeed' component of the folk theory. Several questions were also constructed in order to explore students' beliefs concerning the role of several factors such as parents' expectations, in achievement motivation.

In order to determine the extent to which these attributions and beliefs were associated with academic behaviour the study also included a measure of academic effort, by asking participants to maintain a diary of their daily study activities for four weeks. It was predicted that the Chinese Australian students would spend significantly more time studying than their Anglo-Celtic Australian peers.

2.3 Method

2.3.1 Participants

There were 40 participants: 18 Chinese Australian (six females and 12 males) and 22 Anglo-Celtic Australian (three females and 19 males) students. All were university students enrolled at either the University of Adelaide or Flinders University of South Australia. Mean ages of the Chinese Australian and Anglo-Celtic Australian groups were 19.11 years (SD = 2.37) and 19.00 years (SD = 2.05), respectively.

Method of recruitment

Two strategies were implemented to recruit participants, resulting in a sample of convenience. Based on the enrolment figures (Student Records, University of Adelaide 1993), specific courses with high enrolments of Chinese-speaking students were targeted, in particular engineering and science. The investigator gave a brief verbal summary of the project in first and second year lectures for these degree programs, and interested students were asked to sign up (indicating name and contact telephone number) after the lecture. In addition, advertisements containing a brief description of the study and a contact telephone number for the investigator, were placed around the campuses of the University of Adelaide and Flinders University. The majority (approximately two-thirds) of volunteers came from the former strategy. Participants enrolled at Flinders University (n = 10) were paid a nominal amount ($15) for their participation because this was the practice at this institution.

The recruitment strategies were reflected in the makeup of the sample, as is evident from Table 2.1. The majority (67%) of the students were enrolled in engineering or science degrees with small numbers enrolled in other University courses such as Arts, Law, and Dentistry. Table 2.1 also provides the breakdown of the sample in terms of year at University, indicating that the majority of the Chinese Australian participants were enrolled in first year, while the Anglo-Celtic Australian group was equally distributed between first and second year.

Table 2.1

Distribution of sample by ethnic group, year at University and Degree

	Ethnic Group	
Year	Chinese Australian	Anglo-Celtic Australian
First year	13	11
Second Year	3	11
Third or Fourth Year	2	0
Degree		
Engineering/Science	14	19
Arts/Humanities/Law	3	2
Other	1	1

Definition of Ethnicity

Chinese Australian students were defined as those whose parents were ethnic Chinese but who were Australian residents (see **2.1**). The majority of the Chinese participants were first generation immigrants with only three participants who were born in Australia. Most of the overseas-born students were from Malaysia (approximately 44%) and Hong Kong (28%), with individuals born in Vietnam, Cambodia, and Brunei. The average length of time resident in Australia was 7.21 years (SD = 4.47).

Anglo-Celtic Australian students were defined as second or later generation Australian, i.e., their parents were born in Australia and their grandparents were born in either Australia or Great Britain.

2.3.2 Measures and Apparatus

1. Academic achievement

Participants indicated their University entrance score (results of final year of secondary school) and this was used as an index of academic achievement. This score is a total based on five subjects studied in the final year of secondary schooling with each subject being scored out of 20, yielding a maximum of 100 points.

2. IQ

Participants completed two tests of psychometric intelligence; Raven's Advanced Progressive Matrices (APM) Set II (1962 revision) and the Australian Council for Educational Research (ACER) Advanced Linguistic - Advanced Quantitative Test (AL-AQ).

3. Information Processing

Participants completed two tasks assessing speed of information processing; an inspection time (IT) task and a four-choice reaction time (RT) task. The same apparatus was used for both tasks ; a computer with monitor and keyboard, and a black response keyboard with four grey buttons across the top and two red buttons in the centre of the board, arranged symmetrically.

Inspection Time Task - The target stimulus was presented on the computer monitor screen. It consisted of two vertical lines 25 millimetres (mm) and 35 mm in length, separated by 10 mm and aligned at the top by a horizontal line. The shorter line occurred with equal frequency on the left or right side of the stimulus. Each presentation of the target was preceded by a fixation cue (a small dot in the target stimulus area), displayed for 500 milliseconds (ms). The target was displayed for variable duration until replaced by the pattern mask (360 ms duration). The masking figure consisted of a pair of vertical lines, 45 mm long, that completely covered those of the target stimulus and extended down beyond the longer line. The lines of the mask were thickened around the centre, being shaped to resemble two bolts of lightning (see Evans & Nettelbeck, 1993, for the rationale for the development of this masking figure). Participants responded using the two red response keys to indicate the position of the shorter line (ie. left-hand or right-hand side of figure). Viewing distance was approximately 40 centimetres. The task was run using a computerised program that controlled, timed and recorded all stimulus presentations and responses. The inter-trial interval was 2 seconds and the duration of the initial stimulus presentation was 300 ms.

Inspection Time Procedure - Training for the IT task began with a demonstration of the target, mask and response requirements, followed by 10 practice trials at a target exposure duration of 300 ms. A criterion of nine correct responses during the practice was required before proceeding further. Participants then began the task proper. Throughout the IT task it was emphasised that accuracy, not speed of response, was important and that when discrimination became difficult, it was permissible to guess. IT, defined as estimated target duration required for 90% accuracy, was measured using an adaptive staircase procedure derived from Wetherill and Levitt (1965). This procedure began with an initial exposure duration of 300 ms and subsequently automatically adjusted target duration in response to performance accuracy. The program was designed to incorporate eight points of reversal, requiring six successive correct responses before reducing exposure by 20 ms but only one error to increase duration by 20 ms. IT, at an accuracy level of 90%, is the mean reversal value.

Reaction Time Task - Stimuli were presented on the computer monitor screen as a horizontal row of four circle outlines, one of which would be illuminated at random but all with equal frequency. The length of the display was approximately 10 cm and viewing distance was approximately 40 cm. Participants responded, using the index and middle finger of each hand, by pressing one of the four grey, spatially correspondent keys on the keyboard. There was no gap between stimulus presentation and participants completed 120 trials (30 for each stimulus). Reaction time was the mean response time for the 120 trials.

4. Questionnaires

Participants were given two questionnaires that they completed in their own time and returned to the investigator at a later testing session. The questionnaires were constructed by the investigator and had been designed to examine:[7]

i) Achievement motivation, parental expectations and to obtain demographic data such as language(s) spoken at home, parents' place of birth, level of education and occupation, and participants' extra-curricular activities such as television viewing and casual employment.

Reliability of Questionnaire Items

A sample of first-year psychology students (N = 56) completed the Demographic and Achievement Motivation questionnaire on two occasions (two weeks apart) to determine test-retest reliability. Two items in this questionnaire were designed to examine sources of achievement motivation and influences on career choice. The first item required respondents to rank five proposed sources of academic achievement motivation; parents' expectations, self satisfaction, peers expectations, competitiveness, and desire to get a high-paying job, from 1 (most important) to 5 (least important). This was a forced-choice question where participants had to rank all five sources (although they could nominate additional sources if they wished to) and the rankings were mutually exclusive (i.e., participants could not allocate equal rankings to two sources). Consistency of rankings across two occasions was determined using correlations for each source. Test-retest

[7] Copies of these questionnaires are in Appendix 2.2.

correlation coefficients ranged from 0.56, two-tailed[8] (peers' expectations) to 0.82 (parents' expectations). (See Appendix 2.3 for complete correlation matrix).

The second item was identical in format to the first but the content referred to career choice. Participants were required to rank five potential influences on their choice of career; parents, own interests, money, job prestige, and peers. These sources had test-retest correlation coefficients ranging from $r = .56$ (job prestige) to $r = .70$ (parents).

ii) Causal attributions of academic success and failure. In addition to examining causal attributions that students made for their own academic performance, a measure was chosen that included questions concerning the causes of the success and failure of others, specifically members of one's own and other ethnic groups. Based on a questionnaire devised by Augoustinos (1989), this was a 80 item scale consisting of four vignette descriptions of hypothetical university students and an additional 'self' vignette. The hypothetical university students described in the vignettes varied according to gender and ethnicity, such that there was a male Chinese student, a female Chinese student, a male Anglo-Celtic Australian student and a female Anglo-Celtic Australian student. All other information in the vignette was identical, such as age and number of years at University. An example of a vignette is:

"Chen is 18 years old and in first year at University. He was four years old when his parents migrated to Australian from China with his baby sister Mei-lin. They enjoy the Australian lifestyle but now and again they yearn for their homeland. Chen is about to sit his end of year exams."

Participants rated the importance of suggested sources of academic

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[8] All probabilities are 2-tailed unless specifically described.

performance on a seven-point scale indicating level of agreement, for conditions of success and failure for each vignette. (The order of vignettes was randomised to prevent order effects) The sources of academic performance were ability, effort, luck, task difficulty, motivation, family support, peer support and interest in their course of study. These sources or attributions were chosen according to two criteria : a) they were the most frequently used in the literature; and/or b) they were the most frequent responses to an open-ended question concerning the causes of academic success and failure by a sample of graduating psychology students.

5. Study Diary

A measure of the amount of time participants spent studying was obtained using a purpose-designed study diary. It was a self-report measure in which participants indicated in half-hour blocks how much time they spent studying on a daily basis over a four-week period.[9] Correlations between weeks were positive and significant, ranging from $r = .70$ to $r = .85$, justifying the use of a weekly average in the analyses.

2.3.3 Procedure

The study required that participants attend on three to four occasions and was conducted over approximately four to six weeks. The first occasion was an information processing testing session (IT/RT tasks), with small groups of three or four participants completing the tasks at the same time on individual personal computers. Participants completed each task twice in succession in a single testing session; that is, each participant began with the IT task, followed by a repeat of the same task, then two successive runs through the RT task. The session was between 30 and 50 minutes in duration. At this session, participants were given an envelope

[9] An example of the study diary measure is in Appendix 2.4.

containing the questionnaires and study diary. A brief explanation of the aims and procedure of these measures was given and participants were asked to complete them and return the completed questionnaires when attending the final session. A box was placed in the vicinity of students' academic departments for the return of the study diary once completed.

The second and third sessions involved IQ testing (one session for each of the two tests), in groups of between five and ten people.

2.4 Results

2.4.1 Academic Achievement and IQ Test Performance

The score distributions for the Chinese Australian and Anglo-Celtic Australian students' performance on the IQ measures were roughly normal, with the exception of the Chinese Australian students' scores on the Quantitative (AQ) component of the ACER test which yielded an almost bimodal distribution. In addition, there were two cases with scores more than three standard deviations below the mean for the Advanced Progressive Matrices (raw scores of 7 and 13).[10] These individuals did not have statistically aberrant scores for performance on the ACER test or measures of information processing speed and therefore these cases were excluded from all analyses involving the Matrices only[11].

As is evident from Table 2.2, both groups were of above-average intellectual ability, with IQ scores in the range of 110 to 135.[12] A significant difference between the ethnic groups was observed for the overall ACER AL-AQ score ($t(38) = 3.26$, $p < .01$, 2-tailed). This was substantially the outcome of a difference for the linguistic

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[10] Because ethnic group is the independent variable in all major analyses, statistical outliers were determined on the basis of the mean and standard deviation of each ethnic group's score distribution.

[11] In one of these cases it appeared that performance on the Matrices was affected by low motivation on the day of testing. However, the reason(s) for the below average performance for the other individual were unclear.

section of this test (AL), with the Anglo-Celtic Australian students scoring significantly higher than the Chinese Australian students ($t\ (38) = 4.44$, $p < .01$). Outcomes for APM and the quantitative component (AQ) of the ACER test did not differ. It was evident that the Chinese Australian students found the linguistic subtest more difficult than the Anglo-Celtic Australian students, and questioning revealed that, their Australian status notwithstanding, English was not the first language within their homes. Taking APM and ACER results together, it is apparent that the significant difference between the groups on the linguistic subtest was culturally determined, due to the Anglo-Celtic Australian students being more familiar with materials in this component than the Chinese Australian students. This was supported by a significant positive correlation between length of time resident in Australia and AL performance ($r = .71$, $p < .01$).

[12] Based on the 1993 standardisation of the Advanced Progressive Matrices (Raven, Raven & Court, 1993).

Table 2.2

Mean ability and achievement scores of Chinese Australian and Anglo-Celtic Australian students

Ability and Achievement Measures	Max. score	Chinese Australian M	Chinese Australian SD	Chinese Australian N	Anglo-Celtic Australian M	Anglo-Celtic Australian SD	Anglo-Celtic Australian N
APM[a]	36	28.35	3.90	17	30.05	3.11	21
ACER AL-AQ**	58	27.28	7.87	18	35.45	7.90	22
AL only**	29	14.17	4.71	18	20.05	3.67	22
AQ only	29	13.11	5.59	18	15.41	5.27	22
Achievement[b]	100	86.15	9.77	17	88.36	8.69	21

Note. Ability test data are based on raw scores.

[a]Two statistical outliers were excluded from this analysis. See text for details.

[b]Achievement data refer to University entrance scores. These data were not available for two participants.

** $p < .01$

There was no significant group difference in academic achievement as measured by matriculation score (See Table 2.2 for groups means and standard deviations). These scores were out of 100, indicating that these students were particularly high achievers. For the entire sample there were significant positive correlations between University entrance score and all IQ measures, ranging from $r = .43$ for the Advanced Progressive Matrices, to $r = .73$ for the ACER AL-AQ test. For the Chinese Australian group, correlations between University entrance score and IQ measures ranged from $r = .53$ for the Matrices, to $r = .81$ for the ACER test. Similar correlations were observed for the Anglo-Celtic Australian students, with the exception of performance on the Matrices which yielded a weak, nonsignificant correlation ($r = .24$).

2.4.2 Speed of information processing

As is evident from Table 2.3, group differences in the information processing measures were small and nonsignificant. Consistent with past research using these measures with attenuated distributions of IQ (e.g., Jensen, 1987; Nettelbeck, 1987), there were weak but statistically significant ($p < .05$) negative correlations between the information processing measures (IT and RT) and APM scores ($r = -.32$ and $r = -.36$, respectively). ALAQ scores were also significantly correlated with IT ($r = -.31$, $p < .05$) but not RT ($r = -.26$, $p = .07$). However, separate analyses for ethnic groups revealed that the correlations between performance on the information processing measures and intelligence tests were substantially due to associations in the Anglo-Celtic Australian group where correlations ranged from $r = -.17$ (APM with RT) to $r = -.69$ (AQ with IT). Correlation matrices for the Chinese Australian showed very weak, nonsignificant associations between the variables, ranging from $r = -.05$ (AQ with RT) to $r = -.26$ (APM with IT).

Table 2.3

Mean Inspection Times (IT) and Reaction Times (RT) in ms, of Chinese Australian and Anglo-Celtic Australian students.

	Ethnic Group					
	Chinese Australian			Anglo-Celtic Australian		
Task	M	SD	N	M	SD	N
IT	82.99	17.77	18	75.40	15.14	22
RT	397.14	43.88	18	417.42	51.24	22

2.4.3 Socio-cultural motivational factors

i) Achievement motivation

Independent samples t-tests showed a significant group difference for one of the achievement motivation sources; parents' expectations. The Chinese Australian students rated this factor as a more important source of their motivation to achieve than Anglo-Celtic Australian students ($t(37) = 2.20$, $p < .05$). There were no significant group differences in responses to the related item concerning influences of career choice.

ii) Causal attributions for academic success and failure

Preliminary analyses revealed a strong positive association (collinearity) between responses for the attributions of family support and peer support. Therefore an aggregate rating of 'support' was used in the following analysis.

With ethnic group (Chinese Australian and Anglo-Celtic Australian) as the between-subject independent variable, and vignette (female and male Chinese Australian, female and male Anglo-Celtic Australian, self), attribution (ability, effort, luck, task difficulty, motivation, support, interest in course, and confidence[13]), and condition (success, failure) as within-subject independent variables, a repeated-measures multivariate analysis of variance (MANOVA) was performed using SPSS for Windows.

Main Effects

There were no significant main effects for group, indicating few differences in attributions between the Anglo-Celtic Australian and Chinese Australian students in the sample. Therefore the following results refer to individual differences in

[13] Each vignette contained an additional question concerning respondents' confidence in their answers. This was used as a measure of internal reliability rather than causal attributions therefore the results are not presented here.

responses and the descriptive statistics provided in Tables 2.4 and 2.5 are averaged ratings for the entire sample.

Significant main effects were found for vignette ($F(4,148) = 6.43$, $p < .01$), attribution ($F(7,259) = 45.6$, $p < .01$), and condition ($F(1,37) = 37.35$; $p < .01$), such that there were individual differences in responses depending on the vignette (e.g., Chinese female student, Anglo-Australian male student). the attribution (e.g., motivation, effort or task difficulty), and the condition (success or failure) that participants were asked to rate. As is evident when comparing the ratings in Tables 2.4 and 2.5, there were stronger responses for the success condition than for failure, such that each attributional scale (e.g., ability, effort,) was more likely to be seen as a source of academic success than failure. The attribution scales perceived as the most important sources of both academic success and failure (i.e., highest mean level of agreement across vignettes) were, in rank order; effort, motivation, and interest in course.

Interaction Effects

Significant interaction effects were found between vignette and attributions ($F(28,1036) = 7.39$; $p < .01$), vignette and condition ($F(4,148) = 5.51$; $p < .01$), and attribution and condition ($F(7,259) = 16.00$; $p < .01$). Interactions involving vignette indicated that attributions varied according to the ethnic group that participants were asked to rate. That is, participants responded differently in attributing causes of success and failure depending on the hypothetical student description. For example, as is evident from the mean ratings in Table 2.4 (success condition), for those attribution scales with the strongest levels of agreement across the sample (i.e., effort and motivation), a Chinese vignette (male or female) was given the strongest endorsement. That is, those causes perceived by the students as the most significant sources of academic success were also those that the students perceived as the most important factors contributing to the success of the hypothetical Chinese Australian student.

Table 2.4

Causal attributions for academic success – means and SDs (in parentheses) of ratings for entire sample.

			Success				
			Attribution				
Vignette	Ability	Effort	Luck	Task Difficulty	Motivation	Support	Interest
Chinese Male	3.08 (1.44)	1.85 (0.81)	4.74 (1.50)	4.33 (1.46)	2.13 (1.08)	2.81 (1.05)	2.87 (1.36)
Chinese Female	3.05 (1.38)	1.87 (0.83)	4.97 (1.44)	4.38 (1.37)	2.31 (1.26)	2.79 (0.96)	2.87 (1.20)
Anglo-Male	3.17 (1.15)	2.82 (1.25)	4.10 (1.41)	4.18 (1.50)	3.00 (1.34)	3.41 (1.29)	2.74 (1.25)
Anglo-Female	3.15 (1.33)	2.51 (1.00)	4.26 (1.39)	4.05 (1.38)	2.74 (1.19)	3.22 (1.32)	2.51 (1.17)
Self	3.13 (1.67)	2.26 (1.50)	4.18 (1.73)	4.15 (1.80)	2.59 (1.67)	3.20 (1.39)	2.85 (1.94)

Note. 1 = Agree : 7 = Disagree

Table 2.5

Causal attributions for academic failure – means and SDs (parentheses) of ratings for entire sample.

Failure							
			Attribution				
Vignette	Ability	Effort	Luck	Task Difficulty	Motivation	Support	Interest
Chinese Male	4.20 (1.56)	2.69 (1.40)	4.26 (1.55)	4.05 (1.43)	3.54 (1.70)	4.23 (1.41)	3.13 (1.52)
Chinese Female	4.23 (1.61)	3.03 (1.69)	4.41 (1.63)	3.97 (1.40)	3.46 (1.65)	4.20 (1.48)	3.44 (1.35)
Anglo-Male	3.90 (1.52)	2.26 (0.88)	4.41 (1.52)	4.10 (1.45)	2.72 (1.12)	3.87 (1.37)	2.54 (1.10)
Anglo-Female	3.69 (1.61)	2.38 (1.11)	4.44 (1.46)	4.13 (1.49)	2.64 (1.16)	3.76 (1.45)	2.61 (1.07)
Self	5.33 (1.51)	1.79 (1.32)	4.05 (1.73)	3.46 (1.65)	2.92 (1.85)	5.17 (1.59)	3.92 (2.20)

Note. 1 = Agree : 7 = Disagree

2.4.4 Time spent studying

As is evident from Table 2.6, the Chinese Australian students in the sample reported spending significantly more time studying than their Anglo-Celtic Australian peers ($t\ (38) = 3.16$, $p < .01$), averaging almost nine hours more per week.

Table 2.6

Descriptive statistics for time spent studying (hour per week on average) for Chinese Australian and Anglo-Celtic Australian students

	Ethnic Group	
	Chinese Australian	Anglo-Celtic Australian
Mean	25.08	16.22
SD	11.02	6.55
N	18	22

As is evident from the standard deviations in the table, the inter-individual variability in study times was greater among the Chinese Australian students compared to the Anglo-Celtic Australian students. Although the distribution of scores in the Chinese Australian group appeared to be approximately normal and the median score of 26.19 is actually slightly higher than the mean, the range was considerably larger than that for the Anglo-Celtic Australian students.[14] To investigate the hypothesis that the group differences observed were due to a small number of extreme scorers in the Chinese group, additional comparisons were made excluding scores at the very top of the distributions. Although these scores were not statistical outliers, due to the high inter-individual variability, scores greater than or

[14] The frequency distributions for time spent studying are in Appendix 2.5.

equal to 35 were excluded from the analysis as this appeared to be a natural cutoff point in the distribution. This resulted in a total of 14 cases for the Chinese Australian students and 22 for the Anglo-Celtic Australian students.[15] The exclusion of these cases resulted in a smaller group mean for the Chinese Australian students (Mean = 20.73), as well as lower variability that is more similar to the Anglo-Celtic Australian group (SD = 8.10 for the Chinese students compared to 6.55 for the Anglo-Australian students). Moreover, exclusion of these cases decreased the difference between the groups to nonsignificance ($t(34) = 1.84$, $p = .07$). These results suggest that the group differences in time spent studying may be a weak effect that is influenced by a small group of Chinese students who spend a very large amount of time studying. However, the cutoff point for exclusion of high scores was arbitrarily determined and the shape of the distribution of scores for the Chinese Australian students did not appear to be affected by extremely high scores. Therefore it is also possible that there is simply greater variability among the Chinese Australian students in amount of time spent studying.

Additional post-hoc analyses were conducted to determine whether there was a relationship between time spent studying and verbal IQ performance in the Chinese Australian group. As noted earlier, the Chinese Australian students had significantly lower scores on the verbal component (AL) of the ACER test than the Anglo-Celtic Australian students, and Chinese students' performance on this component was related to length of time in Australia. Sue and Zane (1985) found that Chinese American students who were more recent immigrants spent significantly more time studying than early immigrants and American-born Chinese students, which they suggested may be partly in response to limited English proficiency. Therefore, it was

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[15] There were no cases with scores of 30 or greater in the Anglo-Celtic Australian Group.

hypothesised that time spent studying was related to English proficiency (as measured by the linguistic component of the ACER test) among the Chinese Australian students.

The results of these analyses provided little support for this hypothesis, although it should be noted that the size of the Chinese Australian group (N = 18) limited the statistical power of the analyses. Contrary to prediction, there was a weak positive correlation between AL scores and time spent studying for the Chinese Australian students(r = .31), although this was not significant at an alpha level of .05 (2-tailed). In addition, an independent samples t test was conducted comparing the AL scores of Chinese students with shorter versus longer study times (determined by median split; the median was 26.19). The results of this test were also nonsignificant (t (16) = -1.5, p = .15).

2.5 Discussion

The results of the present study did not support the hypothesis that Chinese Australian students would show higher higher academic achievement than Anglo-Celtic Australian students of the same ability, i.e., there was no evidence of an IQ/achievement gap for the Chinese Australian students. In general, there were no reliable group differences in IQ test performance and academic achievement, and correlations between IQ test performance and academic achievement for the Chinese Australian students were positive and significant. These results were also inconsistent with those reported by Jensen and Whang (1993, 1994), who found that Chinese American primary school students scored significantly higher on the Standard Progressive Matrices than Anglo-American students.

The relatively lower scores of the Chinese Australian students on the linguistic component of the ACER test supported the common finding of lower performance on measures of verbal IQ for individuals of Asian background (e.g., Lynn & Hampson, 1986; Stone, 1992). This result is plausibly due to the Anglo-Celtic Australian students finding the verbal component comparatively easier than the Chinese Australian students, due to the language and cultural biases in the test. This effect diminished with Chinese Australian students' increased time resident in Australia, presumably due to increased familiarity with the English language and the content matter of some questions.

The results of the information processing measures were generally consistent with the IQ scores, taking into account the interpretation of the ACER AL-AQ results discussed above. Therefore, in terms of ethnic differences in speed of information processing the results are inconsistent with those reported by Jensen and Whang (1993) and Lynn, Chan and Eysenck (1991), as these authors found significantly faster performance for their Chinese American and Chinese participants. However, it is difficult to compare the present results with these studies as these researchers used Jensen's reaction time apparatus and procedure which is different to that used in the present research[16]. Moreover, although Jensen and Whang (1993) found that the Chinese American children had significantly faster performance than the Anglo-American children across the range of speed measures in their survey, they did not find significant group differences in mean reaction times. Lynn, Chan and Eysenck (1991) found significant group differences in choice reaction time but not simple reaction time. Both of these studies also reported greater inter-individual variability in reaction times among the Chinese and Chinese American students compared to the British and Anglo-American students. The pattern of results, and inconsistencies between his own and Lynn's results led Jensen

[16] See Jensen and Whang (1993) for a description of the apparatus and procedure used in these studies.

(Jensen & Whang, 1993, 1994) to conclude that ethnic group differences in performance on these chronometric tasks is "multidimensional and cannot be attributed simply to the groups' difference in psychometric intelligence" (Jensen & Whang, 1994, p. 1). Although the present results for information processing speed were consistent with the IQ results, it appears that the relationship between these variables may be different for different ethnic/cultural groups. Therefore, it is also possible that speed of information processing tasks may not be measuring the same thing among individuals from ethnic backgrounds other than the Anglo-European samples with which they have generally been used in the past. As Flynn (1991b) proposed, more research comparing ethnic groups' performance on speed of processing tasks needs to be conducted before we can be certain that the relationship between IQ and these chronometric measures is similar in all ethnic/cultural contexts.

It is possible that the failure to find an IQ/achievement gap for Chinese Australian students was at least partly due to the highly selected sample used. The majority of the participants were enrolled in a University course requiring a very high achievement level for entrance, as indicated by the entrance score average of 87%. Therefore these students were at the very top end of the scale in achievement, with high homogeneity within both ethnic groups (and particularly among the Anglo-Australian students). It is therefore plausible that ceiling effects may have reduced the likelihood of finding a group difference in achievement.

Another factor influencing the study's outcome is the retrospective nature of the measurement of academic achievement. University entrance scores are determined on the basis of the final year of schooling, and therefore in some cases the score was based on achievements as many as four years prior to the present study. Hence, the assessments of ability and achievement were not contemporaneous. Although it may be argued that IQ is a relatively stable measure of ability (Jensen, 1980) there is some evidence of individual instability over time (e.g., Moffit, Caspi, Harkness & Silva, 1993) and it would be preferable to obtain concurrent measures of both ability and achievement in order to explore fully the relationship between these factors.

Relative Functionalism and the folk theory of success

The study provided some support for Sue and Okazaki's (1990) proposed folk theory of success for persons of Asian background. In particular, it was evident that the Chinese Australian students reported spending considerably more time studying, on average, than their Anglo-Celtic Australian peers. It appeared that this may have been a weak effect, i.e., the group mean was affected by a small number of Chinese Australian students who spent very large amounts of time on their studies. However, the distribution of study times among the Chinese Australian students was roughly normal and the result may reflect greater variability within the Chinese Australian sample rather than a weak effect. Moreover, the Chinese Australian group mean is similar to the results obtained by Sue and Zane (1985) in their study of Chinese American college students, in which the students from Chinese backgrounds reported spending between 22 and 28 hours per week, on average (in the present study the Chinese Australian students reported spending approximately 25 hours per week on average).

It was also evident that there were cultural differences in the predicted direction in attitudes to achievement in general, such as the role of parents in relation to achievement motivation. This result was also supported by the responses that Chinese Australian students made to several open-ended questions in the questionnaire. For example when asked to explain their ratings for sources of achievement motivation, the Chinese Australian students gave responses such as:

"I believe that it's important to not let my parents down; after all I do owe them a lot for taking care of me all these years. Secondly, I would like to get a well paid job so that my parents/family can live a pretty comfortable life."

"Family is the most important factor in my life, so obviously parents would be the most influential factor in anything".

"One of the main purpose[s] for me to live is basically to meet the expectations of my parents...."

Contrary to the hypothesis concerning the perceived importance of effort, the study did not find ethnic group differences in causal attributions for academic success and failure. These results were consistent with those of Burgner and Hewstone (1993) and Ng, McClure, Walkey and Hunt (1995). However, the general pattern of ratings for attributions of effort and motivation provided some interesting results concerning the ethnic stereotype of Asian students. For example, both ethnic groups endorsed effort as a source of academic success more strongly for the Chinese vignettes than for any other, including their own academic performance ('self' vignette). This seemed to imply a perception of Asian students as model students. This stereotype is similar to teachers' perceptions of Asian American students identified by Wong (1980). Not only did the teachers in Wong's study have higher expectations of their Asian American elementary and secondary students but they also perceived the students "as significantly more academically competent ... quicker, more able to concentrate, more organized, more persevering, and as having a better memory than Anglo students" (Wong, 1980, p.240). Schneider and Lee (1990) also reported positive academic stereotyping of East Asian American students by Anglo-American teachers and students.

The failure to find ethnic group differences in causal attributions may be due to a number of factors. Consistent with Ng et al. (1995) the results of the present study indicated a general preference for effort attributions for academic success, irrespective of ethnicity. It may be that such attributions develop in or are fostered by an achievement-oriented, academic setting. Moreover, the restricted range of ability in the present sample means that it is unlikely that this potential cause (ability) would be perceived as one that would distinguish between those who do well at university and those who do not. Only approximately 13% of the adult Australian population complete a course at university[17] and most of the participants in the present sample were enrolled in a course that required very high school performance for entrance.

It is also possible that the lack of ethnic group differences in causal attributions are due, at least in part, to problems with the cross cultural validity of this measure. Indeed, there may be cultural differences in the meaning of the causes chosen (such as effort, motivation, ability and luck), and even the constructs of success and failure (Duda & Allison, 1989; Hau & Salili, 1993), that may be traced to the dimension of individualism-collectivism (see Kim, Triandis, Kagitcibasi, Choi & Yoon, 1994). That is, it has often been proposed that theories of achievement motivation, and related theories such as attribution theory as it is construed here, are primarily applicable in western countries with a predominantly individualist ethos, such as the United States (Augoustinos, 1989; Maehr, 1974; Markus & Kitayama, 1991; Spence, 1985). Within this western, individualist framework, achievement motivation is conceptualised as an individual striving to meet a self-defined goal for his/her benefit (Spence, 1985). In contrast, in cultures with greater emphasis on collectivist values, such as Chinese and other East Asian cultures, the role of the group (in many contexts the group is the family) is given precedence over the individual. This results in a more social or group oriented approach to achievement (Hsu, 1985). According to this view, students with cultural backgrounds in which collectivist values are more dominant are more likely to regard their own academic performance as an integral part of family or group achievement and success. This may explain why the Asian students may have responded more strongly to the vignettes describing a member of their own ethnic group compared to the 'self' vignette, although it does not explain why the Anglo-Celtic Australian students responded in a similar fashion.

In conclusion, contrary to North American research, the results of the present study did not support the hypothesis that students of Chinese background would have superior academic performance to their Anglo-Australian peers. However, the study provided some support for Sue and Okazaki's (1990) theory of relative functionalism, at least in terms of time spent studying, and highlighted the significant role of the family in the achievement motivation of Chinese Australian students. With this in mind, and noting the possibility of ceiling effects influencing the present results, it was decided that follow-up research should focus on IQ and socio-cultural factors influencing the achievement of a sample of Asian Australian students with a wider range of ability and achievement.

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[17] Based on the percentage of Australians with University qualifications from the 1991 Census (Bureau of Immigration and Population Research, 1994c).

CHAPTER 3

Factors influencing the academic achievements of Vietnamese Australian, Chinese Australian and Anglo-Celtic Australian school children (Study 2)

3.1 Aims of the study

Following from the results of the first (pilot) study conducted with University students, the general aim of the second study was to extend the initial investigation to a sample of Asian Australian students with a wider range of ability and achievement. The highly selected nature of the university sample introduced the possibility of interference by ceiling effects, making it difficult to test the hypothesis concerning the IQ/achievement gap. It was therefore decided that a senior primary school or junior high school sample would be more appropriate as it would encompass a broader range of both ability and achievement.

Therefore the general aim of the second study was essentially the same as that for the pilot; to investigate the predictive validity of IQ in relation to the academic achievement of Australian students of Chinese and Vietnamese background. On the basis of Flynn's (1989b, 1991b) hypothesis it was predicted that there would be an IQ/achievement gap for these students, such that IQ would underpredict their academic achievement.

Explaining the gap

As outlined earlier, there are two potential explanations for the IQ/achievement gap described by Flynn, although these are difficult to distinguish between scientifically and in principle may not be necessarily mutually exclusive, so that both could be operating simultaneously. One possible interpretation derives from the presence of test bias; that is, that conventional IQ tests are not providing an accurate absolute measure of intellectual ability for members of these ethnic groups and their achievement levels are a better indicator of their intellectual potential. Consistent with the pilot study, measures of information processing speed were included to investigate this possibility, based firstly on empirical evidence that these measures are related to IQ but secondly on suggestions that they may be less vulnerable to linguistic and cultural biases than pen-and-paper intelligence tests.

The other interpretation, which Flynn (1998) has seemed to favour, is that socio-cultural motivational factors prevalent within Asian cultures are serving to boost the academic achievement of students of Asian background beyond what would be predicted on the basis of IQ. Factors such as cultural values that emphasise the importance of education, filial piety, and beliefs in the efficacy of effort are among those proposed to explain the academic achievements of Asian Americans. It was argued that Sue and Okazaki's (1990) theory of relative functionalism can accommodate the more consistent findings of the large and diverse body of research in the area. In particular, their proposed folk theory of success for students of Asian background ("If I study hard, I can succeed, and education is the best way to succeed", p. 919) provides an avenue for testable hypotheses.

The pilot study provided some support for Sue and Okazaki's theory, primarily in the amount of time that Chinese students spent studying. However, the hypothesis concerning stronger belief in the importance of effort for academic success among Asian students compared to Anglo-Australian students was not supported, and it was argued that this was partly due to problems with the cross-cultural validity of the questionnaire used to measure academic beliefs. Therefore, the second aim of the present study was to extend on the previous investigation of Sue and Okazaki's theory. As with the previous study, academic effort was operationalised using a study diary in which students recorded how much time they spent studying on a daily basis. However, due to the problems associated with the cross-cultural validity of the questionnaire format, the study diary, as a measure of academic behaviour, was assumed to reflect a belief in the importance of effort and the belief itself was not directly investigated.

The present study also included some measures of the second aspect of the folk theory of success; "education is the best way to succeed". Based on the investigations of others (e.g., Fuligni, 1997; Goyette & Xie, 1999; Kao, 1995), this theory was operationalised in terms of educational and occupational aspirations. Specifically, it was proposed that students from Chinese and Vietnamese backgrounds would have higher educational aspirations than their Anglo-Celtic Australian peers, and their occupational aspirations would tend to concentrate on careers that required educational (e.g., tertiary) qualifications. It was also hypothesised that this effect would be unrelated to parents' educational and occupational background (e.g., Goyette & Xie, 1999) and would be most pronounced for first generation immigrants (Fuligni, 1997; Goyette & Xie, 1999). Moreover, it was proposed that this emphasis on education would extend to activities outside of school, such that Chinese and Vietnamese students would be less likely to engage in extra-curricular pursuits such as sport and more likely to attend extra classes or learn a musical instrument (Schneider et al., 1994). Further, it was proposed that the family would play a greater role in the motivation of Chinese and Vietnamese children, who would be more likely to regard parents' expectations as an important source of achievement motivation than their Anglo-Celtic Australian peers, who would tend to have a more individualistic approach to their studies. Finally, it was predicted that Chinese and Vietnamese parents' emphasis on education would be indirectly communicated to their children and not necessarily extend to specific activities such as assisting them with their homework (Kao, 1995).

3.2 Method

3.2.1 Participants

There were 160 participants; 56 Vietnamese Australian, 29 Chinese Australian, and 75 Anglo-Celtic Australian children, all of whom were enrolled in grade 6 or 7 within South Australian schools for primary education (Adelaide metropolitan area). The majority of participants (92%) were attending State government primary schools with a small group (N= 13) attending a nongovernment school. A total of seven metropolitan schools participated in the project. The average age of participants was 11.67 years (SD = 0.73). The gender distribution of the sample was exactly equal with 80 female and 80 male participants.

Two groups of Anglo-Celtic Australian students were included in the study for separate comparisons with the Chinese and Vietnamese Australian participants. This was necessary due to the different geographical locations of the Chinese and Vietnamese communities in Adelaide, the majority of Vietnamese families being resident in the northwestern suburbs (Beer & Cutler, 1995). The residential pattern was less concentrated for Chinese families, with roughly two groups of settlement; in the southern and southwestern metropolitan areas and the northwestern and northern metropolitan areas (Beer & Cutler, 1995). Associated with these residential patterns were socio-economic differences; for example, the north-western suburbs are lower socio-economic areas with higher proportions of public housing and manufacturing employment than the inner northern and southern metropolitan areas (Beer & Cutler, 1995). These differences in socio-economic status are commensurate with the educational characteristics of the two communities, with a greater proportion of tertiary educated Chinese immigrants than Vietnamese adults in South Australia.

Two Anglo-Celtic Australian groups were therefore included, each of which was approximately comparable with the respective Asian ethnic group with regard to socio-economic status, residential location, and school characteristics. Anglo-Celtic Australian Group 1 consisted of 46 participants from a lower socio-economic status background for comparison with the Vietnamese Australian group. Anglo-Celtic Australian Group 2 consisted of 29 participants from a higher socio-economic status background for comparison with the Chinese Australian group. These groupings are consistent with Gordon's (1978) notion of ethclasses; a concept in which social group classification takes into account both ethnic and socio-economic status characteristics.

The age and gender characteristics of each group in the sample are provided in Table 3.1. As is evident from the table, there was negligible difference between groups in terms of age. Although the groups were also approximately comparable for gender representation, exceptions were slightly more boys (56%) in the Anglo-Celtic Australian Group 1 (Control group for Vietnamese Australian group) and slightly fewer boys (45%) in the Anglo-Celtic Australian Group 2 (control group for Chinese Australian group).

Table 3.1

Gender distribution and mean age (in years) of each ethnic group in the sample

	Vietnamese Australian	Anglo-Celtic Australian Group 1	Chinese Australian	Anglo-Celtic Australian Group 2
N	56	46	29	29
No. of Boys	26	26	15	13
No. of Girls	30	20	14	16
Mean Age (years)	11.89	11.63	11.55	11.45
Age SD	0.76	0.64	0.83	0.63

Ethnicity and Generation

Chinese Australian children (N = 29) were defined as those whose parents identified themselves as ethnic Chinese but who were Australian residents. More than half (59%) of the Chinese participants were first generation immigrants. Places of birth for these children were Malaysia (N = 5) and Hong Kong (N = 5), with smaller numbers of immigrants from Thailand, the People's Republic of China, Singapore, Brunei, Macau, and Vietnam. The average length of time resident in Australia for the first generation was 6.61 years (SD = 3.11, Range = 2 - 13 years).

The Vietnamese Australian category (N = 56) was defined using similar criteria. This group was roughly evenly split between first (43%) and second generation (57%) immigrants. Of those participants born outside of Australia approximately 80 percent were born in Vietnam, with other countries of birth including Thailand, Malaysia, the Philippines, and Indonesia. The average length of time resident in Australia for the first generation was 7.08 years (SD = 3.47, Range = 1-13 years).

Anglo-Celtic Australian students were defined as second generation Australian; that is, they were born in Australian, their parents were born in Australia and their grandparents were born in either Australia or Great Britain.

3.2.2 Measures and Apparatus

1. Academic Achievement

Academic achievement was measured using teacher-assessed school grades.[1] This measure was developed by the investigator and was an adaptation of a grading system used by some of the schools. Using a six-point rating scale ranging from one

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[1] The schools did not have a universally accepted system at the time of the study. A copy of the form

('a beginning level') to six ('an extended level'), teachers were asked to indicate participating students' achievement in and understanding of eight curriculum areas; oral language, listening and reading, spelling, written language, mathematical concepts, mathematical problem solving, social studies, and science. Space was also provided for teachers to comment, although this was rarely used and any such comments are not considered here.

Correlations among the ratings for the eight curriculum areas were calculated for the entire sample. Correlation coefficients ranged from $r = .50$ (mathematical concepts with oral language) to $r = .87$ (listening and reading with written language). (See Appendix 3.2 for complete correlation matrix). Three achievement variables were constructed from these ratings: (a) an overall achievement score, justified by the generally high correlations between curriculum areas, was computed by averaging the scores across the eight areas; (b) an overall mathematics score was computed by averaging the two mathematics ratings ($r = .86$); and (c) a language score was computed by averaging the ratings for listening and reading, oral language, written language, and spelling (*r*s from .63 to .87). The scores for the achievement variables ranged from 1 to 6.

2. IQ

Participants completed two tests of psychometric intelligence; Raven's Progressive Matrices (PM) 1962 revision, and the Australian Council for Educational Research (ACER) Intermediate Test-F (ACER, 1980). One item from the ACER Intermediate Test was not included in the analyses due to obsolescence of content. The item involved using change including one and two cent pieces (these coins were not issued after February 1992). This resulted in the test being scored out of 75

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used for teacher ratings of academic achievement is in Appendix 3.1.

instead of 76.

3. Information Processing

Participants completed two tasks assessing speed of information processing; an inspection time (IT) and a four-choice reaction time (RT) task. The apparatus and procedure for these tasks were identical to those used in the pilot study (see Chapter 2, Section 2.2.3).

4. Motivational factors - Questionnaire

As in the pilot study, participants were asked to complete a questionnaire designed to examine general attitudes toward achievement, parental expectations, and to obtain demographic data. The questionnaire was constructed by the investigator and was based on that used in the pilot study, with some modifications to make the content more appropriate for primary school children and some additions.[2]

In addition to questions to obtain general demographic data, such as place of birth and length of time resident in Australia, the Questionnaire contained several items designed to examine participants' achievement motivation, educational and occupational aspirations, extra-curricular activities, and perceptions of parents' interest in school activities. Achievement motivation was measured with a similar item to that used in the pilot study. Participants were asked to rank five proposed sources of achievement motivation; parents' expectations, self satisfaction, peers' expectations, competitiveness, and desire to get a high paying job, from 1 (most important) to 5 (least important). This was a forced choice question where participants had to rank all five (although they could nominate additional sources if they wished to) and the rankings were mutually exclusive.[3]

[2] A copy of the questionnaire is in Appendix 3.3.

[3] As described in the Procedures, the investigator read aloud each question and provided additional explanation. With this assistance, the completion of these and similar questions in the Demographic and Achievement Motivation questionnaire did not appear to be unduly difficult for the children.

Educational and occupational aspirations were measured by asking participants whether they wished to attend university (Yes/No), and what sort of job they would like to have when they grow up. The item designed to explore extra-curricular activities included a list of 11 activities and participants were asked to tick which ones they engaged in on a regular basis. The activities were: playing sport, learning a musical instrument, reading, listening to music, playing with friends, watching videos/going to the movies, playing computer games, attending religious functions such as going to Church, working (e.g., in the family business, delivering papers), attending another school or classes such as language, music classes, and visiting family friends and relatives. The children were told they could tick as many options as were true for them. The children were also asked to estimate how much time they spent watching television per week on average. Five categories were provided: 1-5 hours, 6-10 hours, 11-15 hours, 16-20 hours and more than 20 hours, and participants were asked to tick the box next to the appropriate category that was true for them.

Children's perceptions of their parents' interest in their schoolwork were measured using four questions with a Yes/No response format. The style and content of these questions was based on that used in many of the large North American surveys (e.g., Coleman et al., 1966). Participants were asked whether their parents a) asked how they were going in school, b) looked at their school diary, c) read to them, and c) helped them with their homework.

5. Study diary

Consistent with the previous study, a measure of the amount of time participants spent studying was obtained using a purpose-designed study diary. It was a self-report measure in which participants indicated in half-hour blocks how much time they spent studying on a daily basis over a four-week period. This measure was structured slightly differently from the one used with university students such that it did not include time during which the children would be attending school.[4] Correlations between weeks were positive and significant (2-tailed probabilities), ranging from $r = .79$ to $r = .91$, justifying the use of a weekly average in the analyses.

3.2.3 Procedure

Schools with high enrolments of students of Chinese and/or Vietnamese background were sent an introductory letter summarising the aims and procedures of the project. This was followed up with a telephone call to the school principal. After initial meetings with the school principal and relevant teachers, the investigator met with potential participants in the classroom to describe the aims and procedure of the project, and to answer questions students may have had regarding the project. At this session the students were also given the information sheets and consent forms to take home to their parents. Attached to the consent form was a two-page questionnaire for parents containing questions concerning fathers' and mothers' place(s) of birth, occupation(s), and educational level.[5] Translated versions of the information sheet and consent form (Mandarin Chinese and Vietnamese)[6] were given to students according to the school's information concerning parents' literacy. Data collection began the following week with those students whose parents or guardian had given their written consent.

The study required that participants attend on three occasions and was conducted over between one to two weeks (depending on the number of participants)

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[4] An example of the study diary measure is in Appendix 3.4.
[5] A copy of this questionnaire is in Appendix 3.5.
[6] The translations were conducted by the South Australian Government Interpreting and Translating Centre.

in each school, with the exception of two schools in which data collection took place over three to four weeks. In the former case students attended one session per day and in the latter, students attended one session in each week.

At the first session the participants completed Raven's Standard Progressive Matrices followed by the Demographic and Achievement Motivation Questionnaire. Although written responses to questionnaire items were provided by the children themselves, the investigator read aloud each question and provided additional explanation when required. The study diaries were also distributed to students in the first session and a brief explanation concerning the aim and procedure of this measure was provided. This session was approximately one hour in duration with a five to 10 minute break between completion of the Matrices and commencement of completion of the questionnaire.

At the second session participants completed the ACER Intermediate Test. This session was approximately 45 minutes in duration. Both the first and second sessions took place in a classroom in the school with groups of 10 to 20 students.

The third occasion was an information processing testing session (IT/RT tasks), with small groups of three to four participants completing the tasks at the same time on individual personal computers. Each participant began with the IT task, followed by a repeat of the same task, then two successive runs through the RT task. The session was between 30 and 40 minutes in duration and took place in a classroom or computing facility within the school.

The study diaries and grades were collected from the school four weeks after the commencement of data collection.

3.3 Results

3.3.1 Background characteristics

i) Parents' educational and occupational characteristics

To check the classification into high and low socio-economic status (SES) groups, the groups were compared for parents' educational background and occupational status. Participants' parents were asked to indicate the highest level of education they had completed using three categories; a) primary school, b) secondary school, and c) tertiary education. Comparisons between the Anglo-Australian groups supported the classification such that fathers from Anglo-Celtic Australian Group 2 were more highly educated than fathers from Anglo-Celtic Australian Group 1 ($\chi2$ (2, N = 69) = 26.91, p < .01, 2-tailed[7]). A similar result was observed for mothers' educational background ($\chi2$ (2, N = 73) = 24.38, p < .01). Specific comparisons for educational categories (e.g., comparing the groups for completion of primary school only) revealed that the differences between the Anglo-Celtic Australian groups were primarily in the proportions that had completed tertiary education. As is evident from Table 3.2, parents from Anglo-Celtic Australian Group 2 were more likely to have completed tertiary education than parents from Anglo-Celtic Australian Group 1 ($\chi2$ (1, N = 69) = 26.79, p < .01; $\chi2$ (1, N = 73) = 23.30, p < .01) for fathers' and mothers' education respectively).

Although it appears from the group frequencies in Table 3.2 that the Chinese parents were more highly educated than the Vietnamese parents were these differences were not significant. The only educational variable in which the groups differed significantly was whether mothers had completed tertiary education ($\chi2$ (1, N = 73) = 4.09, p < .05), such that more Chinese mothers had completed tertiary studies than had Vietnamese mothers.

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[7] All probabilities are two-tailed unless specifically described.

Table 3.2
Level of education completed by participants' parents.

Variable	Ethnic Group			
	Vietnamese Australian	Anglo-Celtic Australian Group 1	Chinese Australian	Anglo-Celtic Australian Group 2
Father's Education				
Primary	13	3	5	1
Secondary	24	36	12	7
Tertiary	9	4	10	18
Total[a]	46	43	27	26
Mother's Education				
Primary	13	5	7	0
Secondary	28	35	12	11
Tertiary	5	4	8	18
Total[a]	46	44	26	29

[a] Some parents did not complete this information.

There were also significant group differences in employment status. The proportion of unemployed fathers was highest in the Vietnamese group (36%), followed by Anglo-Celtic Australian Group 1 (17%), Anglo-Celtic Australian Group 2 (8%), and the Chinese Australian fathers (7.4%). There was no difference between the Anglo-Celtic Australian groups in employment status of fathers, but mothers from Anglo-Celtic Australian Group 2 were more likely to be employed than mothers from Anglo-Celtic Australian Group 1 ($\chi 2$ (1, N = 75) = 7.22, $p < .01$). In contrast, Vietnamese and Chinese mothers did not differ significantly while Chinese fathers were more likely to be employed than Vietnamese fathers($\chi 2$ (1, N = 71) = 9.80, $p < .01$). However, it should be noted that these data were not available for a number of participants and the unemployed category is best considered as 'not employed' because it included all persons who reported that they were not employed at the time of the study. In the case of mothers, and, to a lesser extent, some fathers, this may have included parents who were not actively seeking paid work but who chose to stay at home.

Parents who were currently employed were asked to indicate their current occupation. Occupational status scores were obtained by classifying parents' occupations using the Australian Standard Classification of Occupations (McLennan, 1997, 2nd Ed.) then converted to status scores using the ANU3-2 scale (McMillan & Jones, 1999). Status scores range from 0 to 100 and are based on a number of indices including average income of persons in an occupation, qualification and training necessary to enter the occupation, and community prestige of the occupation. A higher score indicates higher occupational status. Analyses of variance revealed significant differences between the groups in terms of both fathers' occupational status (F (3,102) = 10.80, $p < .01$) and mothers' occupational status (F (3,83) =

24.95, p < .01). Post-hoc tests (Tukey's HSD) showed that these differences were generally consistent with the socio-economic groups, such that fathers of children in the Anglo-Celtic Australian Group 2 (high SES) were employed in higher status occupations than the Vietnamese Australian and Anglo-Celtic Australian Group 1 fathers. They also had higher status occupations than the Chinese Australian fathers. For mothers' occupation, nearly every group was significantly different from each other, such that the Vietnamese Australian mothers were employed in the lowest status occupations, followed by a) Anglo-Celtic Australian Group 1 mothers, b) Chinese Australian mothers, and c) Anglo-Celtic Australian Group 2 mothers.

Table 3.3

Occupational status of Vietnamese, Chinese and Anglo-Celtic Australian participants' parents

	Ethnic Group			
Occupational Status	Vietnamese Australian	Anglo-Celtic Australian Group 1	Chinese Australian	Anglo-Celtic Australian Group 2
Father				
Mean	23.67	25.30	33.40	56.25
SD	26.38	17.75	29.78	17.71
N	28	32	22	24
Mother				
Mean	13.69	26.70	32.61	55.04
SD	14.92	14.36	25.04	13.10
N	23	23	15	23

Note. These data refer only to parents who indicated that they were employed at the time of the study.

In summary, the general pattern of participants' parents' educational background and occupational status supported the classification of the Anglo-Celtic Australian participants into two socio-economic groups for separate comparison with the Vietnamese and Chinese groups. Although the differences between the Anglo-

Australian groups in educational level were greater than those between the Vietnamese and Chinese parents, it was evident that the comparison groups were generally more similar to each other than to the other groups. That is, the Vietnamese parents were more similar to the Anglo-Celtic Australian Group 1 parents, particularly in terms of occupational status, than to the Chinese and Anglo-Celtic Australian Group 2 parents. It should also be noted that more recent immigrants, such as the Vietnamese families in the present study, are often employed in lower status occupations than is commensurate with their educational level, due to factors such as discrimination, lack of fluency in the language of the host country, and employers' failure to recognise qualifications obtained overseas. Although, the occupational status of parents from Anglo-Celtic Australian Group 2 was clearly higher than that of the Chinese parents, Anglo-Celtic Australian Group 2 was retained as the comparison group because of the groups' similarities in residential location and school characteristics.

ii) Family size

There were significant ethnic group differences in number of siblings ($F(3,150) = 4.36$, $p < .01$). Post-hoc tests showed that this significant result was mainly due to larger families among the Vietnamese Australian children than the children in Anglo-Celtic Australian Group 2. Other group comparisons were not significant.

3.3.2 Descriptive Statistics and ethnic group differences

The following analyses refer to ethnic group comparisons within socio-economic status groups, that is, Vietnamese Australian children were compared with Anglo-Australian Group 1 (low SES), and Chinese Australian children were compared with Anglo-Australian Group 2 (high SES). To assist the reader in following the summary the Vietnamese Australian - Anglo-Australian Group 1 comparison is always described first. As is evident when comparing scores in the Tables for all four groups, there were also significant socio-economic group differences on most key variables. These differences will be described in the next section.

i) Academic achievement and IQ Test performance

As is evident from Table 3.4, the Vietnamese Australian and Anglo-Celtic Australian children did not differ significantly on any of the measures of intellectual ability. The Chinese Australian children had significantly higher scores on Raven's Progressive Matrices than their Anglo-Celtic Australian counterparts ($t\ (56) = 2.29$, $p < .05$). There were no ethnic group differences for the ACER test or its components[8].

As is evident from Table 3.5, the Vietnamese Australian and Chinese Australian children had significantly higher teacher ratings for mathematics achievement than their Anglo-Celtic Australian peers ($t\ (100) = 2.52$, $p < .05$, and $t\ (56) = 2.73$, $p < .01$). There were no ethnic group differences for language achievement or overall achievement.

[8] These component scores (based on the main categories of item type provided in the Manual, de Lemos, 1982) should be interpreted with caution as the Manual does not provide strong support for the partitioning of the test in terms of separate components. However, given that half of the present sample consists of children from non-English speaking backgrounds (NESB), and based on the previous study's findings of lower performance on more verbal measures among NESB students, it was considered worthwhile to examine these categories separately, in addition to the total score.

Table 3.4

Descriptive statistics for measures of ability for Vietnamese Australian, Chinese Australian and Anglo-Celtic Australian children

		Ethnic Group											
Variable		Vietnamese Australian			Anglo-Celtic Australian Group 1			Chinese Australian			Anglo-Celtic Australian Group 2		
	Max. Score	M	SD	N	M	SD	N	M	SD	N	M	SD	N
Ravens Progressive Matrices[a]	60	41.04	5.88	56	39.37	6.75	46	46.76	4.11	29	44.38	3.80	29
ACER Intermediate Test[b]													
Total score	75	32.93	11.33	55	33.62	11.22	45	46.48	10.50	29	50.24	10.99	29
Quantitative Reasoning	31	13.09	5.39	55	12.33	4.98	45	17.79	5.12	29	18.59	6.04	29
Verbal Comprehension	14	5.96	2.22	55	6.44	2.38	45	8.66	2.47	29	9.66	2.38	29
Verbal Reasoning	30	13.87	5.05	55	14.84	5.26	45	20.03	4.24	29	22.00	4.21	29

Note. Ability test data are based on raw scores.

[a] Based on the 1986 standardisation sample these average raw scores convert to the following IQ ranges; 100-101 for the Vietnamese Australian group; 95 for the Anglo-Celtic Australian Group 1; 116-119 for the Chinese Australian group; and 108-110 for the Anglo-Celtic Australian Group 2 (de Lemos, 1989).

[b] One Vietnamese Australian participant and one Anglo-Celtic Australian Group 1 participant failed to complete this measure.

Table 3.5

Descriptive statistics for measures of school achievement for Vietnamese Australian, Chinese Australian and Anglo-Celtic Australian children

		Ethnic Group											
Variable		Vietnamese Australian			Anglo-Celtic Australian Group 1			Chinese Australian			Anglo-Celtic Australian Group 2		
	Max. Score	M	SD	N	M	SD	N	M	SD	N	M	SD	N
School Achievement													
Overall average	6	3.68	1.00	56	3.53	0.92	46	4.57	0.75	29	4.26	0.67	29
Language achievement	6	3.54	1.21	56	3.55	0.99	46	4.53	0.91	29	4.36	0.76	29
Maths achievement	6	3.94	1.15	56	3.39	1.01	46	4.70	0.92	29	4.02	0.98	29

ii) Speed of information processing

Both measures of information processing speed were significantly negatively correlated with both IQ measures for the entire sample, with correlation coefficients ranging from $r = -.18$ (IT with Raven's Matrices) to $r = -.49$ (RT with Raven's Matrices). These outcomes were consistent with previously published results (Jensen, 1987; Kranzler & Jensen, 1989; Nettelbeck, 1987). The relationships between measures of IQ and processing speed varied across ethnic groups, such that the correlations for the Vietnamese Australian children were generally consistent with the overall sample results, while the correlations were generally smaller and nonsignificant within the Anglo-Celtic Australian and Chinese groups. However, some of these correlation coefficients may have been non-significant due to the smaller sample sizes of the Chinese Australian group and Anglo-Celtic Australian Group 2. (See Appendix 3.6 for complete correlation matrices).

The Vietnamese Australian children had faster times for both measures in information processing speed (see Table 3.6). However, this group difference was only significant for reaction time ($t\ (99) = 4.76, p < .01$). Similar results were observed for the Chinese Australian comparison, with significantly faster reaction times for the Chinese Australian children compared to the Anglo-Celtic Australian children ($t\ (54) = 2.18, p < .05$). Error rates were consistent with these ethnic group differences in speed. Not only were the Chinese Australian children faster than their Anglo-Celtic Australian peers but they also made fewer errors; with an error rate of approximately 5% compared to 7.7%. Similarly the Vietnamese Australian children had a lower error rate (approximately 6.1%) than children from Anglo-Celtic Australian Group 1 (approximately 7.4%). However, there were no significant ethnic group differences in number of errors.

Table 3.6

Average reaction times (RT) and inspection times (IT) in ms, of Vietnamese Australian, Chinese Australian, and Anglo-Celtic Australian children.

Processing speed measure	Ethnic group: Vietnamese Australian			Anglo-Celtic Australian Group 1			Chinese Australian			Anglo-Celtic Australian Group 2		
	M	SD	N	M	SD	N	M	SD	N	M	SD	N
Reaction Time (RT)	646.79	146.79	55	785.66	145.35	46	566.06	71.02	29	616.68	100.87	27
Inspection Time (IT)	118.71	45.33	52	126.89	46.21	45	97.37	23.73	29	103.66	31.77	27

Note. Several cases are missing from this analysis due to out of range or incomplete data. For Reaction Time two Anglo-Celtic Australian Group 2 participants were absent from school at the time of testing, and one statistical outlier was excluded (one Vietnamese Australian participant). In the case of Inspection Time, one Vietnamese Australian participant failed to complete the measure while three Vietnamese Australians' and one Anglo-Celtic Australian participant's scores were statistical outliers. In these four cases it was apparent that the children did not understand the task, despite the investigator repeating the task instructions, demonstrating the task, and allowing extra time for practice. This was supported by the number of trials taken to complete the measure (in excess of 100 for every case) and the size of the standard deviations. This inability to comprehend the nature of the exercise seemed to be restricted to the IT task, therefore the RT and other data for these individuals have been included in all other analyses.

iii) Socio-cultural motivational factors

Achievement motivation

Independent samples t tests were conducted to compare the mean rankings for each proposed source of achievement motivation. The only significant group difference observed was for parents' expectations for the Chinese Australian and Anglo-Celtic Australian (Group 2) students ($t(54) = 4.65$, $p < .01$). As is evident from the mean rankings in Table 3.7, the Chinese Australian children ranked parents as a significantly more important source than did the Anglo-Celtic Australian students (Group 2).

Table 3.7

Descriptive statistics for five sources of achievement motivation for Vietnamese Australian, Chinese Australian and Anglo-Celtic Australian children.

	Ethnic Group											
Source of Motivation	Vietnamese Australian			Anglo-Celtic Australian Group 1[a]			Chinese Australian			Anglo-Celtic Australian Group 2[a]		
	M	SD	N	M	SD	N	M	SD	N	M	SD	N
Parents' expectations	2.16	1.00	56	2.33	1.00	45	1.59	.63	29	2.44	0.75	27
Self satisfaction	1.95	.98	56	2.11	1.13	45	2.45	1.30	29	2.04	1.09	27
Competitiveness	4.20	.94	56	4.24	.75	45	3.69	1.14	29	4.07	1.17	27
Friends' expectations	4.30	.85	56	4.33	.74	45	4.34	0.77	29	4.11	1.01	27
To get a high paying job	2.37	1.10	56	1.96	1.07	45	2.90	1.32	29	2.22	1.34	27

[a] Three Anglo-Celtic Australian participants did not complete this question.

Educational and Occupational Aspirations

Participants were asked whether they intended to go to university after completing secondary school, with a dichotomous Yes/No response format. A greater proportion of Vietnamese Australian children (93%) indicated they intended to go to university compared to 84% of participants in Anglo-Celtic Australian Group 1. However, chi-square analyses showed no significant difference between the groups (χ^2 (1, N = 98) = 1.96, p = .16). The frequencies of positive and negative responses were almost identical for the Chinese Australian and Anglo-Celtic Australian Group 2 children, with all Chinese participants and all bar one Anglo-Celtic Australian Group 2 participant indicating they intended to go to university.

Another question required participants to indicate their preferred future occupation. The most common responses (with frequencies greater than 5 in total sample) are provided in Table 3.8. The responses were categorised as either professional or non-professional occupations according to the Australian Standard Classification of Occupations (ASCO) (McLennan, 1997, 2nd Ed.). Chi-Square analyses revealed significant differences between the ethnic groups for these two categories, such that the Vietnamese Australian children were significantly more likely to nominate a professional occupation than the Anglo-Celtic Australian Group 1 children (χ2 (1, N = 96) = 7.07, p < .01). Similar results were obtained for the comparison of the Chinese-Australian and Anglo-Celtic Australian Group 2 participants (χ2 (1, N = 48) = 8.07, p < .01). As is evident from Table 3.8, many Vietnamese Australian and Chinese Australian participants nominated 'doctor' as their desired future occupation. Ethnic group comparisons for this occupation showed significant differences (χ2 (1, N = 96) = 12.94, p < .01; and χ2 (1, N = 48) = 7.76, p < .01) for the Vietnamese - Anglo-Australian Group 1 and the Chinese -

Anglo-Australian Group 2 comparisons respectively.

Table 3.8

Occupational aspirations (group frequencies) of Vietnamese Australian, Chinese Australian and Anglo-Celtic Australian schoolchildren.

	Ethnic Group			
Occupation	Vietnamese Australian N = 56	Anglo-Celtic Australian Group 1 N = 46	Chinese Australian N = 29	Anglo-Celtic Australian Group 2 N = 29
Doctor	21	4	10	1
Pharmacist	5	0	1	0
Sportsperson	4	6	3	3
Lawyer	3	5	1	0
Veterinarian	0	1	1	5
Other profession	3	6	8	3
Other non-profession	15	23	2	10
No answer/ Don't know	5	1	3	7

The occupations nominated by the children were also classified according to their occupational status using the ANU3-2 Scale (McMillan & Jones, 1999). Although it was possible for the majority of responses to classified into the broad ASCO categories of professional and non-professional, several responses did not provide sufficient detail for conversion to status scores. Therefore, as evident from Table 3.9, the sample sizes are slightly smaller for these classifications.

As is evident from Table 3.9, the occupations nominated by Vietnamese Australian and Chinese Australian children tended to have higher status than those nominated by the Anglo-Celtic Australian groups. These ethnic group differences were significant; for the Vietnamese comparison $t\ (92) = 3.25$, $p < .01$, and for the

Chinese comparison t (46) = 2.04, $p < .05$). This effect was not a consequence of higher educational and/or occupational status among Chinese and Vietnamese parents. As described earlier, measures of educational level and occupational status generally showed the Vietnamese and Chinese parents to be less well educated and employed in lower status occupations, on average, compared to their Anglo-Celtic Australian counterparts.

Table 3.9

Descriptive statistics for occupational status of children's nominated future career for Vietnamese Australian, Chinese Australian, and Anglo-Celtic Australian children.

	Ethnic Group			
	Vietnamese Australian	Anglo-Celtic Australian Group 1	Chinese Australian	Anglo-Celtic Australian Group 2
N	50	44	26	22
Mean	69.11	50.63	70.20	55.90
SD	28.87	25.75	25.92	22.06

Extra-curricular activities

Chi-square analyses were conducted to compare the groups' frequencies for each of the 11 activities. For the Vietnamese - Anglo-Australian comparison, there were significant differences for 'hanging out/playing with friends' (χ^2 (1, N = 101) = 7.25, $p < .01$) and 'attend another school or classes' (χ^2 (1, N = 101) = 32.54, $p < .01$), such that the Anglo-Celtic Australian Group 1 children were significantly more likely to indicate 'hanging out/playing with friends' as a regular activity compared to the Vietnamese Australian children, while the Vietnamese Australian children were more likely to attend another school or classes. Differences between the Chinese

Australian and Anglo-Celtic Australian Group 2 participants were observed for playing sport ($\chi 2$ (1, N = 58) = 4.86, p < .05), reading (χ^2 (1, N = 58) = 10.88, p < .01), hanging out/playing with friends (χ^2 (1, N = 58) = 8.06, p < .01), and attending another school/classes (χ^2 (1, N = 58) = 10.88, p < .01). Compared to their Anglo-Celtic Australian peers, fewer Chinese Australian children played sport and played with friends, while more Chinese Australian children spent time reading and attending another school/classes.

Mann Whitney U tests were conducted to compare the children's estimates of time spent watching television. There was no significant difference between the Vietnamese and Anglo-Celtic Australian Group 1 children (U (N = 102) = 1051, p = .10). However, the Chinese children reported spending less time watching television than their Anglo-Celtic Australian peers (U (N = 58) = 244, p < .01).

Table 3.10

Group frequencies for children's estimates of television viewing (hours per week on average)

	Ethnic Group			
	Vietnamese N = 56	Anglo-Celtic Australian Group 1 N = 46	Chinese N = 29	Anglo-Celtic Australian Group 2 N = 29
1-5 hours	9	5	12	3
6-10 hours	14	8	6	6
11-15 hours	12	6	6	6
16-20 hours	8	13	1	6
More than 20 hours	13	14	4	8
Mean rank	47.28	56.64	23.41	35.59
Sum of ranks	2647.5	2605.5	679	1032

Perceptions of parents' interest in school activities

Chi-Square analyses revealed that the only significant difference was between the Vietnamese Australian and Anglo-Celtic Australian Group 1 children for homework assistance ($\chi 2$ (1, N = 102) = 7.70, $p < .01$). Observed and expected cell frequencies suggested that this significant effect was largely due to a higher frequency of positive responses for the Anglo-Celtic Australian children; that is, they were more likely to indicate that their parents helped them with their homework than not (frequency of 36 compared to 8), while the frequencies of positive and negative responses for the Vietnamese Australian students were approximately equal (30 compared to 26).

iv) Homework

A number of study diaries were not returned at the end of the four week period, such that there were 49 diaries for the Vietnamese Australian participants, 35 for the Anglo-Celtic Australian Group 1 participants, and 24 each for the Chinese Australian and Anglo-Celtic Australian Group 2 participants. The completion rate was slightly higher for the Vietnamese children (87%) compared to the Chinese (83%) children and Anglo-Celtic Australian Group 2 (83%), while the completion rate was even lower for Anglo-Celtic Australian group 2 (78%). The most common reason for failing to return the diaries was that they had been lost. Of those diaries returned, data from four were excluded from the analyses because the participants (one Vietnamese Australian and three Anglo-Celtic Australian Group 1) had completed fewer than two weeks of the diary. This resulted in complete data for 48 Vietnamese participants, 33 Anglo-Celtic Australian Group 1, 24 Chinese Australian and 24 Anglo-Celtic Australian Group 2 participants.

Despite high inter-individual variability there were significant differences between the ethnic groups in the number of hours they reported studying. As is evident from Table 3.11, the Chinese Australian children reported studying for the greatest amount of time, with an average of 12 hours per week, followed by the Vietnamese Australian children who reported studying for approximately 8.5 hours per week on average. The Anglo-Celtic Australian groups reported significantly lower (and similar) amounts of time spent on homework with an average of 5.09 for Anglo-Celtic Australian Group 1 and 4.69 for Anglo-Celtic Australian Group 2. These group differences were significant, with the Vietnamese Australian children studying more on average than their Anglo-Celtic Australian peers ($t(77.02)$[9] $= 2.91$, $p < .01$), and the Chinese Australian participants studying more than Anglo-Celtic Australian Group 2 participants ($t(26.85) = 4.63$, $p < .01$).

Table 3.11

Descriptive Statistics for time spent on homework (hours per week on average) for Vietnamese Australian, Chinese Australian and Anglo-Celtic Australian children.

	Ethnic Group			
	Vietnamese Australian	Anglo-Celtic Australian Group 1	Chinese Australian	Anglo-Celtic Australian Group 2
N	48	33	24	24
Mean	8.55	5.09	11.99	4.69
SD	6.75	3.90	7.42	2.15

[9] Levene's test for Equality of Variances was significant for both comparisons and the statistics for unequal variances are presented here.

As is evident from the descriptive statistics in Table 3.11, the Vietnamese Australian and Chinese Australian groups exhibited greater inter-individual variability in the number of hours they reported studying compared to the Anglo-Celtic Australian groups. The frequency distributions of each group's scores were inspected to explore whether the significant group differences were due to a small number of Vietnamese and Chinese participants boosting the means for the groups, i.e., a weak effect produced by a small number of extreme scores. (See frequency distributions in Appendix 3.7). The score distributions for the Vietnamese Australian, Anglo-Celtic Australian Group 1 and Group 2 participants were positively skewed, while the scores for the Chinese Australian group approximated a normal distribution. Similarly, the median study score for the Vietnamese Australian participants was considerably lower than the mean; 5.25 compared to 8.55, while the median scores for the Anglo-Celtic Australian groups were similar to the means: Md = 4.25, M = 5.09 for Anglo-Celtic Australian Group 1; and Md = 4.71, M = 4.69 for Anglo-Celtic Australian Group 2. For the Chinese Australian students the median study score was 8.94; lower than the mean of 11.99 but still considerably higher than the other three groups. These inspections of the score distributions suggest a weak effect for the Vietnamese Australians, whereby a small number of participants had very high scores which resulted in a high mean relative to the Anglo-Celtic Australian Group 1 participants. In contrast, it appears that the distribution of scores is uniformly higher in the Chinese Australian group and therefore it would seem that this significant ethnic group difference is a stronger effect.

To investigate the hypothesis that the group differences observed were due to a small number of extreme scorers in the Vietnamese and Chinese groups, additional comparisons were made excluding scores at the very top of the distributions.

Although these scores were not statistical outliers, due to the high inter-individual variability, scores greater than or equal to 15 were excluded from the analysis. This resulted in a total of 39 cases for the Vietnamese Australian group, 31 for the Anglo-Celtic Australian group 1, 18 for the Chinese Australian group and 24 for the Anglo-Celtic Australian Group 2[10]. As is evident from Table 3.12, the exclusion of these cases resulted in considerably smaller group means for the Vietnamese and Chinese Australian groups, as well as lower variability that is more similar to the Anglo-Celtic Australian groups. However, the differences between the ethnic groups remained significant, such that the Vietnamese Australian children's mean was still higher than that of Anglo-Celtic Australian Group 1 ($t(67.12) = 2.16, p < .05$), and the Chinese Australian students' mean was also significantly higher than that of their Anglo-Celtic Australian peers ($t(26.13) = 3.75, p < .01$). These results suggest that the group differences in time spent studying are a strong effect that is not limited to a small group of Chinese and Vietnamese students who spend a very large amount of time on their homework.

Table 3.12

Descriptive Statistics for time spent on homework (hours per week on average) for Vietnamese Australian, Chinese Australian and Anglo-Celtic Australian children, (excluding scores greater than or equal to 15)

	Ethnic Group			
	Vietnamese Australian	Anglo-Celtic Australian Group 1	Chinese Australian	Anglo-Celtic Australian Group 2
N	39	31	18	24
Mean	5.81	4.32	8.26	4.69
SD	3.38	2.38	3.57	2.15

[10] There were no cases with scores of 15 or greater in the Anglo-Celtic Australian Group 2.

3.3.3 Other group differences

i) Socio-economic status (SES) differences

As is evident from the descriptive statistics provided in the previous section, there were large differences between the socio-economic status groups in performance on measures of ability and achievement, particularly when comparing the two Anglo-Celtic Australian groups. Although the research hypotheses do not include predictions concerning socio-economic status effects, the magnitude of the differences warrants some description and discussion.

Multivariate analyses of variance were conducted with ethnicity (Asian Australian versus Anglo-Australian) and SES (low versus high) as between-subject factors. In addition to the ethnic group differences observed previously, there were main effects for socio-economic status for most measures. For Raven's Progressive Matrices the higher SES groups (consisting of the Chinese Australian and Anglo-Celtic Australian Group 2 participants) had significantly higher scores than the lower SES groups (Vietnamese Australian and Anglo-Celtic Australian Group 1) ($F(1,156) = 32.26$, $p < .01$). Similar results were observed for performance on the ACER test ($F(1,154) = 67.68$, $p < .01$) and its components; quantitative reasoning ($F(1,154) = 38.30$, $p < .01$), verbal comprehension ($F(1,154) = 58.11$, $p < .01$), and verbal reasoning ($F(1,154) = 69.46$, $p < .01$).

Significant SES group differences were also observed for the measures of processing speed. For both reaction time and inspection time the higher status groups had faster scores than the lower status groups ($F(1,153) = 33.97$, $p < .01$ for RT, and $F(1,149) = 10.88$, $p < .01$ for IT). In addition to the main effects for ethnicity and SES, an interaction effect was observed for reaction time ($F(1,149) = 4.24$, $p < .05$). Examination of the group means suggested that this interaction was largely due to the SES effect being most pronounced in the Anglo-Australian group compared to the Asian Australian group; that is, the difference in reaction times between the Anglo-Celtic Australian groups was considerably larger than the difference between the Chinese Australian and Vietnamese Australian groups.

Multivariate analyses of variance were also conducted to compare groups' school achievement scores. Consistent with the results of the within-SES ethnic group comparisons described in the previous section, there were no main effects for ethnicity for overall achievement or language achievement, while a significant effect for ethnicity was observed for achievement in mathematics. In addition, there were main effects for SES for all three measures, such that the higher SES groups had higher achievement scores for language ($F\ (1,156) = 28.64$, $p < .01$), mathematics ($F\ (1,156) = 16.32$, $p < .01$) and overall achievement average ($F\ (1,156) = 30.76$, $p < .01$).

Finally, a multivariate analysis of variance was conducted with time spent studying as the dependent variable. The results showed a main effect for ethnicity only ($F\ (1,125) = 26.88$, $p < .01$).

ii) Gender differences

Independent samples t tests were conducted to investigate potential gender differences in the measures of ability, achievement and time spent studying, for the whole sample and within groups. For the entire sample the only significant difference between male and female students was in teacher ratings for achievement in language ($t\ (158) = 3.10$, $p < .01$), such that the girls had significantly higher scores than the boys. This outcome is generally consistent with previously published results showing higher score for girls on verbal achievement measures, although previous studies have shown the effect to be more pronounced in younger age groups (e.g., Lummis & Stevenson, 1990). Comparisons within ethnic groups suggested that this effect was largely due to higher scores among the female Asian students, although only the difference between girls and boys in the Vietnamese Australian group was significant ($t\ (54) = 2.87$, $p < .01$). The only other gender difference within ethnic groups was also for the Vietnamese Australian children, with a significant difference for reaction time ($t\ (53) = 2.10$, $p < .05$), such that the Vietnamese boys were significantly faster than the girls.

iii) Generation differences within the Asian groups

It was hypothesised that first generation immigrants would have higher occupational aspirations than would second generation immigrants. Within the Asian groups there were 41 participants who had emigrated to Australia (first generation), 17 of whom were Chinese and 24 were Vietnamese. Vietnamese participants comprised a greater proportion of the 44 second generation participants; with 32 Australia-born Vietnamese and only 12 Australia-born Chinese.

Independent samples t tests were conducted to compare the generational groups on all key variables. None of the comparisons was significant. In particular, there was no difference between the groups in occupational aspirations ($t\ (74) = 1.13$, $p < .01$).

3.3.4 Relationships between variables

i) Number of siblings and IQ

Correlations between number of siblings and performance on the IQ measures were calculated for the entire sample and within groups. There was a weak but significant negative correlation between number of siblings and performance on Ravens Progressive Matrices for the entire sample ($r = -.17$, $p < .05$), and for performance on the verbal reasoning component of the ACER test ($r = -.18$, $p < .05$).

These outcomes are consistent with previously published results, (see Blake, 1989), although they are inconsistent with Caplan et al.s' (1992) findings with Indochinese children. Correlations between number of siblings and IQ within ethnic groups were similarly weak and negative, although nonsignificant, which may be partly due to reduced sample sizes.

ii) IQ and academic achievement

Table 3.13 provides correlation matrices for the relationships between the measures of ability, and achievement for each ethnic group. As is evident from the Table, the pattern of associations is different in the different ethnic groups. Nearly all of the IQ measures are moderately and significantly correlated with achievement scores for the Vietnamese Australian group. In contrast, although performance on the ACER test is moderately correlated with achievement for the children from Anglo-Celtic Australian Group 1, correlations between scores on Raven's Matrices and achievement are very weak and nonsignificant. Similarly weak correlations between the Matrices and achievement variables are evident among the Chinese Australian participants with achievement in mathematics being the only achievement variable correlated with performance on the Matrices. For the Chinese Australians the correlations between the ACER test and achievement variables are weak to moderate. The quantitative reasoning and verbal reasoning components of the ACER test do not correlate with achievement measures for the Anglo-Celtic Australian Group 2 participants, although the verbal comprehension component has moderate to strong correlation coefficients.

Table 3.13

Intercorrelations between measures of ability, and achievement for Vietnamese Australian, Chinese Australian and Anglo-Celtic Australian schoolchildren.

	Achievement		
	Overall average	Language Achievement	Maths Achievement
	Vietnamese Australian (N = 55)		
Ability			
Raven's Matrices	.52**	.48**	.49**
ACER total score	.56**	.51**	.54**
Quantitative Reasoning	.44**	.36**	.48**
Verbal Comprehension	.40**	.41**	.33*
Verbal Reasoning	.61**	.57**	.55**
	Anglo-Celtic Australian Group 1 (N = 45)		
Ability			
Raven's Matrices	.07	.10	.09
ACER total score	.51**	.53**	.48**
Quantitative Reasoning	.40**	.41**	.40**
Verbal Comprehension	.47**	.47**	.39**
Verbal Reasoning	.51**	.53**	.46**

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

Table 3.13 cont'd.

	Achievement		
	Overall average	Language Achievement	Maths Achievement
	Chinese Australian (N = 29)		
Ability			
Raven's Matrices	.23	.03	.40*
ACER total score	.52**	.48**	.46**
Quantitative Reasoning	.55**	.48**	.55**
Verbal Comprehension	.41*	.38*	.20
Verbal Reasoning	.39*	.38*	.36
	Anglo-Celtic Australian Group 2 (N = 29)		
Ability			
Raven's Matrices	.48**	.45*	.42*
ACER total score	.43*	.34	.39*
Quantitative Reasoning	.32	.17	.37*
Verbal Comprehension	.58**	.59**	.38*
Verbal Reasoning	.34	.32	.28

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

iii) Homework and academic achievement

Given the significant ethnic group differences in time spent studying and achievement in mathematics, it seemed worthwhile to explore the relationship between these variables for the sample and within each ethnic group. Time spent studying was found to be weakly but significantly positively correlated with achievement in mathematics for the whole sample ($r = .24$, $p < .01$). However, study was not significantly correlated with the overall achievement average ($r = .13$) or language achievement ($r = .05$). Moreover, within-group correlation coefficients were very weak and nonsignificant. Moderate, significant correlations between time spent studying and achievement measures (overall average and language achievement) were observed for participants in the Anglo-Celtic Australian Group 2 only.

3.3.5 Predicting academic achievement

In order to test the hypothesis of differential predictive validity of IQ for the academic achievement of students of Chinese and Vietnamese background, the data were subjected to hierarchical multiple regression analyses. Based on the findings of ethnic group differences in mathematics achievement, only the analyses for predicting this aspect of school achievement are reported here. Consistent with the ethnic group comparisons conducted in the previous section, additional regression analyses were conducted separately for the Vietnamese and Chinese comparisons; that is, one analysis was conducted with the data for the Vietnamese Australian children and their Anglo-Celtic Australian controls, and the other for the Chinese Australian children and their Anglo-Celtic Australian control group.

Achievement in mathematics was the outcome variable. IQ was entered into the equation first. This was an average of participants' scores on Raven's

Progressive Matrices and the ACER test (total score), after conversion to z scores. Ethnicity, coded as 1 for Vietnamese [Chinese] and 0 for Anglo-Celtic Australian Group 1 [Anglo-Celtic Australian Group 2], was entered at step 2. The product of ethnicity and IQ was entered at step 3. The inclusion of the product of ethnicity and IQ was to test the hypothesised different relationship between IQ and achievement for students of Asian background. A significant increase in R^2 at this step would indicate a difference between the slopes of the regression equations for the two groups and therefore, differential predictive validity of IQ for mathematics achievement.

Results of the regression analyses did not support the hypothesised differential predictive validity of IQ for mathematics achievement for students of Chinese and Vietnamese background, as the product of ethnicity and IQ did not contribute significantly to the equation (for the Vietnamese comparison $t = 1.55$, $p = .12$, and for the Chinese comparison, $t = 0.07$, $p = .95$). Therefore, there was no difference between the ethnic groups in the slope of the equation using IQ to predict maths achievement.

Additional regressions analyses were conducted to test whether ethnicity had a unique main effect on maths achievement, after controlling for IQ. The results of these regressions for the Vietnamese comparison are provided in Table 3.14, and for the Chinese comparison in Table 3.15. As is evident from the tables, the sample sizes for these analyses are smaller than the group comparisons above. This is due to the fact that only those participants who completed both IQ measures and the homework diary were included in the regression analyses. Independent samples t tests revealed no significant differences between this subset of the sample with those excluded from the regression analyses (See Appendix 3.8 for results of this comparison).

Table 3.14

Summary of hierarchical multiple regression analyses using IQ and ethnicity to predict mathematics achievement for Vietnamese Australian and Anglo-Celtic Australian Group 1 schoolchildren (N = 81)

Step	Variable	B	SE B	β	R^2	Sig. of R^2 change
1	IQ	.66	.12	.47**	0.23	<.01
2	Ethnicity	.48	.19	.21*	0.28	<.05

Note. B, SE B and β reflect the effect of each variable after the other variable has been included in the equation.
** $p < .01$, * $p < .05$

Table 3.15

Summary of hierarchical multiple regression analyses using IQ and ethnicity to predict mathematics achievement for Chinese Australian and Anglo-Celtic Australian Group 2 schoolchildren (N = 48)

Step	Variable	B	SE B	β	R^2	Sig. of R2 change
1	IQ	.78	.20	.47**	0.23	<.01
2	Ethnicity	.64	.24	.32*	0.34	<.05

Note. B, SE B and β reflect the effect of each variable after the other variable has been included in the equation.
** $p <.01$, * $p < .05$

As is evident from Tables 3.14 and 3.15, IQ was a significant predictor of achievement in mathematics for all groups, irrespective of ethnicity. However, ethnicity was also a significant predictor in both comparisons, indicating that the

Chinese and Vietnamese students obtained higher maths achievement ratings than their Anglo-Celtic Australian peers with the same IQ. For the Vietnamese comparison, ethnicity contributed approximately 5% to the variance in maths achievement, and approximately 11% for the Chinese comparison. Given that the previous analyses indicated that the relationship between IQ and achievement was comparable for the different ethnic groups (i.e., no difference in the slope of the regression equations), these results suggest that for a student of average IQ, being Vietnamese adds around 0.5 of a grade and being Chinese about 0.6 of a grade. Although these effects appear small they are meaningful when considered in relation to the 1 to 6 scale on which students' achievement was rated.

Additional hierarchical multiple regression analyses were conducted to explore this ethnicity-related-variance in mathematics achievement. As with previous analyses, a regression analysis was conducted for each of the paired comparisons. In both cases the outcome variable was maths achievement and IQ was entered at Step 1 to control for ability. Based on the literature reviewed earlier, and the findings of significant ethnic group differences in time spent on homework and occupational aspirations, hours spent on homework (labelled 'study') was entered at Step 2, followed by occupational aspirations at Step 3. Ethnicity was entered at Step 4. If the effect of ethnicity on maths achievement is due, at least in part, to greater time spent on homework and/or higher aspirations then we would expect these variables to have a significant effect on mathematics achievement and the effect of ethnicity on achievement to diminish or disappear when they are in the regression equation. The results of regressions for the Vietnamese comparison are provided in Table 3.16, and for the Chinese comparison in Table 3.17.

Table 3.16

Summary of hierarchical multiple regression analyses using IQ, study, aspirations and ethnicity to predict mathematics achievement for Vietnamese Australian and Anglo-Celtic Australian Group 1 schoolchildren (N = 81)

Step	Variable	B	SE B	β	R^2	Sig. of R^2 change
1	IQ	.56	.15	.40**	0.23	<.01
2	Study	.014	.02	.08	0.25	NS
3	Aspirations	.007	.004	.18	0.29	<.05
4	Ethnicity	.30	.25	.14	0.31	NS

Note. B, SE B and β reflect the effect of each variable after the three other variables have been included in the equation.

Table 3.17

Summary of hierarchical multiple regression analyses using IQ, study, aspirations, and ethnicity to predict mathematics achievement for Chinese Australian and Anglo-Celtic Australian Group 2 schoolchildren (N = 48)

Step	Variable	B	SE B	β	R^2	Sig. of R^2 change
1	IQ	.84	.23	.50**	0.23	<.01
2	Study	.035	.03	.22	0.35	<.05
3	Aspirations	.003	.006	.08	0.36	NS
4	Ethnicity	.36	.29	.18	0.38	NS

Note. B, SE B and β reflect the effect of each variable after the three other variables have been included in the equation.
** $p < 0.01$

As is evident from Tables 3.16 and 3.17, the effect of ethnicity was not significant when study and aspirations were in the regression equations. The inclusion of aspirations added significantly to the equation predicting mathematics achievement for the Vietnamese Australian and Anglo-Celtic Australian Group 1 children. However, as indicated in Table 3.16, aspirations did not make a significant independent contribution to the equation once the three other variables; IQ, study and ethnicity, were included. A similar result is evident for study in predicting the maths achievement for the Chinese Australian and Anglo-Celtic Australian Group 2 children. That is, although the inclusion of aspirations and study resulted in a significant change in R^2 for the Vietnamese comparison and the Chinese comparison respectively, neither variable made a significant independent contribution to the variance once the other variables were entered. This suggests that, in the case of the Vietnamese comparison, aspirations and ethnicity share variance in mathematics achievement and while aspirations contributes to the variance it does not make a contribution independent of ethnicity. A similar conclusion could be made concerning the effect of study on mathematics achievement for the Chinese comparison. Therefore, while the results of the regression analyses suggest that study and aspirations are part of the ethnicity-related variance in mathematics achievement, it is difficult to tease out the contributions of each variable.

Finally, an additional regression analysis was conducted to investigate whether the relationship between IQ and achievement in mathematics differed for the two Asian Australian groups. This analysis was conducted with data from the Vietnamese Australian and Chinese Australian children, and, as with previous analyses, the dependent variable was mathematics achievement. To control for socio-economic differences between the groups, mother's educational background was entered at step 1. This was a set of two dummy variables based on the educational background categorisation described at the beginning of the chapter (see section 3.3.1). The first dummy variable was coded 1 for completion of primary school only and 0 for 'other', and the second dummy variable was coded 1 for completion of secondary school and 0 for 'other'. (The third category, completion of tertiary education, is defined by the other two). IQ was entered at Step 2, followed by ethnicity (coded 1 for Vietnamese and 0 for Chinese) at Step 3. The product of ethnicity and IQ was entered at Step 4.

Consistent with the results of the previous regression analyses, the inclusion of the product of ethnicity and IQ at Step 4 did not result in a significant change in R^2 ($t = 0.22$, $p = .83$). Therefore, there was no difference between the Chinese and Vietnamese children in the slope of the equation using IQ to predict mathematics achievement.

A final regression analysis was conducted to examine whether ethnicity had a unique main effect on mathematics achievement for the Chinese and Vietnamese children. Mother's education was again entered at step 1 to control for socio-economic differences between groups. IQ was entered at step 2 with ethnicity included at step 3. The results of this regression analysis are provided in Table 3.18.

Table 3.18

Summary of hierarchical multiple regression analyses using IQ and ethnicity to predict mathematics achievement for Vietnamese Australian and Chinese Australian schoolchildren (N = 72)

Step	Variable	B	SE B	β	R^2	Sig. of R^2 change
2	IQ	.79	.16	.62**	.42	< .01
3	Ethnicity	.07	.28	.03	.42	NS

Note. B, SE B and β reflect the effect of each variable after the two other variables have been included in the equation.
** $p < 0.01$

As is evident from Table 3.18, after controlling for socio-economic differences, IQ was a significant predictor of achievement in mathematics for both the Vietnamese Australian and Chinese Australian children and ethnicity was not a significant predictor. That is, ethnic differences between the two Asian Australian groups did not contribute to the variance in mathematics achievement once IQ has been entered in the regression equation. This result suggests that the relationship between IQ and mathematics achievement is similar for the two groups, and that, consistent with Tables 3.4 and 3.5, IQ differences between the Vietnamese Australian and Chinese Australian children accounted for the observed group differences in mathematics achievement.

3.4 Discussion

3.4.1 Summary of findings

The results of the study provided evidence of a gap between the IQ and mathematics achievement of students of Chinese and Vietnamese background. There was also some support for Sue and Okazaki's (1990) theory of relative functionalism. In particular, the Chinese Australian and Vietnamese Australian children reported spending considerably more time studying than their Anglo-Celtic Australian counterparts and had significantly higher occupational aspirations despite coming from similar or lower SES backgrounds. Contrary to prediction, generation did not have an effect on the aspirations of the children from Chinese and Vietnamese backgrounds. This may have been due to the fact that the present sample only contained first and second generation immigrants. The results of North American studies (e.g., Fuligni, 1997; Goyette & Xie, 1999) have demonstrated the strongest differences in aspirations between the first and third generations.

Some support was evident for the predictions concerning extra-curricular activities; the Chinese Australian and Vietnamese Australian children were more likely to attend another school/classes and less likely to spend out-of-school-hours with their friends, compared to their Anglo-Celtic Australian peers. The Chinese

Australian students were also more likely to spend spare time reading and less likely to play sport. The hypothesis concerning achievement motivation was only supported for the Chinese Australian children, who were more likely to indicate their parents as an important source of motivation than the children from Anglo-Celtic Australian Group 2. Similarly, partial support was obtained for the prediction concerning parents' involvement in their child's school activities, with fewer Vietnamese Australian children reporting that their parents help them with their homework than the Anglo-Celtic Australian Group 1 children.

3.4.2 The IQ/achievement gap

The results of the present study provide evidence for an IQ/achievement gap for Australian students of Chinese and Vietnamese background, at least in terms of mathematics achievement. Despite similar IQs the Vietnamese Australian and Chinese Australian children obtained significantly higher teacher ratings for mathematics than did their Anglo-Celtic Australian peers. The results of the regression analyses demonstrated that although IQ was a reasonable predictor of mathematics achievement for all of the children, ethnicity also made an independent contribution when comparing the Asian Australian children with their Anglo-Australian peers. This effect was in the positive direction, and suggested that IQ tends to underestimate mathematics achievement for the Chinese and Vietnamese children. This finding supports Flynn's hypothesis (1989a, 1989b, 1991a) and is consistent with Stone's (1992) findings with prediction of Basic Number Skills for Asian American children. More generally, the results suggest that the relationship between IQ and mathematics achievement is probably similar within these ethnic groups, but the predictive validity of IQ for mathematics achievement decreases when applied across groups. That is, as Flynn suggested, IQ cannot cross cultural boundaries.

This interpretation gains support from the results of the regression analyses comparing the two Asian Australian groups. In contrast to the analyses involving the Anglo-Celtic Australians, those comparing the Asian groups found that the higher mathematics achievement observed among the Chinese Australian children was due to higher IQ only; i.e., there was no additional ethnic/cultural contribution. This may reflect differences between the Chinese and Vietnamese populations in Adelaide. As described at the beginning of this chapter and in chapter 2, the majority of the Chinese Australian population is more highly educated than Vietnamese Australian immigrants. In addition to educational and socio-economic variables, Chinese immigrants may be more highly selected for intellectual ability. However, it should be acknowledged that this is speculative because the measures of socio-economic status were relatively crude and were not available for every participant.

Interpretations of the IQ/achievement gap

As outlined earlier, there are two possible interpretations of an IQ/achievement gap; either conventional IQ tests are not providing an accurate measure of intelligence for persons of Chinese and Vietnamese background, or there are non-IQ factors that are serving to enhance or boost academic achievement for these ethnic groups. The results of the present study provided some evidence for both of these interpretations.

The hypothesis of IQ test bias is partially supported by the Chinese and Vietnamese students' performance on alternative estimates of intellectual potential such as the measures of information processing speed. The Chinese Australian and Vietnamese Australian children had faster speeds for both measures with a significant group difference for reaction time. These results were not consistent with their IQ scores, and, taken together with the results for mathematics performance, could suggest higher intellectual ability than is indicated by the intelligence tests.

The most frequently proposed explanation of IQ test bias relates to the cultural and language content of the tests. The present findings concerning IQ test performance and school achievement provide little support for this explanation. While the first study provided some evidence that IQ measures like the ACER Intermediate Test are linguistically and culturally biased, this is less likely to be true of Raven's Progressive Matrices. This IQ test essentially measures abstract problem solving ability and is arguably less vulnerable to the effects of language and culture than the ACER test. Moreover, the Chinese and Vietnamese students' performance on the ACER test components of Verbal Comprehension and Verbal Reasoning, the content of which is most likely to be linguistically and culturally biased, was very similar to that of their Anglo-Celtic Australian counterparts, and there were no ethnic group differences in the Quantitative Reasoning test component. One would expect the Chinese and Vietnamese students to have lower performance on the verbal components and/or higher performance on the quantitative component if the test was linguistically biased. Furthermore, despite the fact that English was a second language for many of the Chinese and Vietnamese students, their school achievement in the language areas of the curriculum was similar to that of the Anglo-Celtic Australian students. Therefore, although it remains plausible that the Chinese and Vietnamese students are superior in intellectual ability and this has not been detected by the IQ tests, there is little evidence that this is the result of language bias in the content of the tests.

It is also possible that the group differences observed for reaction time were not an indication of superior intellectual ability but were instead a result of motivational factors. Although speed measures such as reaction time are moderately correlated with IQ and speed of processing is probably *related* to intelligence, there is considerable argument that such measures are not free of cultural and/or motivational bias and it is highly questionable as to whether they provide a 'pure' indication of biological potential, as proposed by Jensen and others (Nettelbeck, 1998). In particular, it has been found that RT performance can be affected by factors such as attention, motivation, and practice (e.g., Elliott, 1972). Moreover, Jensen (Jensen & Whang, 1993) has acknowledged that group differences in performance on these chronometric tasks may not simply reflect differences in underlying mental processes that are related to general intelligence. It is plausible that cultural factors such as obedience to and respect for teachers, and the classroom context, resulted in enhanced motivation and /or compliance among the Chinese and Vietnamese children, which in turn resulted in faster and more accurate performance. Although this interpretation is consistent with the cultural-motivational explanation of high achievement, the present study did not provide sufficient evidence to support or refute it.

Another potential explanation for the IQ/maths achievement gap concerns non-IQ factors such as social and cultural influences that may be serving to enhance the mathematics achievement of the Asian Australian children. Sue and Okazaki's (1990) theory of relative functionalism was proposed as a framework for these socio-cultural factors. The present study found some support for their theory, as the Chinese and Vietnamese children spent significantly more time studying than their Anglo-Celtic Australian peers and had higher occupational aspirations. The preferred occupations among the Vietnamese and Chinese Australian children tended to be those that require tertiary qualifications and are high status/high income professions such as "doctor" (i.e., medical practitioner). The study result is consistent with previous research (Caplan et al., 1992; Fejgin, 1995; Huang & Waxman, 1995; Peng and Wright, 1994; Reglin & Adams, 1990), and supports the hypothesis of the importance of academic effort in East Asian cultures. In particular, the weekly averages for the Chinese Australian and Vietnamese Australian children were slightly lower but similar to the amount of homework time spent by the Indochinese grade school students in Caplan et al.'s (1992) study. However, the results of the regression analyses did not provide clear support for the prediction that the Chinese Australian and Vietnamese Australian children obtained higher mathematics grades due to greater time spent on homework or higher aspirations. Although there were significant ethnic group differences in these variables in the expected direction, neither made a significant *independent* contribution to mathematics achievement. As described in the results, study and aspirations seemed to share variance in mathematics achievement with ethnicity rather than making independent contributions. It could be the case that the relationship between these variables and achievement is indirect or confounded with other variables. For example, it is possible that the increased time spent on homework is related to other factors, not included in the present study, that are responsible for the higher mathematics achievement. Indeed, it is widely acknowledged that school achievement is the product of a complex array of social and motivational factors in addition to academic ability. Motivational indices such as aspirations, and time spent studying are probably parts of a socio-cultural 'package' that enhances mathematics achievement for these students.

It should also be noted that the measure of homework included in the present study is a fairly crude estimate of academic effort. Length of time spent on homework is not necessarily related to the quality of the work produced. Students who spend a lot of time on their homework may be embellishing or working inefficiently, and the length of time may be unrelated to their grades. Indeed, the finding of similar amounts of time spent studying among the Anglo-Celtic Australian groups suggests that there may be a minimum level required to achieve satisfactory grades (or grades generally commensurate with the student's level of ability) and additional time beyond this may have little effect on academic achievement. Furthermore, it is therefore possible that the restricted range of scores for the Anglo-Celtic Australian groups reflect floor and ceiling effects, such that these students completed the minimum homework required (i.e., formal homework set by the teacher) and no more. This begs the question, what were the Chinese and Vietnamese Australian students actually doing during the additional time?

It is possible that the Chinese and Vietnamese students spent more time studying simply because they had more work to do, as many of the students were attending additional classes in their mother tongue, outside of school hours. This additional homework is separate from their regular schoolwork and is unlikely to affect their school grades. However, although there is additional homework required for these classes it is unlikely to account for all of the difference between the Asian and Anglo-Celtic Australian students in time spent on homework. For example, the Chinese background students reported doing on average approximately seven hours more homework per week than their Anglo-Celtic Australian peers. According to the principal of one of the ethnic language schools, the students are not expected to spend more than one hour per week on this work and in most cases would spend considerably less than this.

There are also problems associated with the self-report nature of the homework measure. This makes it vulnerable to the effects of response biases such as 'faking good'. It is possible that the students of Chinese and Vietnamese background tended to exaggerate the amount of time they spent on their homework. This is particularly plausible given the importance of academic effort in these cultures and the widespread acceptance within mainstream Australian culture of the stereotype of the model Asian student. These factors could enhance the students' desire (which may not be conscious) to impress the investigator, or to meet parents' expectations. Although I emphasised to the students the importance of honesty in completing the measure, they were aware that their responses were not anonymous and the measure (a daily diary) was completed at home, possibly in the presence of other family members. Nonetheless, a desire to exaggerate time spent on homework would be an interesting finding in itself and support the argument proposed earlier that time spent on homework may be one aspect of a more complex social and motivational package that is related to school achievement. Therefore, although it is conceivable that the amount of time the children reported spending on homework did not reflect the actual amount of time they spent, particularly in the case of the Asian students, this does not challenge the general conclusion that studying is highly valued in these cultures and that there is an expectation (among parents or children or both) that a considerable amount of effort should be expended on academic study.

One factor that may be related to the amount of time the Chinese and Vietnamese Australian children reported studying that was not addressed by the present study is parental values and attitudes concerning education and academic performance. The Asian Australian children may be spending more time studying simply because their parents expect them to. This explanation is supported by anecdotal evidence from teachers and qualitative data from the children's responses to several questions in the Demographic and Achievement Motivation questionnaire. Several teachers commented that many Chinese and Vietnamese parents complained to the school when they thought their children were not receiving enough homework (in contrast to the Anglo-Celtic Australian parents, some of whom complained of the opposite), and some Asian parents bought workbooks or hired tutors to provide their children with extra academic work. Similarly, many of the Asian Australian children said their parents expected them to do homework for a set period of time, irrespective of the amount set by teacher. Although the length of the expected 'set period' varied between individuals, in many cases it was linked to the amount of homework older siblings were doing. In other words, many of these 10 to 12 year old participants were spending similar amounts of time studying as their high school age siblings. Although previous research (e.g., Campbell & Mandel, 1990) has demonstrated a relationship between parental influence and school achievement, most models have not included time spent studying as well as ethnicity. Future research should explore the effects of parental expectations and values on academic effort, specifically time spent studying.

Arguably, the use of teacher ratings as a measure of school achievement is less than ideal. Teachers' grades might be seen as more objective and ideally standardised achievement tests might be used. Neither of these procedures was available, however. The schools did not have a universally accepted system of assessment that returned marks or grades and, for a variety of reasons that included time constraints as well as philosophical issues, the schools were reluctant to permit the use of standardised tests. On the other hand, the teachers' ratings procedure was found to have good internal reliability among the curriculum areas within both the language and mathematics areas (the two areas where multiple measures were involved). Thus, intercorrelations within both of these areas ranged from $r = .63$ to $r = .87$. Moreover, because this procedure was perceived by the teachers to have more 'real-world' validity than standardised tests, and to reduce the out-of-class time required by the project, it was the only method possible.

Nonetheless, it is accepted that teachers' ratings will be more subjective than standardised measures and therefore more vulnerable to bias. This is particularly relevant to the present study because a number of North American studies (e.g., Hsia & Peng, 1998; Schneider & Lee, 1990; Tom, McGraw & Cooper, 1984; Wong, 1980) have found teachers to have a perception of Asian students as 'model students' - both in terms of behaviour and achievement. In particular, Hsia and Peng (1998) observed a discrepancy between Asian American students' language achievement grades and their performance on objective standardised tests, such that teachers tended to give higher grades than were warranted on the basis of test performance. These authors suggested that this may be partly due to a more positive attitude toward these students because of their 'model' academic behaviour, and also might be a consequence of teachers generalising students' achievement from other areas of the curriculum, such as mathematics, in which Asian students did demonstrate above average performance.

Therefore, it is possible that the observed ethnic group differences in mathematics achievement may have been due to "positive academic stereotyping" by teachers (Hsia & Peng, 1998, p. 333). However, it seems unlikely that such an effect could solely account for the group differences obtained, because the present study encompassed seven schools across the metropolitan area and approximately twenty teachers. Nonetheless the influence of this factor cannot be ruled out and the present results should be interpreted with caution due to uncertainty concerning the reliability and validity of the measure. Moreover, future studies should attempt to include grades and standardised tests if this is possible, in order to investigate this relationship further.

3.4.3 Socio-economic group differences

The exploration of socio-economic differences in IQ, speed of information processing, and school achievement was not a primary aim of the study. However, the consistently higher performance by the students from higher SES backgrounds warrants some discussion. Indeed, these group differences featured in comparisons for nearly every variable of interest. The children from higher socio-economic backgrounds had higher IQ scores, faster times on measures of processing speed, and higher school grades overall, in language, and in mathematics. While these results may be some cause for concern as they suggest an IQ advantage of between 10 and 15 points for the higher SES students, it should be noted that the participants in the study were not randomly selected and the samples may not be representative of the population. Moreover, the grouping of participants into the high and low SES categories used in the analyses of variance is a highly crude distinction based primarily on the geographical location of the school.

Nonetheless, these categories were generally supported by more precise indices such as parents' educational and occupational background. Therefore, although they should be interpreted with caution, they are still a cause for concern for parents and educators. In particular, the results tentatively suggest a growing division between lower and middle class groups in terms of school performance that should be investigated more thoroughly in future research.

The SES results provide an interesting backdrop for the ethnic group comparisons, particularly when considering the Vietnamese Australian group.

Despite similar SES characteristics to their Anglo-Celtic Australian peers, the Vietnamese Australian schoolchildren managed to outperform them in mathematics achievement. Although this may be partly influenced by teachers' stereotyping of the students as described above, it is consistent with a general pattern of high motivation and hard work. That is, in many respects the Vietnamese Australian children were characterised by values and attitudes more similar to both of the higher SES groups than to children from comparable SES backgrounds.

The results concerning the Chinese Australians seem to suggest that socio-economic status has an additive effect on the socio-cultural values investigated, such that the combination of both higher SES and being Chinese Australian enhances school achievement. This would seem to contradict Sue & Okazaki's theory, as one would expect the emphasis on education to diminish with increased socio-economic security - education should not continue to be regarded as the sole means of social advancement, and indeed, social advancement should become less of a priority as higher levels have already been attained. However, as Sue & Okazaki commented, it is the *perception* of the opportunities for social mobility that is crucial. It may be that the Chinese Australian families in the present study still regard education as the best means for their children to build upon the socio-economic level they have achieved, which was still lower than the Anglo-Celtic Australian families in the same suburbs.

3.4.4 Conclusion

In conclusion, the present study is one of the few examples of direct evidence for Flynn's hypothesised IQ/achievement gap. The Chinese Australian and Vietnamese Australian schoolchildren were obtaining higher maths achievement ratings than would be predicted on the basis of their IQs. There was some evidence that the IQ tests were not providing an accurate estimate of the intellectual ability of these children, although the popular explanation of language bias in the tests was not generally supported by the results. Furthermore, despite ethnic differences in time spent studying, this factor did not explain the gap between IQ and maths achievement scores for the Chinese and Vietnamese schoolchildren. It was proposed that the failure of IQ to predict achievement in mathematics across cultural boundaries may be due to a more complex group of social and motivational factors, including academic effort and parental expectations and attitudes, that should be addressed by future research.

CHAPTER 4

Parental academic standards and educational expectations (Study 3)

4.1 Aims of the study

The results of the second study with Chinese Australian, Vietnamese Australian, and Anglo-Celtic Australian primary school students yielded several interesting findings. In particular, the study found a gap between the IQ and mathematics achievement of the Chinese and Vietnamese students, such that both groups obtained higher grades for mathematics than would be predicted on the basis of IQ. Although there was some evidence that the IQ tests were not providing an accurate absolute measure of the intellectual ability of these groups, the weight of evidence pointed to the role of socio-cultural motivational factors - time spent studying and occupational aspirations - in boosting the achievements of these children. However, although these factors accounted for some of ethnicity-related variance in mathematics achievement they did not make significant independent contributions to the regression equations predicting mathematics achievement.

It is possible therefore that time spent on homework does not directly cause achievement but is instead part of a more complex cultural-motivational package that enhances achievement. It was argued in the previous chapter that one of the reasons that the students of Chinese and Vietnamese background spent more time on their studies was because of a cultural emphasis on the value of effort, which is transmitted by their parents. Moreover, it is possible that the relationship between amount of study and academic achievement at primary school level is not a simple linear function but one in which the benefits of study reach asymptotic level after a certain input. Therefore, it may be that the extra time that the Chinese and Vietnamese students were spending on homework yields little benefit in terms of achievement outcomes beyond this point.

Parental academic standards and educational aspirations

The primary aim of the third study was to examine another potential dimension of this socio-cultural package; the role of parental academic standards and educational expectations of their children. The results of both previous studies highlighted the significant role of parents in Asian students' motivation to achieve - at least for Chinese Australian students - and anecodotal evidence from the second study suggested that parents' expectations were influential in the amount of time the Vietnamese and Chinese children reported spending on their homework. As described in Chapter 1, the role of the family in the achievement motivation of Asian American students has been one of the most popular explanations for their academic success. Much of the previous research has focused on the identification of family and home environment variables that differ between Asian Americans and Anglo-Americans and that are assumed to influence academic achievement. The results of these studies have generally shown that Asian American families place greater value on education, have higher educational aspirations and expectations (Chen & Stevenson, 1995; Fejgin, 1995; Fuligni, 1997; Goyette & Xie, 1999; Mordkowitz & Ginsburg, 1987; Okagaki & Frensch, 1998; Reglin & Adams, 1990; Schneider & Lee, 1990), and create a home environment that is more conducive to studying and learning (Asakawa & Csikszentmihalyi, 1998; Campbell & Mandel, 1990; Caplan et al., 1992; Mordkowitz & Ginsburg, 1987; Schneider et al., 1994).

Based on the North American research and Sue and Okazaki's (1990) theory which emphasises the traditional value of education in East Asian cultures and parents' beliefs that education is the best means for social mobility for their children, it was predicted that Chinese and Vietnamese parents would be found to hold high expectations of their children's performance in school and high aspirations for their subsequent education. Specifically, it was predicted that the Vietnamese and Chinese parents would be more likely to prefer their child to attend university than Anglo-Celtic Australian parents from similar (SES) backgrounds. It was also predicted that the level of education that Chinese and Vietnamese parents would like their child to complete would be higher than that for Anglo-Celtic Australian parents from similar backgrounds.

Home environment

Consistent with the results of North American studies, it was predicted that the emphasis that Vietnamese and Chinese parents placed on their child's education would extend to the provision of a home environment that is conducive to studying. It was expected that this would involve parents removing potential obstacles to studying, such as doing household chores and watching television. Therefore, it was hypothesised that Vietnamese and Chinese parents would report that they expect their child to do fewer household chores than Anglo-Celtic Australian parents from similar backgrounds, and would report that they expect their children to spend more time doing homework than Anglo-Celtic Australian parents. It was also predicted that Chinese and Vietnamese parents would be more likely than Anglo-Celtic Australian parents to report that they monitor their child's television viewing in terms of how much time is spent watching television, whereas Anglo-Celtic Australian parents would be more likely to monitor the type of programmes their children watch. Finally, it was hypothesised that Chinese and Vietnamese parents would be more likely to indicate that they have provided a specific place in the house for the child to study than Anglo-celtic Australian parents from similar backgrounds.

4.2 Method

4.2.1 Participants

Approximately 550 questionnaires were sent home to parents via schools. The response rate was approximately 47% with 258 returned. Of those returned, nine were excluded due to incomplete data (key questions referring to academic standards and educational expectations were not completed) and 10 were excluded because one or both parents identified themselves as belonging to an ethnic group not included in the study (e.g., Serbian, Italian). Therefore, the final sample comprised 239 participants: 58 Vietnamese, 60 Chinese, and 121 Anglo-Celtic Australian parents. Consistent with the previous study, so as to address average SES differeces between Vietnamese and Chinese participants, the Anglo-Celtic Australian participants were divided into lower and higher SES groups, intially on the basis of the geographical areas in which the children's schools were located. There were 71 lower SES Anglo-Australian participants and 50 higher SES Anglo Australian participants (referred to hereafter as Anglo-Celtic Australian Group 1 and Anglo-Celtic Australian Group 2 respectively).

4.2.2 Materials

Data were obtained using a purpose-designed questionnaire constructed by the author[1]. It was designed to obtain data from parents (mother, father, or guardian) concerning one of their children between the ages of 6 and 14 years old. To maximise participation the questionnaire could be completed by either of the child's

[1] A copy of this questionnaire is provided in Appendix 4.1

parents. The questionnaire was divided into two sections. The first section included questions about the child such as age and gender, and questions designed to assess; a) parental standards for their child's academic performance, b) parents' expectations and aspirations for their child's future education, and c) the extent to which parents regulated their child's after school activities, including time spent watching television. (These questions are described in more detail below). The second section included questions designed to obtain general demographic data concerning the participants' themselves, such as place of birth, length of time resident in Australia, educational background and occupation. The questionnaire took approximately 15 minutes to complete.

The questionnaire was translated into Vietnamese and Chinese (Mandarin)[2]. Back-translations provided by independent translators indicated very few differences from the original English version. In consultation with the persons who provided the translations it was determined that these differences were unlikely to affect the interpretation of the questions and therefore the translated versions were not altered.

To assess parental academic standards, two questions were constructed based on those used by Harold Stevenson and colleagues in their cross-cultural research on mathematics achievement (e.g., Chen & Stevenson, 1995). Both items described a hypothetical class test scored out of 100 marks, in which the average mark was 50.[3] Participants were asked to indicate what score they thought their child would be likely to achieve (expected score), and what score they would be satisfied with their child achieving (satisfied score). The first item referred to the test as a mathematics

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[2] The translations were conducted by the South Australian Government Interpreting and Translating Centre.

[3] The item used by Chen and Stevenson (1995) referred to the average score in the class as 70. After consultation with several teachers this was changed to 50 for the present study because of teachers' opinions that this was a score distribution with which the parents were familiar.

test and the second item referred to a spelling test.

Three questions were constructed to explore parents' expectations of and aspirations for their child's future education. The first question provided a list of options for education and employment upon completion of secondary school, such as attending university, getting an apprenticeship, and getting a job. Participants were asked to indicate which one of the options they would prefer their child to take, by ticking the box next to that option. The other two items referred to the amount of formal education participants would like their child to complete and the amount of eductation they thought their child would complete (i.e., expected them to complete). These items provided a list of categories from completion of year 10 to completion of a postgraduate degree. Participants were first asked to tick the box next to the highest level of education they would like their child to complete, and then to indicate the highest level of education they expected their child would be likely to complete.

After-school activities were investigated with a series of questions concerning household chores, homework, and television viewing. Participants were asked to indicate what sort of household tasks they expected their child to do and were provided with several examples, such as washing the dishes and babysitting. This was an open-ended question. In addition, participants were asked to estimate how much time their child spent watching television per week on average. Five categories were provided: 1-5 hours, 6-10 hours, 11-15 hours, 16-20 hours and more than 20 hours, and participants were asked to tick the box next to the most appropriate category for their child. The same format was used for the question that required participants to estimate how much time their child spent doing homework, per week on average. Participants were also asked to indicate whether they; a) monitored how much television their child watched, b) monitored which television programmes their child watched, and c) provided a place in the house that was set aside for their child to use for study purposes. A dichotomous Yes/No response format was provided for these three questions.

The questionnaire was piloted with a small sample (N = 12) of university students who were parents of children between the ages of 6 and 15 years old. These participants completed the questionnaire on two occasions, two weeks apart to estimate test-retest reliability. Based on this small sample, the assessment of key variables was highly reliable; correlation coefficients were positive and significant (2-tailed probabilities) and ranged from $r = .67$ (satisfied spelling score) to $r = .97$ (expected educational attainment).

4.2.3 Procedure

As with the previous study, schools with high enrolments of children from Vietnamese and Chinese backgrounds were sent an introductory letter summarising the aims and procedures of the project. This was followed up with a telephone call to the school principal. Approximately 20 government and nongovernment schools for primary education were contacted. Principals from eight government schools agreed to participate in the study. Three of these schools had been involved in the second study.

The school principal (or delegate) identified all children of Chinese and Vietnamese background between grades 1-7 attending the school. They were then asked to identify a comparable group of Anglo-Celtic Australian children, such that the Anglo-Celtic Australian children were roughly matched for age and gender with the Chinese or Vietnamese children. Children who had been diagnosed with specific behavioural or learning difficulties were excluded from the study. The school was then provided with the appropriate number of questionnaire packages. These consisted of the questionnaire, an introductory letter (also translated) and a pre-paid, addressed envelope in which to return the questionnaire directly to the author. The principals distributed the packages (in sealed envelopes) to the children as soon as was convenient. The procedure of meeting with school principals, determining numbers and distributing questionnaires took approximately three weeks. Participants were asked to return the questionnaire within four weeks of receipt.

As an incentive to return the questionnaire, a raffle ticket was attached to each one. Participants were informed in the introductory letter that if they completed their details on the ticket they would enter a draw to win one of three prizes (first prize: $50 book voucher; second prize: scientific calculator; third prize: stationery supplies worth $20). The raffle was drawn approximately six weeks after the commencement of the study.

Translations

Although the majority of the questions could be completed by ticking boxes, several questions involved open-ended responses and participants were instructed that they could respond in their preferred language. Translations of responses were conducted by four independent persons. One person translated all of the Vietnamese responses and a second person translated approximately 30% of the responses. The same procedure was adopted for the Chinese translations. Inter-rater reliability was 90% on average.

4.3 Results

4.3.1 Background characteristics of sample

To check the classification into high and low socio-economic status (SES) groups, the groups were compared for parents' educational background and occupational status. Participants were asked to indicate the highest level of education that they had completed using three categories; a) primary school, b) secondary school, and c) tertiary education. Comparisons between the Anglo-Australian groups supported the classification such that fathers from Anglo-Celtic Australian Group 2 were more highly educated than fathers from Anglo-Celtic Australian Group 1 ($\chi 2$ (2, N = 107) = 50.99, $p < .01$, 2-tailed[4]). A similar result was observed for mother's educational background ($\chi 2$ (2, N = 119) = 21.87, $p < .01$). Specific comparisons for educational categories (e.g., comparing the proportions who had completed primary school only) revealed that the differences between the Anglo-Celtic Australian groups were primarily in the proportions who had completed secondary and tertiary education. As is evident from Table 4.1, parents from Anglo-Celtic Australian Group 2 were more likely to have completed tertiary education than parents from Anglo-Celtic Australian Group 1 ($\chi 2$ (1, N = 107) = .49.34, $p < .01$; $\chi 2$ (1, N = 113) = 20.54, $p < .01$; for father's and mother's education respectively).

Fewer differences in educational background were observed among the Chinese and Vietnamese participants. The difference in father's educational level was not significant ($\chi 2$ (2, N = 113) = 4.64, $p = .10$) but the difference in mother's educational level was significant ($\chi 2$ (2, N =113) = 6.24, $p < .05$). More specific comparisons revealed that the Chinese fathers were more likely to have completed tertiary education than Vietnamese fathers ($\chi 2$ (1, N = 113) 4.03, $p < .05$), while a greater proportion of Vietnamese mothers had only completed primary schooling compared to Chinese mothers ($\chi 2$ (1, N = 113) = 5.43, $p < .05$).

To check that the Anglo-Celtic Australian groups were comparable with the Asian Australian groups for educational and occupational variables, the groups were also compared within socio-economic categories (e.g., Vietnamese participants were compared with Anglo-Celtic Australian Group 1 parents). As is evident from the group frequencies in Table 4.1, Vietnamese fathers were more heterogeneous in terms of educational background than the Anglo-Celtic Australian fathers in Group 1. For example, the majority of fathers in the Anglo-Celtic Australian group had completed secondary education, while several Vietnamese fathers had only completed primary education and more Vietnamese fathers had completed tertiary education. These group differences were significant ($\chi 2$ (2, N = 115) = 26.18, $p < .01$). A similar pattern was observed for mothers' educational level, although the Vietnamese and Anglo-Celtic Australian groups were similar in the proportions of mothers who had completed tertiary education ($\chi 2$ (2, N = 123) = 19.73, $p < .01$).

The differences between the Chinese and Anglo-Celtic Australian Group 2 parents in educational background were not as marked. As is evident from the group frequencies in Table 4.1, the Anglo-Celtic Australian Group 2 parents tended to be more highly educated than the Chinese parents, with fewer individuals who had completed only primary or secondary education and a greater proportion who had completed tertiary education. Chi-square analyses revealed that the groups differed significantly for father's education ($\chi 2$ (2, N = 105) = 7.82, $p < .01$) and mother's education ($\chi 2$ (2, N = 109) = 11.94, $p < .01$).

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[4] All probabilities are two-tailed unless specifically described.

Table 4.1

Educational background of participants – group frequencies (with percentages in parentheses)

Variable	Vietnamese N = 58	Anglo-Celtic Australian Group 1 N = 71	Chinese N = 60	Anglo-Celtic Australian Group 2 N = 50
	Ethnic Group			
Father's Education				
Primary	12 (21)	2 (3)	10 (22)	2 (4)
Secondary	26 (45)	57 (80)	19 (32)	12 (24)
Tertiary	15 (26)	3 (4)	28 (47)	31 (62)
Missing	5 (9)	9 (13)	0 (0)	5 (10)
Mother's Education				
Primary	19 (33)	4 (6)	10 (17)	0 (0)
Secondary	25 (47)	56 (79)	32 (53)	23 (46)
Tertiary	9 (15)	10 (14)	18 (30)	26 (52)
Missing	5 (9)	1 (1)	0 (0)	1 (2)

Occupational Status

Occupational status scores were determined for those participants who indicated they were employed at the time of the study. Consistent with the procedure described in the previous chapter, occupations were classified according to the Australian Standard Classification of Occupations (McLennan, 1997, 2nd Ed.) then converted to status scores using the ANU3-2 scale (McMillan & Jones, 1999). The status scores range from 0 to 100 and are based on a number of indices including average income of persons in an occupation, qualification and training necessary to enter the occupation, and community prestige of the occupation. A higher score indicated higher occupational status. Consistent with the results for educational background, there were significant differences between the socio-economic groups in occupational status such that both the Chinese and Anglo-Celtic Australian Group 2 fathers were employed in higher status occupations than the Vietnamese and Anglo-Celtic Australian Group 1 fathers ($F\ (3,164) = 15.24, p < .01$). A similar result was observed for mother's occupational status ($F\ (3,122) = 20.88, p < .01$), although the difference between Chinese mothers and Anglo-Celtic Australian Group 1 mothers was not significant. Although the Vietnamese and Chinese parents appeared to have lower scores than their respective Anglo-Celtic Australian comparison groups, these differences were not significant.

In summary, the general pattern of participants' educational background and occupational status supported the classification of the Anglo-Celtic Australian participants into two socio-economic groups. Although there were some exceptions, each Anglo-Australian group was approximately comparable in terms of socio-economic status variables with the respective Vietnamese and Chinese groups. Moreover, discrepancies between Anglo-Celtic Australians and Asian Australians in higher and lower SES categories favoured the former, an outcome that would, if anything, tend to work against the predictions made about educational aspirations.

Table 4.2

Occupational status of Vietnamese, Chinese and Anglo-Celtic Australian participants

	Ethnic Group			
Occupational Status	Vietnamese Australian	Anglo-Celtic Australian Group 1	Chinese Australian	Anglo-Celtic Australian Group 2
Father				
Mean	23.89	25.89	40.68	50.67
SD	22.21	13.65	24.92	20.66
N	33	50	46	39
Mother				
Mean	15.14	25.94	36.60	47.49
SD	11.35	14.86	24.40	16.74
N	26	39	25	36

Note. These data refer only to parents who indicated that they were employed at the time of the study.

Immigration, country of birth and length of time in Australia

With the exception of two mothers, the Vietnamese parents were all first generation immigrants. Ninety-six percent were born in Vietnam. The majority (92%) had been resident in Australia for five years or more and the average length of time resident was 12.86 years, SD = 7.37. All of the Chinese participants except one were also first generation immigrants. Countries of birth (major groups in order of frequency) included; a) the People's Republic of China, b) Vietnam, c) Hong Kong, d) Malaysia, and e) Taiwan. Compared to the Vietnamese group a greater proportion of the Chinese parents were recent immigrants with 30% of Chinese parents having been resident in Australia for fewer than five years. The average length of time resident in Australia was 9.59 years, SD = 6.68.

Target Child

As described in the Method, each questionnaire was completed with regard to one child between the age of 6 and 14 years old. The majority of the target children were in middle to senior primary and the average age was 10.06 years, SD = 1.88. The ethnic groups were not significantly different in the age of the child about whom the parents were responding (F (3,235) = 2.18, p = 0.09). The descriptive statistics for age of child for each ethnic group are provided in Table 4.3.

Table 4.3

Descriptive statistics for age (in years) of target child by ethnic group

	Ethnic Group			
	Vietnamese Australian	Anglo-Celtic Australian Group 1	Chinese Australian	Anglo-Celtic Australian Group 2
N	58	71	60	50
Mean Age	9.84	9.86	10.06	10.64
SD	2.01	1.94	1.90	1.43
Range	6-13	6-13	6-13	7-13

The distribution of gender among the target children was approximately equal, with 113 of the questionnaires referring to female children and 112 referring to male children (14 parents did not complete this information). Approximately equal gender distributions were also evident within ethnic groups.

4.3.2 Academic standards

As described earlier, parental standards for child's academic performance were measured using hypothetical test scenarios in which participants were asked to indicate the score they thought their child would achieve and the score they would be satisfied with their child achieving. Following from Chen and Stevenson (1995), the difference between these scores was calculated for each participant by subtracting the expected score from the satisfied score (referred to hereafter as the differential score). A positive score for this difference would indicate that parents would only be satisfied with a score higher than they expected their child would be likely to achieve, and a negative score would indicate that parents would be satisfied with a lower score than they expected their child would achieve.

The descriptive statistics for expected, satisfied, and differential scores are provided in Table 4.4. As is evident from the group sizes in the table, a number of parents completed only one part of the question, and therefore the numbers of responses for the satisfied and differential scores are lower. This was particularly the case for parents from Anglo-Celtic Australian Group 2 group in response to the second part of the question (the score they would be satisfied with their child achieving). Nearly all of the parents who did not indicate a numeric value responded instead by stating that they would be happy with whatever their child achieved as long as he/she did his/her best. None of the Vietnamese or Chinese parents responded in this way.

As the focus of the study was on ethnic group differences, independent samples t-tests were conducted to compare ethnic groups' mean scores within the broad socio-economic groups. That is, the Vietnamese parents were compared with Anglo-Celtic Australian Group 1 parents, and Chinese parents were compared with Anglo-Celtic Australian Group 2 parents, for each variable of interest. All alpha levels refer to two-tailed probabilities.

As is evident from Table 4.4, the Vietnamese parents had significantly higher scores than the Anglo-Celtic Australian Group 1 parents for: a) expected mathematics score (t (121.94[5]) = 4.04, $p < .01$); b) mathematics score they would be satisfied with (t (123) = 5.92, $p < .01$); and c) spelling score they would be satisfied with (t (121) = 3.47, $p < .01$). There were no significant differences between the groups for expected spelling score or differential scores, although the difference between the groups for mathematics differential approached significance (t (119) = 1.81, p = .07).

The Chinese and Anglo-Celtic Australian Group 2 parents had similar expectations of their child's likely mathematics and spelling performance (expected scores) but differed in the scores they would be satisfied with. For both mathematics and spelling, the score Chinese parents reported they would be satisfied with was considerably higher than that reported by the Anglo-Celtic Australian Group 2 parents. These differences were significant; for mathematics t (100) = 5.22, $p < .01$) and for spelling t (100) = 4.05, $p < .01$). Given that the groups had similar expected scores but higher satisfied scores among the Chinese parents, it is not surprising that the differential scores were also significantly different. The Chinese parents had significantly larger differentials than the Anglo-Celtic Australian Group 2 parents for both variables; for mathematics differential; t (99) = 3.28, $p < .01$, and for spelling differential; t (99) = 3.12, $p < .01$.

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[5] Levene's test for Equality of Variances was significant and the statistics for unequal variances are presented here.

Table 4.4

Expected, satisfied, and differential scores for child's mathematics and spelling performance among Vietnamese, Chinese, and Anglo-Celtic Australian parents. (Maximum score = 100)

	Ethnic Group											
	Vietnamese			Anglo-Celtic Australian Group 1			Chinese			Anglo-Celtic Australian Group 2		
Variable	M	SD	N	M	SD	N	M	SD	N	M	SD	N
Math Expected	78.95	13.05	53	68.01	17.13	71	80.14	13.81	57	76.38	16.55	50
Math Satisfied	84.82	13.39	55	69.35	15.31	70	87.93	11.07	58	75.57	12.79	44
Math Differential[a]	6.38	14.14	51	1.23	16.37	70	7.75	11.99	57	-2.95	10.56	44
Spelling Expected	76.74	17.83	54	71.49	19.85	70	81.33	13.72	57	80.96	15.70	50
Spelling Satisfied	83.84	16.16	54	73.67	16.12	69	89.22	10.40	58	79.34	14.24	44
Spelling Differential[a]	6.54	11.61	51	1.96	18.26	68	7.71	12.78	57	0.23	10.78	44

[a] Differential = Satisfied score minus expected score.

Low scores

As is evident from the standard deviations in Table 4.4, there was high inter-individual variability for all four variables. This was particularly the case for parents from Anglo-Celtic Australian Group 1. Inspection of the data revealed that a small group of parents gave very low estimates for the mathematics and/or spelling performance they expected their child would obtain or that they would be satisfied with their child achieving. Eighteen parents responded with scores lower than the average mark of 50 for one or more of the four items (expected and satisfied mathematics and spelling scores). Ten of these participants were Anglo-Celtic Australian Group 1 parents, three were Vietnamese parents, two were Chinese parents, and three were Anglo-Celtic Australian Group 2 parents. Although there was no reason to suspect that these estimates were invalid, additional analyses were conducted to determine whether the inclusion of these scores had an undue effect on the group comparisons. Independent samples t tests were conducted to compare ethnic groups excluding scores lower than 50. The results of these analyses were consistent with the previous results such that all ethnic group differences reported above were still highly significant when comparing parents' estimates of 50 and above. In addition, the differences between the Vietnamese and Anglo-Celtic Australian Group 1 parents in mathematics and spelling differentials were significant once scores lower than 50 were excluded from the analyses.[6]

[6] The results of these analyses can be found in Appendix 4.2

4.3.3 Career and educational expectations

As is evident from Table 4.5, the groups differed in parents' preferred career option after completion of secondary school. In order to explore group differences more closely the groups were compared for each option (e.g., complete an apprenticeship). A significantly smaller proportion of Vietnamese parents indicated that they wanted their child to complete an apprenticeship or traineeship compared to Anglo-Celtic Australian Group 1 parents ($\chi 2$ (1, N = 125) = 18.14, p < .01), while significantly more Vietnamese parents than Anglo-Celtic Australian Group 1 parents indicated they wanted their child to attend university ($\chi 2$ (1, N = 125) = 41.64, p < .01). In contrast, a greater proportion of the Anglo-Celtic Australian Group 1 parents indicated they would like their child to attend another tertiary institution, e.g., TAFE, ($\chi 2$ (1, N = 125) = 3.86, p < .05).

Only one group difference was observed when comparing the responses of the Chinese and Anglo-Celtic Australian Group 2 parents; a greater proportion of Chinese parents indicated they would like their child to attend university compared to Anglo-Celtic Australian parents ($\chi 2$ (1, N = 105) = 9.23, p < .01).

Table 4.5

Parents' preferred career option after completion of secondary school - frequencies (with column percentages in parentheses)

	Ethnic Group			
	Vietnamese N = 57	Anglo-Celtic Australian Group 1 N = 68	Chinese N = 55	Anglo-Celtic Australian Group 2 N = 50
Apprenticeship	1 (1.8)	21 (30.9)	1 (1.8)	3 (6)
University	51 (89.5)	22 (32.4)	54 (98.2)	40 (80)
TAFE	4 (7.0)	13 (19.1)	0 (0)	2 (4)
Job	0 (0)	6 (8.8)	0 (0)	1 (2)
Family Business	1 (1.8)	0 (0)	0 (0)	0 (0)
Child's choice[b]	0 (0)	6 (8.8)	0 (0)	4 (8)

Note. Several participants did not complete this question. See text for details.
[b] Child's choice was not an option provided in the questionnaire. A number of parents in the Anglo-Australian groups gave this response for the 'other' category. There were no other responses for this category.

Consistent with the results for career option, there were also ethnic group differences in educational expectations. The descriptive statistics for the educational level parents reported that they would like and expect their child to attain are provided in Table 4.6. The Vietnamese parents reported significantly higher levels of education they would like (preferred attainment) their child to complete compared to the Anglo-Celtic Australian Group 1 parents (t (127) = 1.99, $p < .05$). A similar result was observed for the level of education parents expected their child to complete (expected attainment) (t (125) = 3.17, $p < .05$). Similarly, the Chinese parents had significantly higher ratings than parents from Anglo-Celtic Australian Group 2 for preferred attainment ($t(106) = 2.00$, $p < .05$) and expected attainment ($t(106) = 2.08$, $p < .05$).

Table 4.6

Descriptive statistics for parents' preferred and expected levels of educational attainment for child

	Ethnic Group			
	Vietnamese	Anglo-Celtic Australian Group 1	Chinese	Anglo-Celtic Australian Group 2
Preferred				
N	58	71	58	50
Mean	4.53	4.14	5.31	5.00
SD	1.13	1.11	0.75	0.86
Expected				
N	57	70	58	50
Mean	4.39	3.71	5.14	4.80
SD	1.13	1.23	0.74	0.95

Note. 1 = complete year 10, 6 = complete postgraduate degree.

Educational 'milestones'

Although the means are significantly different, it is evident from Table 4.6 that the obtained values for each ethnic group are similar, such that, for example, both the Vietnamese and Anglo-Celtic Australian Group 1 parents' ratings are in the range of 4 to 5. Moreover, although the data are of ordinal scaling, the distance between points on the scale is not equal.[7] For example, the difference between completion of year 10 and completion of year 11 is clearly not the same as the difference between completion of a Bachelor's degree and completion of a postgraduate degree. Therefore, in order to explore group differences more closely, chi-square analyses were conducted to compare the groups in terms of particular educational 'milestones', for example completion of secondary school and completion of a Bachelor's degree. Due to the high degree of similarity in responses for preferred and expected attainment, only the results for preferred attainment will be reported here.

As is evident from Table 4.7, the results of these analyses indicated significant differences between the Vietnamese and Anglo-Celtic Australian Group 1 parents for completion of a Bachelor's degree ($\chi 2$ (1, N = 129) = 6.32, $p < .05$), such that a greater proportion of Vietnamese parents indicated they would prefer their child to attain this educational level. There were no ethnic group differences for completion of secondary school ($\chi 2$ (1, N = 129) = .81, p = .37) or completion of a postgraduate degree ($\chi 2$ (1, N = 127) = 2.20, p = .14).

There were no significant differences in Chinese and Anglo-Celtic Australian Group 2 parents' responses regarding completion of secondary school ($\chi 2$ (1, N = 108) = .03, p = .85), and completion of a Bachelor's degree ($\chi 2$ (1, N = 108) = 1.56, p = .21). However, there was a significant difference for postgraduate degree ($\chi 2$ (1, N = 108) = 4.35, $p < .05$). As is evident from Table 4.7, more Chinese parents than Anglo-Celtic Australian Group 2 parents desired their child to complete postgraduate study.

[7] Although the measurement of educational expectations is not quantitative, many researchers have used parametric tests with similar scales such as those used in the National Educational Longitudinal Study (NELS) (e.g., Kao, 1995; Goyette & Xie, 1999).

Table 4.7

Parents' preferred levels of educational attainment for child : Group frequencies for educational milestones (with percentages in parentheses)

	Ethnic Group			
	Vietnamese N = 56	Anglo-Celtic Australian Group 1 N = 42	Chinese N = 57	Anglo-Celtic Australian Group 2 N = 46
Complete secondary school	18 (31)	17 (24)	3 (5)	3 (6)
Complete Bachelor's Degree	27 (47)	18 (26)	29 (50)	31 (62)
Complete postgraduate study	11 (19)	7 (10)	25 (43)	12 (24)

Note. These data refer only to selected catgeories, therefore the sample sizes are smaller. The values in parentheses denote the percentage of parents in each group relative to the total number of responses for that group, e.g., 47% of all Vietnamese parents indicated they would prefer their child to complete a Bachelor's degree.

4.3.4 Home environment

Household chores

Both Anglo-Celtic Australian groups expected their children to do significantly more household chores than did the Chinese and Vietnamese parents [$t\ (119) = 6.02$, $p < .01$ for the Vietnamese - Anglo-Australian comparison and $t\ (103) = 4.68$, $p < .01$ for the Chinese - Anglo-Australian comparison]. The number of chores parents expected their child to do was related to whether the child's mother was engaged in paid employment or not. For the entire sample there was a significant difference between working mothers and mothers at home, in the number of chores parents reported that they expected their child to do ($t(199) = 2.28$, $p < .05$).

Table 4.8

Descriptive statistics for number of household chores by ethnic group

	Ethnic Group			
	Vietnamese Australian	Anglo-Celtic Australian Group 1	Chinese Australian	Anglo-Celtic Australian Group 2
N	52	69	55	50
Mean	1.65	2.83	1.89	3.16
SD	1.05	1.07	1.34	1.43
Range	0-5	0-6	0-5	0-6

Television viewing

As described earlier, parents were asked to estimate how much time their child spent watching television per week using time categories, eg. 1-5 hours. Mann-Whitney U tests were conducted to compare parents' estimates across ethnic groups. As is evident from the group frequencies in Table 4.9, the Vietnamese parents gave lower estimates than the Anglo-Celtic Australian Group 1 parents (U (N=128) = 1572, $p < .05$). However, the Anglo-Australian parents' estimates may be less accurate as they were also more likely to indicate that they do not monitor how much television their child watches ($\chi 2$ (1, N = 128) = 8.96, $p < .01$). There was no difference between Vietnamese and Anglo-Australian parents in monitoring the type of programme their child watches ($\chi 2$ (1, N = 128) = 1.42, p = .23).

The Chinese and Anglo-Celtic Australian Group 2 parents generally gave similar estimates of the amount of time their child spends watching television (U (N = 108) = 1287, p = .30). Although a greater proportion of Chinese parents' estimates fell in the lowest category of 1-5 hours per week, the group frequencies were similar for the other categories. Similarly, there were no differences between the Chinese and Anglo-Celtic Australian Group 2 parents in monitoring of amount of time ($\chi 2$ (1, N = 108) = 1.98, p = .16) or type of programmes their child watches ($\chi 2$ (1, N = 108) = 3.06, p = .08).

Table 4.9

Group frequencies for parents' estimates of child's television viewing (hours per week on average)

	Ethnic Group			
	Vietnamese N = 58	Anglo-Celtic Australian Group 1 N = 70	Chinese N = 58	Anglo-Celtic Australian Group 2 N = 50
1-5 hours	17	6	15	5
6-10 hours	14	18	18	21
11-15 hours	10	22	14	15
16-20 hours	12	14	7	6
More than 20 hours	5	10	4	5
Mean rank	56.60	71.04	51.70	57.75
Sum of ranks	3283	4973	2998.50	2887.50

Homework

Participants were also asked to estimate how much time their child spent doing homework using the same ordered categories as those for television viewing. There were significant group differences between the Vietnamese and Anglo-Celtic Australian Group 1 parents in these estimates (U (N = 127) = 1105, $p < .01$), such that the Vietnamese parents gave higher estimates than their Anglo-Celtic Australian peers. As is evident from the group frequencies in Table 4.8, nearly all estimates of homework by the Anglo-Celtic Australian Group 1 parents were in the lowest categories of 1-5 hours and 6 -10 hours. In contrast, the Vietnamese parents' estimates were more evenly spread across the categories and a greater proportion of parents gave estimates in the 11-15 hour category.

A similar result was obtained when comparing the Chinese and Anglo-Celtic Australian Group 2 participants (U (N = 108) = 902, $p < .01$), such that the Chinese parents reported significantly higher estimates than did the Anglo-Celtic Australian Group 2 parents. Again, the majority of the Anglo-Celtic Australian parents gave estimates in the lowest categories of 1-5 and 6-10 hours per week, while more Chinese parents gave estimates of between 11 and 15 hours per week.

A greater proportion (89%) of the Vietnamese parents indicated that there was a place set aside in their house for their child to study compared to the Anglo-Celtic Australian Group 1 parents (77%). However, this difference was not significant ($\chi 2$ (1, N = 127) = 3.33, p = .07). Similarly, there was little difference between the Chinese and Anglo-Celtic Australian Group 2 parents, with 88% of the Chinese parents and 92% for the Anglo-Celtic Australian Group 2 parents indicating that their homes contained a specific place for their children to study ($\chi 2$ (1, N = 108) = .49, p = .49).

Table 4.10

Group frequencies for parents' estimates of child's time spent on homework (hours per week on average)

	Ethnic Group			
	Vietnamese N = 57	Anglo-Celtic Australian Group 1 N = 70	Chinese N = 58	Anglo-Celtic Australian Group 2 N = 50
1-5 hours	19	52	18	31
6-10 hours	19	13	25	17
11-15 hours	16	4	11	1
16-20 hours	2	0	4	1
More than 20 hours	1	1	0	0
Mean rank	79.61	51.29	63.95	43.54
Sum of ranks	4538	3590	3709	2177

4.3.5 Differences between parents of girls and parents of boys

Although there were no hypotheses concerning the role of child's gender in parents expectations, several studies (e.g., Parsons, Adler, Kaczala, & Meece, 1982; Lummis & Stevenson, 1990) have found that parents expect boys to have higher mathematics performance than girls, despite the discovery of very few gender differences in actual mathematics achievement. However, relatively few studies have included investigations of the effects of both gender and ethnicity on parents' expectations. Marjoribanks' (1996) research with Australian families showed that Southern Italian parents had higher educational aspirations for their sons than their daughters but no gender differences were observed among Anglo-Australian or Greek families. Similarly, in their analysis of data from the National Educational Longitudinal Study (NELS) Rigsby, Stull and Morse-Kelley (1997) found larger ethnic group differences than gender differences in educational expectations and family influence factors. Therefore, while the results of previous research do not provide sufficient evidence for precise predictions, it was considered worthwhile to investigate whether parents' responses differed according to the gender of their child.

Several multivariate analyses of variance (MANOVA) were conducted for academic standards (expected, satisfied and differential mathematics and spelling scores), preferred and expected level of educational attainment, and a univariate analysis of variance was conducted for number of chores. In order to explore potential interaction effects, both gender and ethnic group were included as between-subject independent variables.

Academic standards

In addition to a main effect for ethnicity, the results indicated significant main effects for gender for expected mathematics score ($F(1,197) = 4.76$, $p < .05$) and expected spelling score ($F(1,197) = 7.98$, $p < .01$). In general, the parents of female children expected higher performance than the parents of male children. As is evident from the descriptive statistics in Table 4.11, this effect appeared to be most pronounced among the Vietnamese and Anglo-Celtic Australian Group 2 parents. However, the interaction between ethnic group and gender was not significant for either variable ($Fs(3, 197) = 1.25 - 1.67$, $ps > .05$).

Although there was no main effect for gender for parents' satisfied scores, there was a significant interaction between gender and ethnic group for satisfied mathematics scores ($F(3,197) = 3.05$, $p < .05$) and satisfied spelling scores ($F(3,197) = 3.08$, $p < .05$). As is evident from Figures 4.1 and 4.2, the general pattern of results indicates that parents of girls had higher satisfied scores than parents of boys with the exception of parents from the lower SES Anglo-Australian group, for whom the reverse effect was observed. However, as is evident from Figure 4.1, there was little difference between parents of boys and parents of girls in the mathematics performance scores that Chinese parents reported they would be satisfied with. Post-hoc comparisons (independent samples t tests conducted within ethnic groups) revealed that this interaction was primarily due to a significant difference between parents of boys and parents of girls in the Anglo-Celtic Australian Group 2 ($t(39) = 2.16$, $p < .05$). None of the other gender comparisons within ethnic groups for mathematics satisfied scores was significant at an alpha level of 0.05.

As is evident from Figure 4.2, a similar interaction was evident between gender and ethnicity for the spelling scores parents reported they would satisfied be with. Inspection of the means suggested that Vietnamese parents of girls had higher satisfied scores than Vietnamese parents of boys, and the difference among Anglo-Celtic Australian Group 1 parents was smaller than the effect observed for satisfied scores for mathematics performance. However, post-hoc comparisons conducted within ethnic groups revealed no significant differences, although the difference between parents of girls and parents of boys in the Anglo-Celtic Australian Group 2 approached significance ($t(39) = 1.96$, $p = .057$).

Table 4.11

Expected and satisfied scores for girls' and boys' mathematics and spelling performance among Vietnamese, Chinese and Anglo-Celtic Australian parents (Maximum score = 100)

		Ethnic Group											
		Vietnamese			Anglo-Celtic Australian Group 1			Chinese			Anglo-Celtic Australian Group 2		
Variable		M	SD	N	M	SD	N	M	SD	N	M	SD	N
Math Expected	Girls	81.81	13.21	24	68.41	16.82	34	80.83	12.77	27	81.19	12.61	24
	Boys	77.48	12.72	22	67.57	17.88	36	79.65	15.55	27	71.00	19.45	23
Spelling Expected	Girls	81.30	13.83	25	71.42	17.07	33	83.44	13.07	27	86.48	10.94	24
	Boys	71.98	21.11	22	71.32	22.55	36	80.85	13.68	27	73.80	17.40	23
Math Satisfied	Girls	84.62	14.69	26	65.82	18.35	33	88.57	11.69	28	80.00	9.54	19
	Boys	84.77	13.65	22	72.85	11.29	36	87.41	10.66	27	71.59	14.49	22
Spelling Satisfied	Girls	87.10	12.07	25	71.03	17.98	32	90.79	9.62	28	83.50	11.68	19
	Boys	79.09	20.67	22	76.39	14.11	36	88.24	10.47	27	74.98	15.53	22

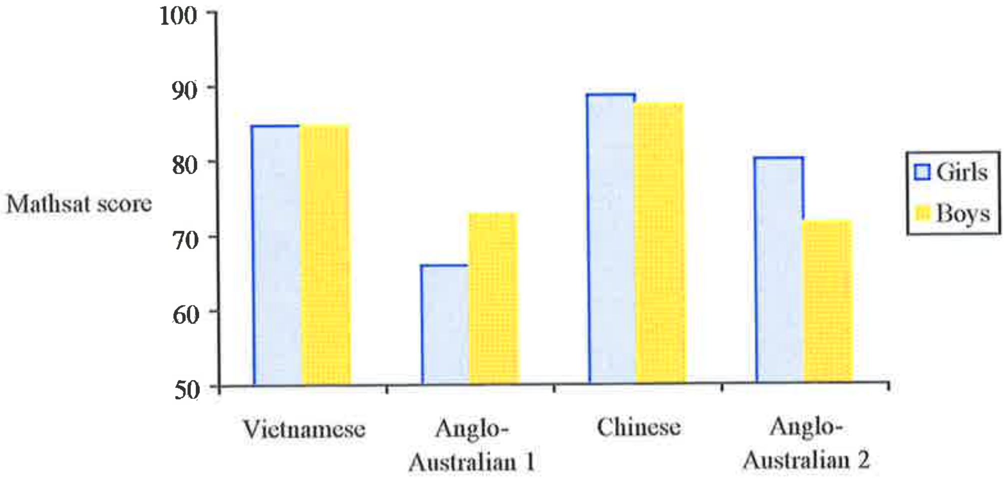

Figure 4.1: Mathematics scores parents would be satisfied with, by ethnic group and gender of child

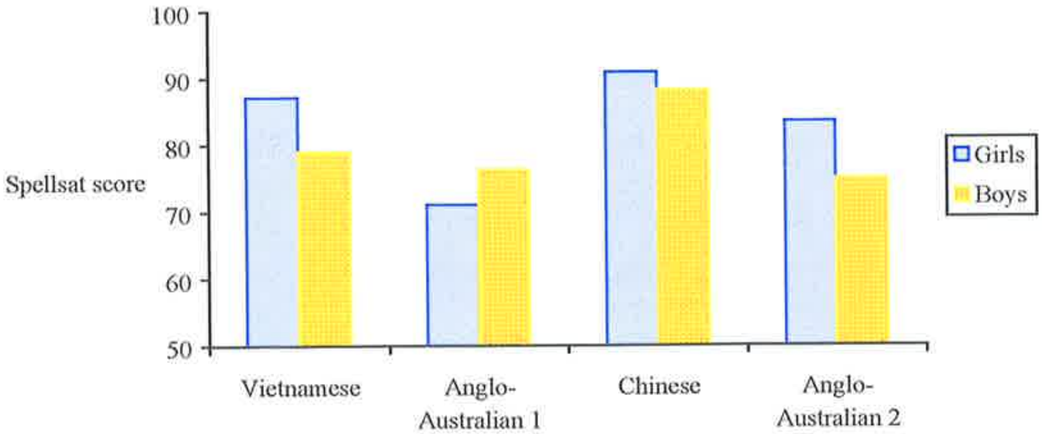

Figure 4.2: Spelling scores parents would be satisfied with, by ethnic group and gender of child

As noted above, the results of some of the post-hoc comparisons of gender differences within ethnic groups approached but did not reach significance. Power analyses were conducted to determine whether the failure to find significant effects was due to insufficient power. Using the procedures described in Keppel (1991) power analyses were conducted for each near-significant result, i.e., gender differences in a) mathsat scores for parents in Anglo-Celtic Australian Group 1, b) spellsat scores for Vietnamese parents, and c) spellsat scores for parents in Anglo-Celtic Australian Group 2. The results of these analyses indicated that these were weak effects and each of the comparisons was relatively under-powered, such that power was approximately equal to .35 for the mathsat analysis, .30 for the spellsat analysis for Vietnamese parents, and .32 for the spellsat analysis for parents from Anglo-Celtic Australian Group 2. Further calculations were conducted to estimate the minimum sample sizes required to detect significant effects of this size with increased power (power = .80). These calculations (also derived from Keppel, 1991) revealed that considerably larger samples would have been required. For the mathsat comparison between parents of girls and parents of boys in the Anglo-Celtic Australian Group 1 100 participants in each group would have been required, while group sizes of 60 would have increased the power in the remaining two comparisons (gender differences in spellsat scores among Vietnamese parents and parents from Anglo-Celtic Australian Group 2). That is, the group sizes required to detect such weak effects range from twice to three times as large as those in the present study.

In light of the finding of ethnic group differences in academic standards (reported in 4.3.2) and the discovery of a significant interaction between gender and ethnicity for these variables, an additional analysis was conducted to determine whether the effect of ethnicity remained after controlling for gender. A multivariate analysis of covariance was conducted for the academic standards variables, with ethnicity as the between-subjects independent variable and gender as the covariate. The results indicated that the effect of ethnicity, reported earlier, was still significant after controlling for the effect of gender.[8]

Educational expectations

A multivariate analysis of variance was also conducted to explore potential gender differences in parents' educational expectations. As with the previous analyses, gender and ethnicity were the between-subject independent variables. The results revealed no significant differences between the expectations of parents of girls and parents of boys for preferred educational attainment ($F\ (1,211) = .30$, $p = .58$) or expected educational attainment ($F\ (1,211) = .38$, $p = .54$). Similarly, there were no significant interactions between gender of child and ethnicity for preferred educational attainment ($F\ (3,211) = 1.42$, $p = .24$) and expected educational attainment ($F\ (3,211) = 1.82$, $p = .14$).

Chores

Finally, a univariate analysis of variance was conducted to check for gender differences in the number of chores parents expected their children to do. The results indicated that there was no significant main effect for gender ($F\ (1,205) = .04$, $p = .83$) and the interation between gender and ethnicity was also nonsignificant ($F\ (3,205) = .01$, $p = .99$).

[8] The results of these analyses can be found in Appendix 4.3.

4.4 Discussion

4.4.1 Ethnic group differences

The results of the study generally supported the hypotheses concerning parents' academic standards, educational expectations and, to a lesser extent, home environment. The Chinese and Vietnamese parents set higher standards for their children's academic performance, particularly in the level of achievement they would be satisfied with. Although the differences between expected and satisfied scores, assumed to be an index of parental standards, were not significantly higher for the Vietnamese parents compared to the Anglo-Celtic Australian Group 1 parents, this may have been due to the fact that the Vietnamese parents also reported higher expected scores and there was considerable variability within groups.

The Chinese and Vietnamese parents' academic standards were similar to those reported by previous researchers (e.g., Chen & Stevenson, 1995; Okagaki & Frensch, 1998; Schneider & Lee, 1990). In particular, despite differences in methodology, the mean scores for performance parents expected and would be satisfied with were similar to those reported by Chen and Stevenson (1995). For example, the mean satisfied score of 92 for Asian American parents reported by these authors is only slightly higher than the present finding of a mean of 88 for Chinese parents. Moreover, their obtained average may be higher due to their use of a higher average class score in their hypothetical scenario (70 compared to 50 in the present study).

The study also demonstrated a persistent preference for university education among Vietnamese and Chinese parents. This result was particularly marked when comparing the Vietnamese and Anglo-Celtic Australian Group 1 parents, and supports both the cultural thesis as well as Sue and Okazaki's (1990) theory of relative functionalism. In particular, the preference for a university education as opposed to other forms of post-secondary education provides indirect support for Sue and Okazaki's hypothesis that there is a perception among Chinese and Vietnamese parents that university education will lead to professional occupations that are safer, i.e., where success and financial reward are less affected by racial discrimination and prejudice. However, because the present study did not investigate parents' reasons for their preference it cannot be concluded that this was the basis for their educational preferences. It is possible that some of the Chinese and Vietnamese parents, particularly more recent migrants, know less about sources of education and training other than universities and this may have affected their preference. For example, Myhill, Herriman and Mulligan (1994) found that the preference for university education among high school students from non-English-speaking backgrounds (NESB) was not necessarily based on accurate information concerning what was necessary for their desired occupation. Therefore, while the results support the hypothesis that Chinese and Vietnamese families value education, the reasons for their preference for university education are not clear.

As described in the results (see Table 4.5), a number of Anglo-Celtic Australian parents from both socio-economic groups responded that the choice of career should be up to their child while none of the Vietnamese or Chinese parents responded in this way. Goodnow and Cashmore (1985) also found that while Australian parents often indicated that their child's future occupation was the child's choice, very few Italian-born parents said this. These authors commented that while this result may be partly due to more traditional values, such as obedience to parents, among the Italian-born families, it is probably also contributed to by parents' reasons for immigration, such that parents who were motivated to emigrate to achieve social mobility may be less likely to allow their children the freedom to choose their occupation. The fact that the present study obtained similar results with different cultural groups lends further support to this argument, which may be interpreted as additional support for Sue and Okazaki's theory of the perceived role of education for social mobility.

The results concerning educational attainment also supported the hypotheses that Chinese and Vietnamese parents have higher educational aspirations and expectations for their children than do Anglo-Celtic Australian parents. These findings are consistent with those of studies conducted with Asian American parents and students (e.g., Fejgin, 1995; Fuligni, 1997; Goyette & Xie, 1999; Kao, 1995), and Australian research with immigrant families (e.g., Bullivant, 1988; Marjoribanks, 1980, 1985, 1996; Myhill, Herriman & Mulligan, 1994). In particular, it was evident that a greater proportion of the Vietnamese parents would like their child to complete a Bachelor's degree than would Anglo-Celtic Australian Group 1 parents. This result is in part due to Anglo-Celtic Australian parents' reported preference for other forms of tertiary education, such as TAFE, as discussed earlier. Therefore, although this result supports the hypothesised higher expectations among the Vietnamese parents, it should be acknowledged that this may be a qualitative rather than quantitative preference, such that the Anglo-Celtic Australian parents' preference is for an *alternative* form of post-secondary education rather than a lower level of educational attainment. Although a Bachelor's degree is generally regarded as a higher form of qualification than a TAFE diploma, the wording of the question may have confounded level with type of education/training.

The Chinese parents also had higher educational expectations than Anglo-Celtic Australian Group 2 parents. More specific comparisons revealed that a greater proportion of Chinese parents indicated that they would like their child to complete a postgraduate degree than did Anglo-Celtic Australian Group 2 parents. Taken together, the Vietnamese and Chinese results suggest that there is an interaction between ethnicity and socio-economic status, such that the educational aspiration effect is most pronounced for families of lower socio-economic background. This may be because of a ceiling effect among the higher SES parents, the majority of whom, consistent with their own educational background, expect their child to complete an undergraduate university degree. Therefore, postgraduate education is the main option that can vary between ethnic groups.

An interaction between ethnicity and SES for educational expectations may also be contributed to by the fairly modest educational expectations among the Anglo-Celtic Australian parents of lower SES. Previous researchers such as Marjoribanks and Bullivant have noted the relatively low aspirations of this group, such that Bullivant (1988) described some of the Anglo-Australian high school students in his study as being "at risk of becoming a new category, namely the *self-deprived*, in the sense of inhibiting their own life chances" (p. 76). While it may be the case that some of the Anglo-Celtic Australian Group 1 children will be disadvantaged by their parents' lower expectations, many of these parents preferred an alternative form of post-secondary education or training that may also result in highly paid occupations. Indeed, the high educational expectations of the Vietnamese parents may result in disappointment in some cases and also restrict their children's options. It should also be noted that despite being employed in lower status occupations, on average, a greater proportion of the Vietnamese parents had completed tertiary education compared to the Anglo-Celtic Australian Group 1 parents. Therefore, for a minority of the Vietnamese parents their educational goals may be a function of their own educational background rather than a socio-cultural effect.

The present findings concerning home environment were mixed. Consistent with the results of previous studies (e.g., Asakawa & Csikszentmihalyi, 1998, Caplan et al ., 1992; Schneider et al., 1994), it appeared that the Chinese and Vietnamese parents expected their children to do fewer household chores than did the Anglo-Celtic Australian parents. It was argued that this is due to the emphasis that these families place on the importance of studying which results in the Chinese and Vietnamese parents removing distractions or obstacles to allow their children to concentrate on their studies. However, as described earlier, this result may have been confounded with ethnic group differences in the number of working mothers. For example, 77% of mothers in the Anglo-Celtic Australian Group 2 were working compared to approximately 45% of Chinese mothers and it was evident that children whose mothers were engaged in paid employment at the time of the study were expected to do more household chores. It is unclear whether the difference in the proportions of working mothers is due to cultural or socio-economic factors because parents were not asked if they were currently seeking employment. It is possible that at least some of the Chinese and Vietnamese mothers had made a conscious decision to stay at home in order to provide support for their children's education and learning. Anecdotal evidence (e.g., Walker, 1994) suggests that many Asian families emigrate in order to provide their children with a good education and secure future and parents are therefore prepared to sacrifice their own careers for the sake of their children. Future studies of the home environment of Chinese and Vietnamese families should include investigations of parents' reasons for emigrating as well as factors influencing their choice (if any) of occupation and employment.

The result concerning household chores was also affected by problems with the assessment of chores such that for some of the Chinese and Vietnamese parents it was not clear how many chores they expected their child to do. Parents were asked to indicate what sort of household tasks they expect their child to do and were provided with several examples. In most cases the Anglo-Celtic Australian parents responded with a list of tasks while several of the Chinese and Vietnamese parents responded with a more general statement such as "I expect her to do little things around the house". This latter type of response was coded as a single task but it may involve several tasks.

With regard to other aspects of the home environment there was some support for the general hypothesis that Chinese and Vietnamese parents will emphasise studying, although the differences between the Chinese and Anglo-Celtic Australian Group 2 parents were small. In particular, according to parents' estimates, Vietnamese and Chinese children spent less time watching television and more time studying than their Anglo-Celtic Australian peers. It was also evident that the Anglo-Celtic Australian Group 2 parents were less likely than Chinese parents to monitor the amount of time their child spent watching television. Together with the results for household chores, these findings support the thesis that Chinese and Vietnamese parents emphasise educational activities at home by removing obstacles to studying.

The average amount of time that parents reported their children were spending on homework were generally consistent with the results of the previous study conducted with school children sampled from the same populations. For example, the majority of the parents in the Anglo-Celtic Australian groups estimated that their children spent between one and five hours per week on average, which is roughly commensurate with the group averages of five hours obtained in the previous study. Similarly, if the parental estimates in the present study were converted to means by using the midpoint of the category (e.g., a score of 3 for the 1-5 category), the average amount of homework time reported by parents would be approximately eight hours for the Vietnamese which is similar to the 8.5 hours reported by the Vietnamese children in the second study. Although, this is clearly a very crude estimate it demonstrates that the parents' responses were roughly consistent with the times reported by the Vietnamese children in the previous study.

With regard to the result concerning television viewing, it should be noted that the present survey did not include questions concerning other non-academic activities such as playing sport and computer games (e.g., Nintendo), an omission that several Anglo-Australian parents commented on in their responses to the questionnaire. Therefore, the results did not comprise a comprehensive picture of children's out of school activities, and future studies of ethnic group differences in home environment should include additional measures of other recreational past-times in order to obtain a more complete picture of relevant characteristics.

While the ethnic groups differed in estimates of time spent on homework and television, there were few differences with regard to parental regulation of television viewing and whether the family home contained a place set aside for studying. Contrary to the hypothesis and previous research (e.g., Schneider et al., 1994), the

Anglo-Celtic Australian parents were not more likely to monitor which programmes their children watched compared to Chinese and Vietnamese parents. Similarly, all groups were approximately equally likely to report that there was a place set aside for their children to do their homework. Although these questions were similar in format to those used in the National Educational Longitudinal Study, the dichotomous response format may have been too crude to assess these factors accurately and future studies should examine them more closely to determine whether there are reliable ethnic group differences in these characteristics of the home environment.

4.4.2 Differences between parents of girls and parents of boys

The results concerning parental academic standards for girls versus boys are difficult to interpret. In general, parents of girls expected higher mathematics and spelling performance than did parents of boys. These results are inconsistent with those of previous research that have generally shown a traditional gender stereotype such that parents expect girls to perform better in language content areas such as reading, writing and spelling, while boys are expected to perform better in mathematics and science (e.g., Eccles, Jacobs & Harold, 1990; Lummis & Stevenson, 1990; Parsons, Adler, Kaczala, & Meece, 1982). However, it should be noted that although the difference in expected mathematics performance between parents of girls and parents of boys was significant, the mean difference was very small for most groups with the exception of the Anglo-Celtic Australian Group 2 parents. Interestingly, these parents also differed in the scores they would be satisfied with their child achieving. Consistent with the result for expected scores, the Anglo-Celtic Australian Group 2 parents of girls reported higher satisfied scores than did parents of boys. A similar effect was observed among the Vietnamese parents. In contrast, the responses of Anglo-Celtic Australian parents of lower SES were consistent with the traditional gender bias, such that they would be satisfied with lower achievement by their daughters than their sons.

It is not clear whether the obtained gender differences in parental standards reflect traditional gender stereotyping because the results are not consistent across the sample or within ethnic groups. Moreover, there were no gender differences in expected educational attainment, a variable that has been found to be influenced by the child's gender and ethnic background (e.g., Marjoribanks, 1996). It should also be noted that the analyses conducted in the present study were comparisons of parents of boys and parents of girls, i.e., different individuals. To fully investigate whether parental standards vary according to the gender of the child, studies should include within-family comparisons i.e., whether parents have different expectations of their son(s) than of their daughter(s). It may be that the results of the present study, which were generally small effects and considerably smaller than the obtained ethnic group differences, are an artefact of the current sample. Indeed, the results of the power analyses confirmed that the interaction effects were small, and considerably larger samples would be required to demonstrate significant gender differences within ethnic groups.

It is also possible that some or all of the gender differences are based on genuine group differences in academic performance. Although the results of previous research have generally revealed few gender differences in achievement in this age range, the absence of an assessment of children's academic achievement in the present study leaves this potential explanation unanswered.

4.4.3 Summary and conclusion

To summarise, the results of the present study generally supported the claim that Chinese and Vietnamese parents have higher academic standards and educational expectations than Anglo-Celtic Australian parents from similar backgrounds. These results are consistent with those from previous research conducted with Asian Americans (e.g., Fuligni, 1997; Goyette & Xie, 1999; Mordkowitz & Ginsburg, 1987; Reglin & Adams, 1990; Schneider & Lee, 1990), and Australian research with immigrant families (e.g., Bullivant, 1988; Marjoribanks, 1980, 1985, 1996; Myhill, Herriman & Mulligan, 1994). It was also evident that Chinese and Vietnamese parents provided a home environment that was supportive of their children's learning and education, such that they expected their children to do fewer household chores than Anglo-Celtic Australian parents, and their children spent less time watching television and more time doing homework than their Anglo-Celtic Australian peers.

CHAPTER 5

General Discussion and Conclusions

5.1 Asian Australians and IQ

Consistent with Flynn's (1989b, 1991a) claim, the present research found little evidence of superior intellectual ability among students from Chinese and Vietnamese backgrounds. The results of the pilot study showed no significant differences between Chinese Australian and Anglo-Celtic Australian University students in performance on the Raven Progressive Matrices. Although the Anglo-Celtic Australian students had higher performance on the ACER test this was substantially due to a significant difference on the verbal component of the test, which the Anglo-Celtic Australian students found comparatively easier than the Chinese Australian students for whom English was a second language. As demonstrated in Chapter 2, the Chinese students' performance on the verbal component was positively related to length of residence in Australia.

The results of Study 2 were less consistent in their evidence for or against the hypothesis of intellectual superiority among persons of Asian background. The study revealed similarities in IQ test performance between the Vietnamese Australian children and their Anglo-Celtic Australian peers but the Chinese Australian children had significantly higher scores on Raven's Progressive Matrices than their Anglo-Celtic Australian counterparts. However, the absolute difference between the means was small (approximately two points out of a maximum score of 60), and the general pattern of results did not suggest superior cognitive ability among the Chinese Australian children.

Taken together, the IQ results of both studies contradict Lynn's (1987) theory of (genetically determined) intellectual superiority among persons from East Asian backgrounds. Although the results of cross-national studies suggest higher mean IQs in Japan and Hong Kong relative to the North American mean, and there is evidence of accelerated generational gains in IQ in some Asian countries (Flynn, 1984, 1987a; Lynn, 1982, Lynn & Hampson, 1986), there remains very little evidence of superior IQ among immigrants from Asian backgrounds. Moreover, the few studies that have shown higher IQs for Asian Americans relative to Anglo-Americans (e.g., Jensen and Whang, 1993, 1994) have only demonstrated the effect with one test for intelligence; Ravens Progressive Matrices. As I shall discuss further in Section 5.5, this test is at the heart of the controversy surrounding the observed generational gains in IQ and researchers such as Flynn (1987a, 1998) have argued that the test is not a pure measure of Spearman's *g* - general intellectual ability - as proposed by Jensen and others.

5.2 An IQ/achievement gap among Asian Australians

With the exception of Stone's (1992) study, the present research appears to be the only example of empirical support for Flynn's (1989a, 1991a) hypothesised IQ/achievement gap for students of Asian background. Although this effect was not evident among a sample of Chinese Australian university students, it was concluded that the sample was too highly selected for ability and achievement to provide an adequate test of the hypothesis. Extension of the investigation to a sample of Australian school children of Chinese and Vietnamese backgrounds revealed a gap between IQ and mathematics achievement for these students, such that they obtained higher mathematics grades than their Anglo-Celtic Australian peers of the same ability. Therefore, the study provided evidence in support of Flynn's claim that IQ cannot cross cultural boundaries.

Poor predictive validity of IQ for the academic achievement of non-Anglo-European samples can be manifested in two primary ways; significant differences between ethnic groups in the intercept and/or the slope of the regression equations used to predict the groups' achievements. If the intercepts of the regression lines are significantly different then, at the same IQ, the average level of achievement for one group is higher than that of the other group. This would mean, for example, that a Chinese Australian child with an IQ of 100 might achieve a B while an Anglo-Australian child with the same IQ might achieve a C+. If the slopes of the regression lines are significantly different (e.g., one may be more steep than the other) then there is evidence of a different relationship between IQ and achievement within groups, i.e., an interaction between ethnicity, IQ and achievement. For example, the differences between the groups in achievement may be higher at higher levels of IQ. In addition, as noted by Horn and Goldsmith (1981), the determination of the selection cut point for the criterion or outcome variable (e.g., academic achievement) can also result in differential predictive validity for different groups when the regression lines are slightly - but not necessarily significantly - nonparallel, and there is no significant difference between the intercepts.

The results of Study 2 provided evidence for the first form of differential predictive validity; a significant difference between ethnic groups in the intercept of the regression equations. That is, ethnicity was a significant predictor of mathematics achievement over and above IQ, but the relationship between IQ and mathematics achievement was similar within ethnic groups, such that the Chinese Australian and Vietnamese Australian school children obtained higher mathematics achievement than their Anglo-Celtic Australian peers of the same ability. Therefore it appears that IQ is a reasonable predictor of mathematics achievement for Australian children from Chinese and Vietnamese backgrounds but the predictive validity of IQ decreases when applied across ethnic/cultural boundaries.

5.3 Explanations for the gap

5.3.1 Test bias

Throughout this thesis the author has accepted the logical distinction drawn by Flynn, that provides two potential explanations for an IQ/achievement gap for Asian Australians; either IQ is not providing an accurate absolute measure of the intellectual abilities of these Asian cultural groups or there are socio-cultural motivational factors that are serving to boost Asian groups' achievements beyond what would be predicted by IQ. The hypothesis of test bias was explored in studies 1 and 2 through the inclusion of alternative measures of cognitive ability; reaction time and inspection time. Although, as argued in Section 5.1 above, the results for IQ test performance did not suggest superior intellectual ability among the students from Asian backgrounds, it is possible that the tests were not providing an accurate measure of the ability of these students due to psychometric bias.

The results of Study 2 provided some support for this hypothesis. The Chinese Australian and Vietnamese Australian school children had significantly faster reaction times than their Anglo-Celtic Australian counterparts. However, there are several problems associated with the interpretation of these results as providing evidence for IQ test bias. First, the information processing speed results were inconsistent, such that the Chinese Australian and Vietnamese Australian children had significantly faster times than their Anglo-Celtic Australian peers for reaction time but not inspection time. In addition, there was little evidence of the more commonly proposed forms of bias such as the linguistic/cultural content of the IQ tests. Moreover, it was argued in Chapter 3 that a socio-cultural explanation could account for the reaction time and inspection time results. It is also questionable whether these tasks are less vulnerable to the effects of cultural and/or linguistic bias than conventional pen and paper tests.

Furthermore, there is considerably less data on the performance of non-Anglo-European samples on these 'speed' measures, and the small amount of research evidence that does exist (e.g., Flynn, 1991b; Jensen & Whang, 1993, 1994; Lynn, Chan, & Eysenck, 1991; Lynn & Shigehisa, 1991) suggests that the relationships between performance on these tasks and IQ is not the same for persons from Asian backgrounds as it is for Anglo-Celtic American or British samples. More simply, it is not clear that these tasks are measuring the same thing in different ethnic/cultural groups and more detailed studies of the factors that influence the performance of persons from non-Anglo/European backgrounds on these tasks is required before we can be confident that they are tapping into the same constructs.

More fundamentally, as noted in Chapter 1, there is considerable debate concerning the processes underlying performance on these chronometric tasks and their relationship with intelligence (Nettelbeck, 1998; Stankov & Roberts, 1997). In particular, Stankov and Roberts (1997) have convincingly argued that the construct of cognitive speed - assumed to be measured by tasks such as inspection time and reaction time - is factorially complex and should not be considered as the primary process underlying intelligence. While the inclusion of measures of inspection time and reaction time in the present research did not depend on the assumption that these measures tap into a basic process of intelligence, it is nonetheless important to recognise that these tasks - which are apparently simple in terms of knowledge requirements - are psychometrically and psychologically complex. Therefore, although they may provide an additional measure of some aspect of mental ability, cross-cultural comparison of performance on such tasks should be interpreted with caution and not assumed to reflect purely elementary cognitive processes.

5.3.2 Socio-cultural motivational factors

The weight of evidence suggested that the observed ethnic group differences in academic achievement were due to the effect of socio-cultural factors on achievement rather than as a consequence of psychometric bias. The results of the second and third studies provided some support for the role of such factors in the achievement of these students. In particular, it was evident that the Chinese and Vietnamese students expended greater effort in their academic studies and had higher occupational aspirations than their Anglo-Celtic Australian peers. However, neither time spent studying nor occupational aspirations accounted for the observed group differences in mathematics achievement. These findings are discussed in more detail below.

i) Student characteristics: Academic behaviour

It was evident that the Australian students from Chinese and Vietnamese backgrounds spent considerably more time studying than their Anglo-Celtic Australian peers. Comparing the results of both studies, it appears that these ethnic differences are weaker at older age groups, such that the ethnicity effect was greater at the primary school level of education than at the university level, and the difference between the Chinese Australian and Anglo-Celtic Australian university students may have been due to a small number of individuals who spent a very large amount of time on their studies. This weaker effect at the university level may be due to self selection for time spent studying among Anglo-Celtic Australian university students. That is, those Anglo-Celtic Australian students who are accepted to university may be students who spent more time on their studies at the secondary and primary levels of education. The weaker ethnic group difference at the tertiary level may also be because of the greater effect that study is likely to have on achievement outcomes at higher levels of education. While it appeared that time on homework had relatively little impact on school grades at the primary level, the importance of studying is likely to increase as students get older, particularly when they enter tertiary education where ability is less likely to distinguish between students who do well and those who do not, due to the more restricted range of ability.

Furthermore, it has been argued that at the primary school level of education the relationship between time spent studying and academic achievement is not a linear one but that homework may operate as a sort of threshold factor whereby it is necessary to complete the minimum set by the teacher in order to get satisfactory grades. However, effort expended beyond that minimum may have little effect on academic outcomes. Using the threshold argument, the extra time that the Chinese and Vietnamese students spent on their studies appeared to be a symptom of the socio-cultural motivation to achieve rather than a cause of achievement. That is, it is the belief in the value of effort that is crucial rather than the behaviour itself.

Therefore, it may be that by the time they reach university the Anglo-Celtic Australian students have narrowed, but not closed, the gap on the students from Chinese and Vietnamese backgrounds in terms of time spent studying. Longitudinal studies and more detailed investigations of the type of study students were actually engaged in may shed more light on this. It would also be worthwhile to investigate the relationship between studying and achievement at the secondary level of education because it may be that study has a greater impact here, particularly in the final two years of schooling when students are striving for high achievement in order to enter their preferred university courses. Perhaps the study habits learned by the Chinese and Vietnamese students at the primary school level pay greater dividends at this later point in their education.

ii) Student characteristics: Occupational aspirations

The second study showed that the Chinese Australian and Vietnamese Australian school children had higher occupational aspirations than their Anglo-Celtic Australian counterparts. Furthermore, these aspirations tended to focus on professional occupations that require tertiary qualifications, such as being a doctor. It may be argued that children aged 10 to 12 years do not have realistic or well-informed career goals; for example, they may aspire to become a professional football player despite demonstrating only average levels of skill in the sport.[1] However, the finding of an overwhelming preference for professional occupations among the Chinese and Vietnamese participants is indicative of a strong motivation for educational success, irrespective of the specific occupation nominated and the longer term validity of these goals.

However, these aspirations did not account for ethnic group differences in mathematics achievement. It is possible that these differences in aspirations reflect cultural differences that are unrelated to students' achievements. For example, it may be that the Chinese and Vietnamese students' responses were essentially a reflection of their parents' aspirations. In contrast, the greater diversity in responses by the Anglo-Celtic Australian children is consistent with the hypothesis that Anglo-Celtic Australian parents were more likely to give their child freedom in the choice of career/occupation. As described in Chapter 4, a number of Anglo-Celtic

[1] Indeed, one participant's response was excluded from the analysis because it ("professional

Australian parents indicated that their child's educational and occupational future was their own choice, while none of the Vietnamese or Chinese parents responded in this way. Therefore, the ethnic group differences in aspirations may reflect socio-cultural differences in parents' child rearing practices and philosophies rather than children's goals that are directly related to academic achievement.

iii) The role of the family

The results of all three studies provided some support for the role of family factors in the achievement motivation of students from Chinese and Vietnamese backgrounds. The first two studies demonstrated that Chinese Australian students were more likely than their Anglo-Celtic Australian peers to regard their parents as an important source of achievement motivation. The results of the survey of parents indicated that Chinese and Vietnamese parents of primary school children had high educational aspirations for their children. In order to achieve these aspirations they expected their children to spend a considerable amount of time studying and expected high levels of academic achievement. There was also some evidence that the Chinese and Vietnamese parents created a home environment that was more conducive to studying, by removing obstacles such as watching television and doing household chores, although they were less likely than Anglo-Celtic Australian parents to provide direct assistance by helping their children with their homework. This latter result may be due to a lack of English proficiency on the part of some parents, although it may also be the case that, as some authors have argued, the type of family support provided by Chinese and Vietnamese families is qualitatively different than that provided by families from Anglo-Celtic backgrounds (e.g., Campbell & Mandel, 1990; Chao, 1994), and does not necessarily involve direct

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hijacker") was not considered a legitimate occupation or a seriously intended career goal.

assistance with academic work (Asakawa & Csikszentmihalyi, 1998).

The present findings concerning the lower aspirations of the Anglo-Celtic Australian Group 1 parents may be some cause for concern. Although it should be remembered that the samples were not random and may not be representative of the population, the general picture of Anglo-Celtic Australian families from lower socio-economic backgrounds is not a very positive one in terms of education and achievement. In many ways, the Anglo-Celtic Australian families of lower SES stood out in the sample, partly because the values and aspirations of the Vietnamese families were more similar to those evident among families of higher socio-economic status (i.e., the Chinese and Anglo-Celtic Australian Group 2 families). In particular, the Anglo-Celtic Australian Group 1 children had lower occupational aspirations and their parents had lower aspirations and expectations for their child's future education, compared with the other three groups. These lower aspirations may limit their children's options. Informal discussion with children from Anglo-Celtic Australian Group 1 revealed that many had apathetic or negative attitudes toward education and there was a commonly held opinion that the employment climate was such that there was little they could do to enhance their employment opportunities. While there is some degree of truth to this, as evidenced by the high rate of unemployment (particularly youth unemployment) in these suburbs which many of the children are likely to have experienced first-hand, these low expectations may create a dangerous self-fulfilling prophecy, as proposed by Bullivant (1988). Moreover, unlike the Vietnamese children, some of the children from this Anglo-Celtic Australian group endorsed the fairly simplistic view that there was little point in attending university because obtaining a university degree no longer guarantees a job. This somewhat fatalistic attitude contrasted sharply with the views of the Vietnamese children, despite the fact that the unemployment rate in the Vietnamese community is currently considerably higher than that among Anglo-Celtic Australians (BIPR, 1994a).

The point of this discussion is not to criticise these parents or children, whose expectations may be considered realistic based on the current employment climate. Moreover, as discussed in the previous chapter, the majority of the Anglo-Celtic Australian parents desired their children to complete some post-secondary education/training and it should be recognised that university education is not the only pathway to financial and social rewards. However, lower aspirations and more general pessimism concerning employment prospects may limit children's options and this should be of concern to educators and indeed, the wider community. There needs to be greater encouragement of and support for children from lower SES backgrounds who have the potential and interest to attend university, as well as other forms of post-secondary education. On the other hand, as discussed in the previous chapter, the Vietnamese and Chinese families may also be unknowingly limiting their children's options, as more recent immigrants may be unaware of the full range of education and training available to their offspring. Therefore, educators and policy makers should make a concerted effort to ensure that parents and children are informed of all of the education and training options available to them.

5.4 Relative functionalism

At the outset of this thesis it was proposed that many of the sociological, cultural and psychological factors assumed to influence the achievements of Asian Americans could be accommodated by Sue and Okazaki's (1990) theory of relative functionalism. To briefly summarise, these authors argued that the educational achievements of Asian Americans should be considered in the social and economic context of their status as immigrants in North America, and therefore that explanations based solely on cultural factors cannot adequately account for the observed achievements. In particular, Sue and Okazaki hypothesised that these 'immigrant' experiences - that are common to many migrant groups, especially those from non-English-speaking backgrounds - result in a greater emphasis on education as a means for social advancement, due to perceptions that formal education and professional occupations are less vulnerable to the effects of racial discrimination and prejudice and reduced English proficiency than other forms of employment (e.g., sport, entertainment). That this emphasis on education appears to be stronger for Asian Americans than other minority groups, and Asian Americans have been more successful in attaining the desired levels of education, may be because of a traditional respect for education and learning that is cultural in basis. Hence, Sue and Okazaki's theory that, for Asian Americans, education is a functional means of achieving social status relative to alternatives, encompasses both sociological and cultural explanations for Asian Americans' educational success.

It was argued that the pattern of Asian migration to and settlement in Australia has been generally similar to that evident in North America, and therefore that Asian immigrants to Australia would have similar motivations and aspirations to those described in the US literature. Therefore the present research included an investigation of Sue and Okazaki's theory with Asian Australian families. The theory was operationalised using their proposed folk theory of success for Asian Americans, which they suggested may be "If I study hard, I can succeed and education is the best way to succeed" (Sue & Okazaki, 1990, p. 919). The belief in the benefits of working hard - the "If I study hard, I can succeed" component - was operationalised in terms of the amount of time Chinese Australian and Vietnamese Australian students spent studying. The belief that education is the best way to succeed was operationalised in terms of the educational and occupational aspirations of the Asian Australian students and parents.

The results provided some support for both components of this folk theory. As summarised earlier (Section 5.3.2), the first two studies demonstrated that Chinese Australian and Vietnamese Australian university and primary school students spent significantly larger amounts of time studying than their Anglo-Celtic Australian peers. Moreover, the finding that the school children had occupational goals that required tertiary education and involved high status/high income professions supported Sue and Okazaki's proposal that education is regarded as the best means for social mobility. This pattern was further confirmed by high educational aspirations for their children's future among Chinese and Vietnamese parents. These aspirations tended to be focussed upon their children attending university and attaining high levels of formal education.

Although the present results support Sue and Okazaki's theory, it may be argued that they also support a cultural explanation in terms of a traditional Confucian commitment to and respect for education and learning. That is, it is possible that a cultural explanation could account for the present results without recourse to the sociological explanation concerning the perceptions of the role of education for social mobility among immigrants from Asian backgrounds. The difficulty in discriminating between the two explanations may be due a lack of clarity in the theory and/or less than perfect operationalisation of components of the theory in the present research. The theory is relatively nonspecific and, as Sue and Okazaki have acknowledged, there is considerable overlap between their theory and cultural explanations. It appears that the key component that may distinguish between the two explanations is the notion that Asian migrants value education not simply for its own sake but as the best means for social advancement. In the present research it was assumed that this could be investigated by asking children about their career goals, and asking parents about their educational aspirations and preferred career choices for their children. Indeed, this appeared to be particularly effective in regard to children's aspiration because the occupational aspirations of the Chinese and Vietnamese school children tended to focus on particular occupations that not only required university education but were also high status and high income professions such as medicine. Other occupations that involve university qualifications and may be regarded as 'learned' occupations - such as scientist, university lecturer, and historian - were not nominated by the Vietnamese and Chinese children. However, in hindsight, a more precise investigation would have included additional questions designed to investigate students' and parents' reasons for these aspirations, and their perceptions of the opportunities available for social mobility. That is, perhaps the questions included in the present research did not probe this issue sufficiently deeply to distinguish conclusively between the two theories.

5.5 Implications for IQ testing and the theory of general mental ability (*g*)

The apparent poor predictive validity of IQ for the mathematics achievement of students from Chinese and Vietnamese backgrounds poses a serious threat to intelligence testing, because the use of the tests has been substantially justified on the basis of their predictive validity. As described in Chapter 1, IQ has been shown to be moderately correlated with school grades, achievement test scores, SAT scores, university grades, and, to a lesser extent, income and occupation, for samples from Anglo-Celtic and European backgrounds (Neisser et al., 1996). These findings have been used to strengthen the case for the usefulness of IQ tests as well as in support of their construct validity, because these achievement and occupational outcomes are assumed to be (at least partly) products of intelligence. Therefore, the discovery of a poor predictive relationship between IQ and achievement for some ethnic groups not only limits the usefulness of the tests but also further casts doubt on the validity of IQ as a measure of intelligence. This problem for IQ testing is compounded by the confirmed generational gains in IQ (Flynn, 1998, 1999; Neisser et al., 1996). It appears that IQ cannot compare groups across temporal or cultural boundaries.

The issue of the construct validity of IQ is exacerbated by Flynn's (1989b) observation that the generational gains in IQ are most marked on tests like Raven's Progressive Matrices. This test, and similar tests such as the Cattell Culture Fair Test for Intelligence, are assumed to be very good measures of general mental ability (*g*), and less vulnerable to the effects of cultural and linguistic bias. The theory of *g* or a single general intelligence factor is largely based on the consistent finding of positive correlations in performance between different IQ tests and measures of cognitive ability (Spearman's 'positive manifold'). Proponents of this theory, notably Jensen (e.g., 1980), have argued that Raven's Matrices is the best measure of *g*, i.e., a relatively pure measure of eduction – advanced by Spearman as the essential core to general intelligence. Flynn's finding that the greatest rates of generational gain are evident on the Matrices suggests that either the test is not as pure a measure of g as Jensen has proposed, or that *g* is not simply or solely 'general intelligence'. The former interpretation is weakened by the considerable empirical evidence that tests such as the Matrices measure a single factor and little else (Flynn, 1999). Therefore, in the psychometric sense, the test provides a very reliable measure of eduction-abstract problem solving. However, if one accepts Flynn's argument that there is little evidence of increases in real-world examples of intelligence – registration of patents, the presence of geniuses and so on - then Flynn's claim that *g* should not be equated with general intelligence is the more plausible of the two interpretations; and the Spearman - Jensen theory of intelligence is in trouble. Interestingly, although Flynn has continued to make this point for more than a decade (see Flynn, 1999), the considerable debate that his discovery has generated has scarcely advanced this issue. focussing instead on possible explanations for the Flynn effect (Neisser, 1998).

Furthermore, it does not appear that these problems for IQ tests can be solved by alternative measures such as the chronometric tasks - reaction time and inspection time- used in the present research (Nettelbeck, 1998; Stankov & Roberts, 1997). As described in Section 5.3.1, research comparing the reaction time performance of persons from different ethnic backgrounds suggests that the relationship between performance on these tasks and IQ may be different for different ethnic/cultural groups and the tasks cannot be assumed to be pure measures of elementary cognitive processes. Even Jensen has acknowledged that one cannot assume that ethnic group differences in performance on speed of processing tasks reflect differences in general intelligence (Jensen & Whang, 1993). Therefore, it would seem that the interpretation of the performance of persons from different ethnic/cultural backgrounds on these chronometric tasks is also problematic.

Moreover, as Stankov and Roberts (1997) have argued, there is now evidence that cognitive speed is no less psychologically complex than IQ test performance. In brief, there are two main aspects to these authors' argument; that cognitive speed is neither a unitary construct nor is it basic to general intelligence. In support of the former claim they cite evidence from their own research (Roberts, 1995 cited in Stankov & Roberts, 1997), demonstrating the existence of four factors within cognitive speed. Moreover, according to the authors, this comprehensive factor analytic study confirmed earlier findings of stronger relationships between speed measures and tasks measuring the (hypothesised) fluid component of intelligence than between speed and tasks measuring crystallised intelligence.[2] As Stankov and Roberts argue, their factor analytic approach is considerably more informative than that of previous research linking speed measures to IQ, which has largely relied upon a single measure of intelligence such as Raven's Progressive Matrices. On the basis of their results and the lack of research supporting the assumption that speed is basic to intelligence, these authors claim that speed is one of several equally important factors underlying general intelligence. Although there is still work to be done to confirm this claim, Stankov and Roberts' (1997) evidence and arguments that speed is not simple nor central to general intelligence are very persuasive.

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[2] These hypothesised components of intelligence are two of several distinct primary abilities proposed to comprise general intelligence in hierarchical models such as Carroll's (1993) three-stratum theory.

5.6 Limitations of the research and methodological issues

5.6.1 Sampling Issues

The generalizability of the results of the present research may be limited by the non-representative nature of the samples. For practical reasons, the studies conducted involved samples of convenience that may not be representative of the populations of interest. Although all schools within the Adelaide metropolitan area with moderate to high enrolments of students from Chinese and Vietnamese backgrounds were initially approached to participate in studies 2 and 3, many school principals declined to participate. In particular, non-government schools were under-represented in the research, due to the high frequency of negative responses by the principals of these schools.[3] This may have affected the representativeness of the samples, particularly in the case of students from Chinese backgrounds as some of these students attend private schools (although this appears to be more common at the secondary level of education than the primary level). Moreover, the participation rate of students from Chinese backgrounds in Study 2 appeared to be negatively affected by the amount of time required by the project, such that several Chinese parents indicated that they did not want their children to miss class time. Therefore, those Chinese students who participated in Study 2 may have been less representative of South Australian school children of Chinese heritage.

The representativeness of the samples was also affected by the size of the obtained samples. The process of recruiting South Australian government school children to participate in research involves three steps for obtaining consent; ethical approval for the project must be obtained from the Department for Education and

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[3] Two non-government schools agreed to participate in the second study. One of these schools was not included in the research because the Asian students attending the school were International students, i.e., temporary Australian residents.

Children's Services (now the Department of Education, Training and Employment); followed by obtaining permission from the relevant school principal; then written parental consent for each child's participation in the study.[4] While this process is primarily and appropriately designed for the protection of the children, it is time consuming and incorporates three points of potential rejection of the research. It was extremely difficult and took a very long time to obtain the data for the second study and this, together with the lower participation rate of Chinese students described above, is reflected in the relatively small sample sizes.

It might usefully be asked whether these difficulties should militate against attempts to pursue such research? The author would wish to argue strongly against this interpretation. Although these sampling issues clearly limit the generalizability of the results, according to census data (e.g., Beer & Cutler, 1995) the samples were approximately representative of the South Australian Chinese and Vietnamese communities for geographical, educational, and, perhaps to a lesser extent, socio-economic, characteristics. Moreover, every effort was made to recruit sufficient participants and the results of the second and third studies did not seem to be affected by lack of statistical power. In addition, despite the practical difficulties described, the research goal of conducting a detailed investigation of predictors of achievement for students from Chinese and Vietnamese backgrounds was achieved. Finally, the statistically significant outcomes were obtained despite relatively small samples, confirming that these were fairly powerful outcomes.

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[4] The policy in South Australian government schools requires that positive consent be obtained, in contrast to default participation, by which all students are included other than those whose parents indicate that they do not want their child to participate.

5.6.2 Methodological issues in cross-cultural research

The present research used ethnicity as a categorical variable, classifying individuals into ethnic groups according to their family's cultural heritage. Although this was done on the basis of several indicators, it became apparent throughout the study that this simple categorisation may have masked some individual variability within cultural groups as well as differences between the Chinese and Vietnamese participants. Although the Asian Australian participants may share a common Confucian cultural heritage, they emigrated from countries with diverse social and political systems, ranging from Vietnam, the People's Republic of China and Hong Kong. It was assumed that the Chinese and Vietnamese families endorsed the value of education for similar reasons, that is, as the best means for social mobility, when the groups may have had different reasons for their preferences. Informal discussions with Vietnamese and Chinese interpreters and teachers suggested that, although the majority of Vietnamese and Chinese parents desired their children to attend university, they may have differed in the university courses they would like their children to complete. Future studies of the relationship between ethnicity and achievement should include investigations of differences between groups, as well as individual differences within groups. The investigation of individual differences within groups could be enhanced by the inclusion of assessment of the extent to which participants adhere to traditional cultural values and practices, i.e., measurement of ethnic identity.

5.6.3 The assessment of academic achievement

Although the results of the second study have been interpreted as providing evidence of a gap between the IQ and mathematics achievement for Chinese Australian and Vietnamese Australian school children, it should be acknowledged that there have been some problems with the measure of academic achievement. As discussed in Chapter 3, teacher ratings of children's achievements may be biased by factors such as the personality and behaviour of the student and potential stereotypes of students from Asian backgrounds. In hindsight, it would have been desirable to have included standardised tests of achievement in addition to teacher assessed school grades. However, the lack of a universally accepted grading system in the schools was not anticipated and, due to practical limitations governing the students' time permitted out of class, achievement tests were not included.

5.6.4 Connecting parent factors to children's achievements

The third study found considerable evidence of cultural differences in factors that are assumed to influence children's achievement. However, it cannot be concluded that these factors were responsible for the higher mathematics achievement among the Chinese and Vietnamese children. While there is an abundance of research showing ethnic group differences in family and home factors that are assumed to contribute to Asian students' academic success, only a few studies have involved an attempt to connect these factors to actual achievement outcomes. It has often been assumed that factors that distinguish ethnic groups and are related to academic achievement within ethnic groups (primarily investigated within Anglo-American groups) can account for achievement differences between groups. This logical fallacy is similar to that evident in the debate concerning group differences in IQ, where it has been claimed that because heredity accounts for some of the variance in IQ within groups, it must therefore account for variance between groups. As discussed in Chapter 1, this argument is both illogical and without empirical support.

However, previous studies that have included parental factors and children's achievement have shown that variables such as parental educational expectations and aspirations do affect Asian American children's performance in mathematics. For example, Campbell and Mandel (1990) identified three parental factors that contributed to the mathematics achievement of Asian American students; parental pressure, parental help (negative relationship), and monitoring/time management. Chen and Stevenson (1995) found that the value placed on education by Asian American students and their parents made a significant contribution to group differences in mathematics achievement between Asian American and Anglo-American students. However, in her analyses of data from the National Educational Longitudinal Study (NELS), Fejgin (1995) found that family factors such as parents' educational expectations contributed to, but did not account entirely for, higher mathematics test scores among Asian American compared to other ethnic groups including Anglo-Americans and African Americans. Kao (1995) also found that Asian Americans still received higher grades than Anglo-Americans after the effects of gender, socio-economic status, family factors (e.g., number of siblings, family communication and home resources) and student characteristics (e.g., limited English proficiency) were controlled for. Finally, Kao and others (e.g., Okagaki & Frensch, 1998; Rigsby, Stull & Morse-Kelley, 1997) have found that the factors that predict individual differences in grades or test scores within Anglo-American samples are not significant predictors for Asian American students' performance.

It is difficult to compare these studies because they included different measures of both student and family characteristics as predictors. Moreover, while some measures of parent factors were provided by the parents themselves (such as the NELS data), other studies relied on students reporting parental expectations (e.g., Chen & Stevenson, 1995; Okagaki & Frensch, 1998). However, several general conclusions can be made. First, parental educational expectations and beliefs in the value of education have been shown to account for at least some of the variance in achievement between Asian American and Anglo-American students, although the effect is weaker for grades compared to standardised test scores. Secondly, the relationships between student and parent characteristics and academic achievement are different for Asian Americans than those for Anglo-Americans, such that traditional predictors of individual differences among Anglo-Americans do not necessarily predict individual differences among Asian Americans and some predictors may have different effects (e.g., parental help has a positive effect in Anglo-American samples but Campbell and Mandel [1990] found a negative effect for Asian-American students). Thirdly, previous research attempts to predict academic performance among Asian-Americans have identified very few significant predictors and future studies should explore other potential influences that may be specific to these ethnic/cultural groups. Finally, predictors of individual differences within ethnic groups are probably not the same as those that account for group differences

5.7 Future research

The preceding discussion of the limitations and implications of the present research has identified several unanswered questions and many potential avenues for future research. With regard to the issue of predictive validity of IQ for the achievements of students from Asian backgrounds, it is clear that there is still much work to be done in investigating the cross cultural validity of IQ tests and chronometric measures such as reaction time and inspection time that have been found to correlate to come extent with psychometric tests. In particular, future studies should further examine the relationship between IQ and performance on these chronometric tasks for different ethnic/cultural groups. It would also be worthwhile to investigate the effects of factors such as practice, motivation/incentive and the use of strategies on performance on measures of processing speed, among different ethnic/cultural groups.

In order to explore the possibility of teacher bias in the form of "positive academic stereotyping" (Hsia & Peng, 1998, p. 333), future studies of the relationship between IQ and academic achievement for students from Chinese and Vietnamese backgrounds should endeavour to include standardised tests of achievement in addition to school grades obtained by teachers' assessments. It would also be worthwhile to investigate Australian teachers' perceptions of students from Asian backgrounds, to determine whether there is evidence of a positive bias toward Asian Australian students. The present findings concerning time spent studying also warrant further attention. Future studies should include an investigation of the type of study students are engaged in and perhaps an investigation of the impact of studying on achievement at the senior secondary level of education.

Finally, as noted earlier, future studies of immigrants and their academic achievements should consider Sue and Okazaki's theory of relative functionalism. Although the present results have provided general support for their theory, Chinese and Vietnamese parents' reasons for their high educational aspirations were unclear. Moreover, an investigation is needed of the perceptions of immigrants (from all ethnic backgrounds) about the opportunities for social mobility available in Australia, because these perceptions may differ from those of migrants to the USA.

5.8 Conclusion

From the preceding discussion it may be seen that the present research has raised more questions than it has answered, and perhaps this is to be expected, given the diversity and complexity of factors associated with academic achievement among ethnic minority groups. Nonetheless, the research has provided one of the few examples of direct evidence for Flynn's hypothesised IQ/achievement gap. It has, besides, challenged Lynn's theory of intellectual superiority among persons from East Asian backgrounds. The research has also demonstrated that the IQ/achievement gap identified here cannot be accounted for by a single factor, such as time spent studying. It is probably the result of an interaction between sociological and cultural factors that enhance motivation for academic success among immigrant families from Chinese and Vietnamese backgrounds. These families were characterised by a strong commitment to the value of education and learning, and a willingness to persevere and expend considerable academic effort in order to succeed.

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List of Appendices

Appendix 2.1: Summary of results including Vietnamese participants (Study 1)

Participants

Eight Vietnamese-Australian students (six females and two males) participated in the pilot study. One of the Vietnamese participants was born in Australia (ie. second generation) while the other seven were born in Vietnam.

Results Summary

Inspection of the data suggested there were two groups within the Vietnamese Australian group, one group of students performing at roughly the same level as the rest of the sample and one group performing substantially lower. However, this observation should be interpreted with caution given the size of the group.

The Vietnamese students performed significantly lower than both the Chinese Australian and Anglo-Celtic Australian groups on the Advanced Progressive Matrices, F (2,43) = 19.27, $p < 0.01$, and the Quantitative component (AQ) of the ACER test, F (2, 45) = 3.94, $p < 0.05$. Although the Vietnamese Australian students' had lower university entrance scores than the other groups, the difference was not significant. There were no significant differences between the groups in performance on the measures of speed of information processing.

The Chinese Australian students in the sample reported spending significantly more time studying than both of the other groups ($F(2,45) = 8.29$, $p < 0.01$), averaging more than 13 hours more per week than Vietnamese Australian students (Chinese students' mean = 25.08 hrs, SD = 11.02 and Vietnamese students' mean = 11.92 hrs, SD = 9.06).

Summary statistics for these comparisons are on the following pages.

Comments

The Vietnamese Australian students were lower in ability and achievement than both the Chinese Australian and Anglo-Celtic Australian students.

This may have been partly due to sampling bias: the majority (seven out of eight) of the Vietnamese Australian students were enrolled at a different university in a variety of courses, most of which require a considerably lower achievement level for entrance. Therefore the Vietnamese group was not comparable with the other ethnic groups from the outset. This factor is likely to have been exacerbated by the very small size of the Vietnamese group (eight participants).

Mean ability and achievement scores of Chinese Australian, Anglo-Celtic Australian, and **Vietnamese Australian** students

Ability and Achievement Measures		**Ethnic Group** Chinese Australian			Anglo-Celtic Australian			**Vietnamese Australian**		
	Max. score	M	SD	n	M	SD	n	M	SD	n
APM[a]	36	28.35	3.90	17	30.05	3.11	21	21.12**	3.48	8
ACER AL-AQ	58	27.28	7.87	18	35.45	7.90	22	21.62	8.26	8
AL only	29	14.17	4.71	18	20.05	3.67	22	12.25	5.70	8
AQ only	29	13.11	5.59	18	15.41	5.27	22	9.37*	4.41	8
Achievement[b]	100	86.15	9.77	17	88.36	8.69	21	79.69	11.50	8

Note. Ability test data are based on raw scores.

[a]Two statistical outliers were excluded from this analysis.

[b]Achievement data refer to Matriculation scores. These data were not available for two participants.

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

Mean Inspection Times (IT) and Reaction Times (RT) in ms, of Chinese Australian, Anglo-Celtic Australian, and **Vietnamese Australian** students.

	Ethnic Group								
	Chinese Australian			Anglo-Celtic Australian			Vietnamese Australian		
Task	M	SD	n	M	SD	n	M	SD	n
IT	82.99	17.77	18	75.40	15.14	22	77.81	27.43	8
RT	397.14	43.88	18	417.42	51.24	22	431.36	45.23	8

Appendix 2.2.1: Demographic and Achievement Motivation Questionnaire (Study 1)

QUESTIONNAIRE FOR DEMOGRAPHIC INFORMATION

The following questionnaire is designed to obtain some background information for the purpose of this study only. All answers will be treated as confidential.

A. INFORMATION ABOUT YOURSELF

1. Your age (in years): ___________

2. Sex: M F

3. What was your Matriculation score? _________

(out of ________)

4. Where were you born?

______________________________ (city/town)

______________________________ (country)

If you weren't born in Australia;

4a. How long have you lived in Australia?

________________________ (months or years)

5. What language(s) is spoken at home?

If you no longer live with your parents, then this question refers to the language spoken in your family home, ie. where you grew up.

____

____

____

6. Do you work part-time/casually?

YES NO

If you answered YES to question 6;

6a. How many hours do you work per week on average?

Please tick the appropriate box.

1 - 5 hours ☐

6 - 10 hours ☐

11 - 15 hours ☐

16 - 20 hours ☐

more than 20 hours ☐

7. Your desire to succeed at University (ie. get high marks) comes from what primary source?

Please rank the following items (from 1 to 5) in terms of how important you think they are as sources of motivation for your academic achievement.

If, for example, you think that 'self-motivation' is the **most important** source of motivation for you, and then parental pressure is the **second most important**, then peer pressure, then competitiveness, then getting a high paying job, then you would place a **1** in the box for self-motivation and a **2** in the box for parental pressure, a **3** in the box for peer pressure and so on. Be sure to put a number in at least the first five boxes below to indicate your preferred ranking.

If there are other factors which you think are important but I haven't included them in the list then put them in the category 'other', explain what they are and rank them accordingly. If you use the 'other' category, you will have at least six boxes in which to place a number.

Please remember to put a number in every box.

	Ranking
parental pressure	☐
self motivation	☐
competitiveness	☐
peer pressure	☐
to get a high-paying job	☐
other (please specify)	☐

____

____

7a. Please explain why you have ranked them in that order.

____

____

____

____

____

____

8. Who or what has been the most influential factor in your choice of career?

Please rank the following items (like you did for the last question) in terms of how important you think they have been as influences on your choice of career. You must put a number in at least each of the first five boxes.

Again, if you use the 'other' category, you will use at least six boxes.

	Ranking
parents	☐
your interests	☐
money	☐
job prestige	☐
peer pressure	☐
other (please specify)	☐

____

8a. Please explain why you have ranked them in that order.

____

____

____

____

____

____

9. How many hours of television do you watch per week on average?

1 - 5 hours ☐

6 - 10 hours ☐

11 - 15 hours ☐

16 - 20 hours ☐

more than 20 hours ☐

B. INFORMATION ABOUT YOUR FAMILY

1. Your mother's place of birth:

________________________________ (city/town)

________________________________ (country)

If your mother was <u>not</u> born in Australia;

1a. How long has she lived in Australia?

__________________________ (months or years)

2. What is her occupation?

____

3. Your mother's level of education:

Please tick the box next to the <u>highest</u> level of education your mother has completed.

primary school ☐

secondary (high) school ☐

tertiary (eg. University) ☐

4. Your father's place of birth:

______________________________ (city/town)

______________________________ (country)

If your father was <u>not</u> born in Australia;

4a. How long has he lived in Australia?

________________________ (months or years)

5. What is his occupation?

____

6. Your father's level of education.

Please tick the box next to the highest level of education your father has reached.

primary school ☐

secondary (high) school ☐

tertiary (eg. University) ☐

7. How many brothers and/or sisters do you have and how old are they?

_________ brother(s) age(s): ______________________

_________ sister(s) age(s): ______________________

Thank you very much for your assistance.

Appendix 2.2.2: Causal Attributions Questionnaire (Study 1)

CAUSAL ATTRIBUTIONS OF SUCCESS AND FAILURE

On the following pages there are descriptions of four students sitting for end of year exams at University. I would like you to read the description of each student carefully. Then you must indicate to what extent you agree or disagree with the statements about the student's chances of doing well in the exams or failing the exams. You must place a tick somewhere along the agree-disagree scales that appear for each student as well as the confidence scales that ask you how sure you are about your answers. There are nine rating scales on each page. It is important that you do all of them. Now please turn over and begin the exercise.

Tom is 18 years old and in his first year at University. He lives with his parents and brother and sister in a modest house. He is a 'second generation Australian' - his grandparents migrated to Australia from England in the 1940s. Tom is about to sit his end of year exams.

<u>If Tom does well in the exams it is likely to be because</u>

1. he is naturally bright and intelligent

Agree ___ ___ ___ ___ ___ ___ ___ **Disagree**
1 2 3 4 5 6 7

2. he studied extremely hard

Agree ___ ___ ___ ___ ___ ___ ___ **Disagree**
1 2 3 4 5 6 7

3. he was lucky

Agree ___ ___ ___ ___ ___ ___ ___ **Disagree**
1 2 3 4 5 6 7

4. the exams were easy

Agree ___ ___ ___ ___ ___ ___ ___ **Disagree**
1 2 3 4 5 6 7

5. he was highly motivated

Agree ___ ___ ___ ___ ___ ___ ___ **Disagree**
1 2 3 4 5 6 7

6. his family is very supportive

Agree ___ ___ ___ ___ ___ ___ ___ **Disagree**
1 2 3 4 5 6 7

7. his friends are very supportive

Agree ___ ___ ___ ___ ___ ___ ___ **Disagree**
1 2 3 4 5 6 7

8. he is very interested in his course

Agree ___ ___ ___ ___ ___ ___ ___ **Disagree**
1 2 3 4 5 6 7

9. how confident are you of your answers

Not at all ___ ___ ___ ___ ___ ___ ___ **Completely**
1 2 3 4 5 6 7

<u>If Tom fails the exams it is likely to be because</u>

1. he is not naturally bright and intelligent

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

2. he did not study hard enough

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

3. he was unlucky

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

4. the exams were too difficult

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

5. he was not very motivated

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

6. his family is not very supportive

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

7. his friends are not very supportive

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

8. he is not very interested in his course

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

9. how confident are you of your answers

Not at all ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Completely**

Chen is 18 years old and in his first year at University. He was four years old when his parents migrated to Australia from China with his baby sister Mei-lin. They enjoy the Australian lifestyle but now and again they yearn for their homeland. Chen is about to sit his end of year exams.

<u>If Chen does well in the exams it is likely to be because</u>

1. he is naturally bright and intelligent

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

2. he studied extremely hard

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

3. he was lucky

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

4. the exams were easy

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

5. he was highly motivated

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

6. his family is very supportive

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

7. his friends are very supportive

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

8. he is very interested in his course

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

9. how confident are you of your answers

Not at all ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Completely**

<u>If Chen fails the exams it is likely to be because</u>

1. he is not naturally bright and intelligent

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

2. he did not study hard enough

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

3. he was unlucky

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

4. the exams were too difficult

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

5. he was not very motivated

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

6. his family is not very supportive

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

7. his friends are not very supportive

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

8. he is not very interested in his course

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

9. how confident are you of your answers

Not at all ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Completely**

Michelle is 18 years old and in her first year at University. She lives with her parents and brother and sister in a modest house. She is a 'second generation Australian' - her grandparents migrated from England to Australia in the 1940s. She is about to sit her end of year exams.

<u>If Michelle does well in the exams it is likely to be because</u>

1. she is naturally bright and intelligent

Agree ___1 ___2 ___3 ___4 ___5 ___6 ___7 **Disagree**

2. she studied extremely hard

Agree ___1 ___2 ___3 ___4 ___5 ___6 ___7 **Disagree**

3. she was lucky

Agree ___1 ___2 ___3 ___4 ___5 ___6 ___7 **Disagree**

4. the exams were easy

Agree ___1 ___2 ___3 ___4 ___5 ___6 ___7 **Disagree**

5. she was highly motivated

Agree ___1 ___2 ___3 ___4 ___5 ___6 ___7 **Disagree**

6. her family is very supportive

Agree ___1 ___2 ___3 ___4 ___5 ___6 ___7 **Disagree**

7. her friends are very supportive

Agree ___1 ___2 ___3 ___4 ___5 ___6 ___7 **Disagree**

8. she is very interested in her course

Agree ___1 ___2 ___3 ___4 ___5 ___6 ___7 **Disagree**

9. how confident are you of your answers

Not at all ___1 ___2 ___3 ___4 ___5 ___6 ___7 **Completely**

<u>If Michelle fails the exams it is likely to be because</u>

1. she is not naturally bright and intelligent

Agree ___1 ___2 ___3 ___4 ___5 ___6 ___7 **Disagree**

2. she did not study hard enough

Agree ___1 ___2 ___3 ___4 ___5 ___6 ___7 **Disagree**

3. she was unlucky

Agree ___1 ___2 ___3 ___4 ___5 ___6 ___7 **Disagree**

4. the exams were too difficult

Agree ___1 ___2 ___3 ___4 ___5 ___6 ___7 **Disagree**

5. she was not very motivated

Agree ___1 ___2 ___3 ___4 ___5 ___6 ___7 **Disagree**

6. her family is not very supportive

Agree ___1 ___2 ___3 ___4 ___5 ___6 ___7 **Disagree**

7. her friends are not very supportive

Agree ___1 ___2 ___3 ___4 ___5 ___6 ___7 **Disagree**

8. she is not very interested in her course

Agree ___1 ___2 ___3 ___4 ___5 ___6 ___7 **Disagree**

9. how confident are you of your answers

Not at all ___1 ___2 ___3 ___4 ___5 ___6 ___7 **Completely**

Mei is 18 years old and in her first year at University. She was two years old when her parents migrated from China to Australia with her older brother Chou. They enjoy the Australian lifestyle but now and again they yearn for their homeland. Mei is about to sit her end of year exams.

<u>If Mei does well in the exams it is likely to be because</u>

1. she is naturally bright and intelligent

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

2. she studied extremely hard

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

3. she was lucky

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

4. the exams were easy

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

5. she was highly motivated

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

6. her family is very supportive

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

7. her friends are very supportive

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

8. she is very interested in her course

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

9. how confident are you of your answers

Not at all ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Completely**

<u>If Mei fails the exams it is likely to be because</u>

1. she is not naturally bright and intelligent

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

2. she did not study hard enough

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

3. she was unlucky

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

4. the exams were too difficult

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

5. she was not very motivated

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

6. her family is not very supportive

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

7. her friends are not very supportive

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

8. she is not very interested in her course

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

9. how confident are you of your answers

Not at all ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Completely**

Now I would like you to do something slightly different. Instead of rating the chances of a fictitious or imaginary student, I would like you to indicate how you feel about your own chances of success in the upcoming end of year exams.

If **you** do well in the exams it is likely to be because

1. you are naturally bright and intelligent

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

2. you studied extremely hard

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

3. you were lucky

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

4. the exams were easy

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

5. you were highly motivated

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

6. your family is very supportive

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

7. your friends are very supportive

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

8. you are very interested in your course

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

9. how confident are you of your answers

Not at all ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Completely**

If **you** fail the exams it is likely to be because

1. you are not naturally bright and intelligent

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

2. you did not study hard enough

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

3. you were unlucky

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

4. the exams were too difficult

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

5. you were not very motivated

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

6. your family is not very supportive

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

7. your friends are not very supportive

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

8. you are not very interested in your course

Agree ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Disagree**

9. how confident are you of your answers

Not at all ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 **Completely**

Appendix 2.3: Summary of test-retest correlations for questionnaire items (Study 1)

Test-retest Correlation coefficients (N = 56)

Question		
1. achievement motivation	**Pearson**	**Spearman**
money	.6379	.6542
competitiveness	.6987	.6850
parents' expectations	.8173	.8212
peers' expectations	.5590	.5393
self satisfaction	.6758	.5988
2. career choice		
money	.6881	.6825
interest	.6761	.6307
parents' expectations	.6978	.6982
peers' expectations	.5787	.6395
job prestige	.5634	.5785
3. Parent interest in study	.9084	.8651
4. TV viewing per week	.8105	.8257

Appendix 2.4: Example pages from study diary (Study 1)

STUDY DIARY

The following tables are designed for you to record how much study you do on a daily basis, over a four-week span. For each week there are two separate tables - a 'day' and a 'night' table. The 'day' table applies to study you do between 7 o'clock in the morning and 5 o'clock in the afternoon. The 'night' table applies from 5 o'clock in the afternoon until 2 o'clock in the morning (if you study that late!). The time slots are 30 minutes each. Please tick a box if you have studied for that time period for that day. Probably the easiest and quickest way to do it is to fill out each column at the end of each day. It shouldn't take more than five minutes (per day).

Example only:

For example, if you studied from 8 am until 10 am on every day of the first week, then your sheet would look like this:

Week 1:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
7.00 - 7.30							
7.30 - 8.00							
8.00 - 8.30	✓	✓	✓	✓	✓	✓	✓
8.30 - 9.00	✓	✓	✓	✓	✓	✓	✓
9.00 - 9.30	✓	✓	✓	✓	✓	✓	✓
9.30 -10.00	✓	✓	✓	✓	✓	✓	✓
10.00 - 10.30							
10.30 - 11.00							
11.00 - 11.30							
11.30 - 12.00							
12.00 - 12.30							
12.30 - 1.00							
1.00 - 1.30							
1.30 - 2.00							
2.00 - 2.30							
2.30 - 3.00							
3.00 - 3.30							
3.30 - 4.00							
4.00 - 4.30							
4.30 - 5.00							

Week 1 - Week beginning Monday 2nd May

During the day (from 7 am to 5 pm)

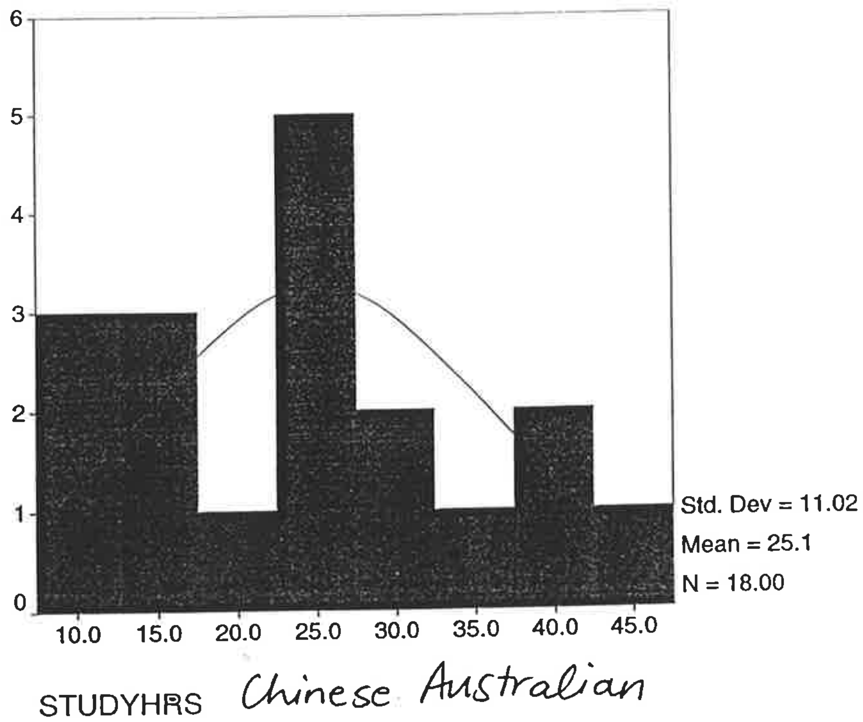
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
7.00 - 7.30							
7.30 - 8.00							
8.00 - 8.30							
8.30 - 9.00							
9.00 - 9.30							
9.30 -10.00							
10.00 - 10.30							
10.30 - 11.00							
11.00 - 11.30							
11.30 - 12.00							
12.00 - 12.30							
12.30 - 1.00							
1.00 - 1.30							
1.30 - 2.00							
2.00 - 2.30							
2.30 - 3.00							
3.00 - 3.30							
3.30 - 4.00							
4.00 - 4.30							
4.30 - 5.00							

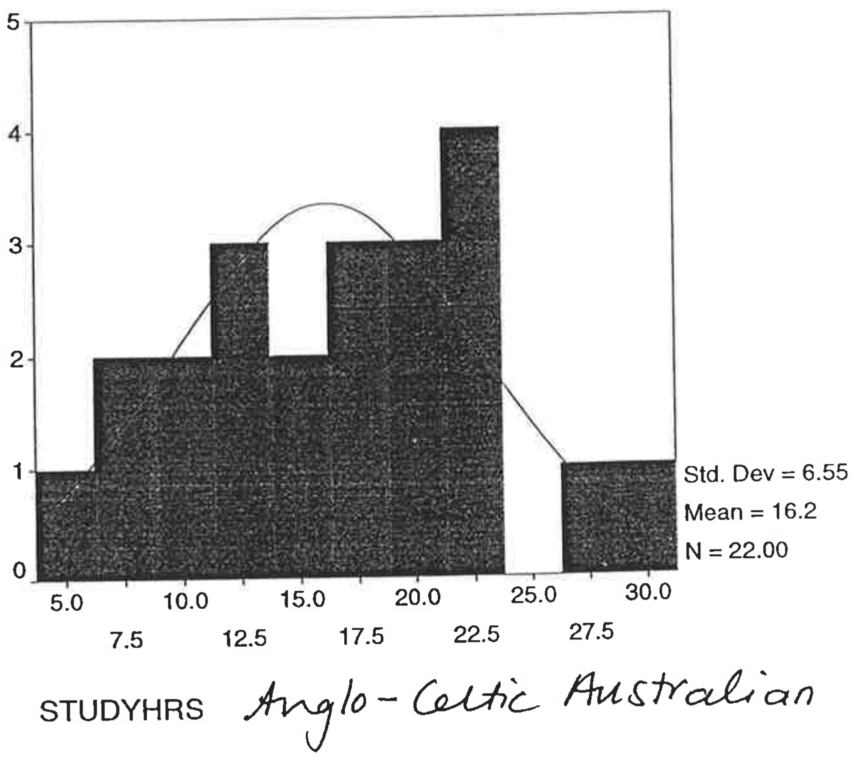
<u>Week 1</u>

During the evening (from 5 pm to 2 am)

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
5.00 - 5.30							
5.30 - 6.00							
6.00 - 6.30							
6.30 - 7.00							
7.00 - 7.30							
7.30 - 8.00							
8.00 - 8.30							
8.30 - 9.00							
9.00 - 9.30							
9.30 - 10.00							
10.00 - 10.30							
10.30 - 11.00							
11.00 - 11.30							
11.30 - 12.00							
12.00 - 12.30							
12.30 - 1.00							
1.00 - 1.30							
1.30 - 2.00							

Appendix 2.5: Frequency distributions for study diary data





Appendix 3.1: School Performance Measure

School Research Project
Justine Dandy

School Performance Measure

Student's Name ______________________________ Year Level _____________

Class Teacher ______________________________

Levels:

1 = a **beginning** level of achievement and understanding

2 = a **basic** level of achievement and understanding

3 = a **competent** level of achievement and understanding **but still a few problems**

4 = a **competent** level of achievement and understanding

5 = an **above-average** level of achievement and understanding

6 = an **extended** level of achievement and understanding

CURRICULUM AREA	**1**	**2**	**3**	**4**	**5**	**6**
1. Language						
- Oral language						
- Listening and reading						
- Spelling						
- Written language						
2. Mathematics						
- Development of concepts in number, space and measurement						
- Ability to reason and solve problems						
3. Society and Environment (Social Studies)						
4. Science						
5. Art,craft, music and drama						

Please tick to indicate whether the student is also receiving ESL instruction:

	YES	NO
6. ESL		

Appendix 3.2: Correlations among curriculum areas (school performance measure)

Correlations

		teacher ratings of competence in oral language	teacher ratings - listening and reading
teacher ratings of competence in oral language	Pearson Correlation	1.000	.752**
	Sig. (2-tailed)	.	.000
	N	160	160
teacher ratings - listening and reading	Pearson Correlation	.752**	1.000
	Sig. (2-tailed)	.000	.
	N	160	160
SPELL2	Pearson Correlation	.634**	.817**
	Sig. (2-tailed)	.000	.000
	N	160	160
teacher ratings - written language	Pearson Correlation	.698**	.866**
	Sig. (2-tailed)	.000	.000
	N	160	160
mathematics -	Pearson Correlation	.499**	.593**
	Sig. (2-tailed)	.000	.000
	N	160	160
maths - problem solving	Pearson Correlation	.567**	.613**
	Sig. (2-tailed)	.000	.000
	N	160	160
SCIENCE2	Pearson Correlation	.587**	.549**
	Sig. (2-tailed)	.000	.000
	N	159	159
SOCST2	Pearson Correlation	.726**	.722**
	Sig. (2-tailed)	.000	.000
	N	160	160

Correlations

		SPELL2	teacher ratings - written language
teacher ratings of competence in oral language	Pearson Correlation	.634**	.698**
	Sig. (2-tailed)	.000	.000
	N	160	160
teacher ratings - listening and reading	Pearson Correlation	.817**	.866**
	Sig. (2-tailed)	.000	.000
	N	160	160
SPELL2	Pearson Correlation	1.000	.855**
	Sig. (2-tailed)	.	.000
	N	160	160
teacher ratings - written language	Pearson Correlation	.855**	1.000
	Sig. (2-tailed)	.000	.
	N	160	160
mathematics -	Pearson Correlation	.630**	.612**
	Sig. (2-tailed)	.000	.000
	N	160	160
maths - problem solving	Pearson Correlation	.642**	.627**
	Sig. (2-tailed)	.000	.000
	N	160	160
SCIENCE2	Pearson Correlation	.598**	.578**
	Sig. (2-tailed)	.000	.000
	N	159	159
SOCST2	Pearson Correlation	.705**	.747**
	Sig. (2-tailed)	.000	.000
	N	160	160

Correlations

		mathematics -	maths - problem solving
teacher ratings of competence in oral language	Pearson Correlation	.499**	.567**
	Sig. (2-tailed)	.000	.000
	N	160	160
teacher ratings - listening and reading	Pearson Correlation	.593**	.613**
	Sig. (2-tailed)	.000	.000
	N	160	160
SPELL2	Pearson Correlation	.630**	.642**
	Sig. (2-tailed)	.000	.000
	N	160	160
teacher ratings - written language	Pearson Correlation	.612**	.627**
	Sig. (2-tailed)	.000	.000
	N	160	160
mathematics -	Pearson Correlation	1.000	.859**
	Sig. (2-tailed)	.	.000
	N	160	160
maths - problem solving	Pearson Correlation	.859**	1.000
	Sig. (2-tailed)	.000	.
	N	160	160
SCIENCE2	Pearson Correlation	.656**	.683**
	Sig. (2-tailed)	.000	.000
	N	159	159
SOCST2	Pearson Correlation	.675**	.713**
	Sig. (2-tailed)	.000	.000
	N	160	160

Correlations

		SCIENCE2	SOCST2
teacher ratings of competence in oral language	Pearson Correlation	.587**	.726**
	Sig. (2-tailed)	.000	.000
	N	159	160
teacher ratings - listening and reading	Pearson Correlation	.549**	.722**
	Sig. (2-tailed)	.000	.000
	N	159	160
SPELL2	Pearson Correlation	.598**	.705**
	Sig. (2-tailed)	.000	.000
	N	159	160
teacher ratings - written language	Pearson Correlation	.578**	.747**
	Sig. (2-tailed)	.000	.000
	N	159	160
mathematics -	Pearson Correlation	.656**	.675**
	Sig. (2-tailed)	.000	.000
	N	159	160
maths - problem solving	Pearson Correlation	.683**	.713**
	Sig. (2-tailed)	.000	.000
	N	159	160
SCIENCE2	Pearson Correlation	1.000	.660**
	Sig. (2-tailed)	.	.000
	N	159	159
SOCST2	Pearson Correlation	.660**	1.000
	Sig. (2-tailed)	.000	.
	N	159	160

**. Correlation is significant at the 0.01 level (2-tailed).

Appendix 3.3: Demographic and Achievement motivation questionnare (Study 2)

QUESTIONNAIRE FOR DEMOGRAPHIC INFORMATION AND ACADEMIC ATTITUDES AND BELIEFS

The following questionnaire is designed to obtain some background information for the purpose of this study only. All answers will be treated as confidential.

A. INFORMATION ABOUT YOURSELF

1. Your age (in years): ___________

2. Sex: M F

3. Do you consider yourself (please circle the cultural group with which you identify)**:**

Chinese Australian or Chinese
Vietnamese Australian or Vietnamese
Anglo-Australian
other cultural group (please specify); ____________________

4. Where were you born?

_________________________________ (city/town)
_________________________________ (country)

[If you weren't born in Australia];
4a. How long have you lived in Australia?

__________________________ (months or years)

5. What language(s) is spoken at home?
If you no longer live with your parents, then this question refers to the language spoken in your family home, ie. where you grew up.

____
____

This page is for Chinese and Vietnamese students only. If you are not Chinese or Vietnamese then go straight to the next page.

6. How confident are you about your Chinese language skills?
Please rate your confidence on the following scale of 0 to 4, where 0 means no confidence and 4 means very confident;

0	**1**	**2**	**3**	**4**
no confidence	not very confident	average confidence	pretty confident	very confident

6a. Can you read or write Chinese?
Please circle the option that best describes your Chinese language skills.

YES I can read Chinese
YES I can read <u>and</u> write Chinese
NO I can't read or write Chinese

7. How confident are you about your Vietnamese language skills?
Please rate your confidence on the following scale of 0 to 4, where 0 means no confidence and 4 means very confident;

0	**1**	**2**	**3**	**4**
no confidence	not very confident	average confidence	pretty confident	very confident

7a. Can you read or write Vietnamese?
Please circle the option that best describes your Vietnamese language skills.

YES I can read Vietnamese
YES I can read <u>and</u> write Vietnamese
NO I can't read or write Vietnamese

All questions from this page onwards are for __all__ students.

8. How confident are you about your __English__ language skills?
Please rate your confidence on the following scale of 0 to 4, where 0 means no confidence and 4 means very confident.

0	**1**	**2**	**3**	**4**
no confidence	not very confident	average confidence	pretty confident	very confident

9. How many hours of television do you watch per week on average?

1 - 5 hours ☐

6 - 10 hours ☐

11 - 15 hours ☐

16 - 20 hours ☐

more than 20 hours ☐

10. Do you plan to go to University or College after high school?

YES NO

11. What are your career goals, ie. what sort of job would you like to have when you grow up?

____

____

____

____

____

____

12. What do you do after school and on weekends?
Please tick the boxes next to the options which apply to you - you can tick as many as you like.

play sport ☐

learn a musical instrument eg. the piano ☐

read ☐

listen to music ☐

hang out with friends ☐

watch videos/ go to the cinema ☐

play on computer or Nintendo/Sega system ☐

religious activities eg. going to church ☐

work eg. in the family business ☐

attend another school /other classes ☐

visit family friends and relatives ☐

13. Your desire to succeed at school (ie. get high marks) comes from what primary source?

Please rank the following items (from 1 to 5) in terms of how important you think they are as sources of motivation for your academic achievement.

If, for example, you think that 'self-motivation' is the **most important** source of motivation for you, and then parents' expectations is the **second most important**, then friends' expectations, then competitiveness, then getting a high paying job, then you would place a **1** in the box for self-motivation and a **2** in the box for parents' expectations, a **3** in the box for friends' expectations and so on. Be sure to put a number in at least the first five boxes below to indicate your preferred ranking.

If there are other factors which you think are important but I haven't included them in the list then put them in the category 'other', explain what they are and rank them accordingly. If you use the 'other' category, you will have at least six boxes in which to place a number.

Please remember to put a number in every box.

	Ranking
parents' expectations	☐
self motivation	☐
competitiveness	☐
friends' expectations	☐
to get a high-paying job	☐
other (please specify)	☐

____

____

____

13b. Please explain why you have ranked them in that order.

____

____

____

____

____

____

____

14. To what degree do your parents show an interest in your homework?

Do they ask how you are going in school?	YES	NO
Do they look at your school diary?	YES	NO
Do they help you with your homework?	YES	NO
Do they read to you?	YES	NO

15. How confident are you that you will be successful in school?
Please rate your confidence on the following scale of 0 to 4, where 0 means no confidence and 4 means very confident.

0	**1**	**2**	**3**	**4**
no confidence	not very confident	average confidence	pretty confident	very confident

16. How many brothers and/or sisters do you have and how old are they?

_________ brother(s) age(s): ______________________

_________ sister(s) age(s): ______________________

Appendix 3.4: Example pages from study diary (Study 2)

STUDY DIARY

The following tables are designed for you to record how much study (ie. homework and any additional study) you do on a daily basis, over a four-week span. There are two tables for each week, a 'school-week' table and a weekend table. The time slots are 30 minutes each. Please tick a box if you have done study for that time slot for that day. If you study at times other than those provided in the tables then cross out the times and enter your own. Probably the easiest and quickest way to do it is to fill out each column at the end of each day. It shouldn't take more than five minutes (per day).

Example only:

For example, if you studied from 7 am until 9 am on every week day of the first week, then your sheet would look like this:
Week 1:

	Time	Monday	Tuesday	Wednesday	Thursday	Friday
Before School	7.00 - 7.30	✓	✓	✓	✓	✓
	7.30 - 8.00	✓	✓	✓	✓	✓
	8.00 - 8.30	✓	✓	✓	✓	✓
	8.30 - 9.00	✓	✓	✓	✓	✓
(School)						
After school	3.30-4.00					
	4.00-4.30					
	4.30-5.00					
	5.00-5.30					
	5.30-6.00					
	6.00-6.30					
	6.30-7.00					
Evening	7.00-7.30					
	7.30-8.00					
	8.00-8.30					
	8.30-9.00					
	9.00-9.30					
	9.30-10.00					
	10.00-10.30					
	10.30-11.00					

Week 1 - Week beginning: ....

	Time	Monday	Tuesday	Wednesday	Thursday	Friday
Before School	7.00 - 7.30					
	7.30 - 8.00					
	8.00 - 8.30					
	8.30 - 9.00					
(School)						
After school	3.30-4.00					
	4.00-4.30					
	4.30-5.00					
	5.00-5.30					
	5.30-6.00					
	6.00-6.30					
	6.30-7.00					
Evening	7.00-7.30					
	7.30-8.00					
	8.00-8.30					
	8.30-9.00					
	9.00-9.30					
	9.30-10.00					
	10.00-10.30					
	10.30-11.00					

Week 1 - Weekend Table

During the day Time	Saturday	Sunday		During the evening Time	Saturday	Sunday
8.00 - 8.30				5.00 - 5.30		
8.30 - 9.00				5.30-6.00		
9.00-9.30				6.00-6.30		
9.30-10.00				6.30-7.00		
10.00-10.30				7.00-7.30		
10.30-11.00				7.30-8.00		
11.00-11.30				8.00-8.30		
11.30-12.00				8.30-9.00		
12.00-12.30				9.00-9.30		
12.30-1.00				9.30-10.00		
1.00-1.30				10.00-10.30		
1.30-2.00				10.30-11.00		
2.00-2.30				11.00-11.30		
2.30-3.00				11.30-12.00		
3.00-3.30						
3.30-4.00						
4.00-4.30						
4.30-5.00						

Appendix 3.5: Questionnaire for background information from parents

The questions on this page and overleaf are only for parents/guardians who give permission for their child to participate.

Please complete the following details about your place of birth, occupation and educational level. Any information you provide will be treated as confidential and used for the purpose of this study only.

1. Information for the child's father to complete:

a. Place of birth:

______________________________ (city/town)

______________________________ (country)

If you weren't born in Australia;

b. How long have you lived in Australia?

_________________________ (months or years)

c. What is your occupation?

____

d. Level of education:

Please tick the box next to the highest level of education you have completed.

primary school ☐

secondary (high) school ☐

tertiary (eg. University) ☐

Please turn over

2. Information for the child's mother to complete:

a. Place of birth:

______________________________ (city/town)

______________________________ (country)

If you weren't born in Australia;

b. How long have you lived in Australia?

________________________ (months or years)

c. What is your occupation?

____

d. Level of education:

Please tick the box next to the highest level of education you have completed.

primary school ☐

secondary (high) school ☐

tertiary (eg. University) ☐

Thank you very much for your assistance. Please return this sheet, with the consent form, to the investigator; Justine Dandy.

Appendix 3.6: Correlations between IQ scores and chronometric task (IT and RT) performance

Whole sample

Chronometric task	IQ measure			
	Matrices	**ACER total**	**ACER quantitative**	**ACER verbal**
Inspection time				
r	-.18	-.33	-.31	-.31
N	153	151	151	151
sig.	.025	<.01	<.01	<.01
Reaction time				
r	-.49	-.45	-.48	-.38
N	157	155	155	155
sig.	<.01	<.01	<.01	<.01

By ethnic group

1. Vietnamese Australian

	Matrices	**ACER total**	**ACER quantitative**	**ACER verbal**
Inspection time				
r	-.22	-.40	-.34	-.39
N	52	51	51	51
sig.	NS	< .01	< .05	< .01
Reaction time				
r	-.52	-.56	-.57	-.48
N	55	54	54	54
sig.	< .01	< .01	< .01	< .01

2. Anglo-Celtic Australian Group 1

	Matrices	**ACER total**	**ACER quantitative**	**ACER verbal**
Inspection time				
r	.08	-.07	-.08	-.05
N	45	44	44	44
sig.	NS	NS	NS	NS
Reaction time				
r	-.28	-.18	-.18	-.16
N	46	45	45	45
sig.	NS	NS	NS	NS

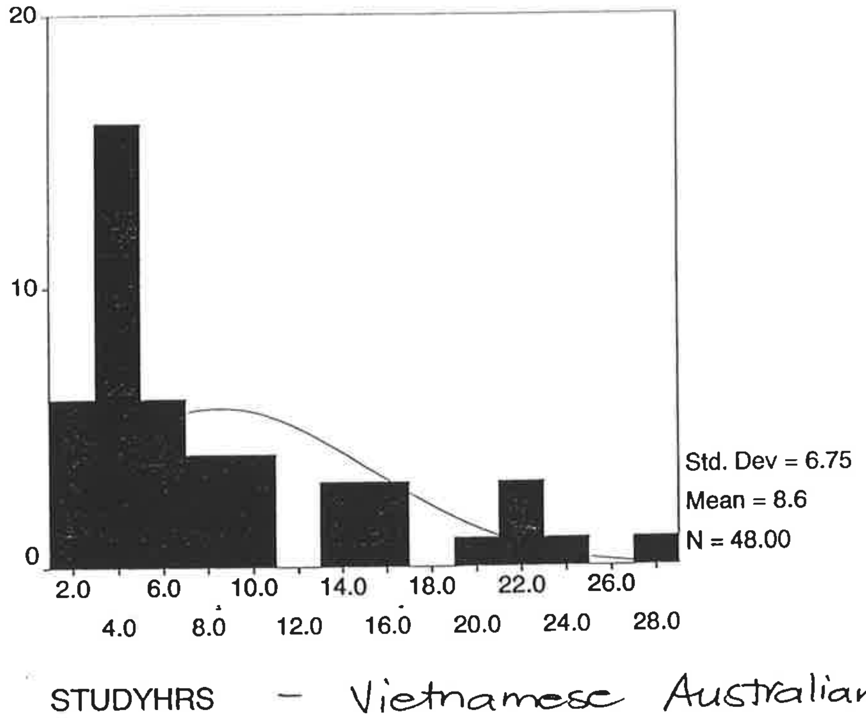
3. Chinese Australian

	Matrices	ACER total	ACER quantitative	ACER verbal
Inspection time				
r	.02	-.27	-.24	-.26
N	29	29	29	29
sig.	NS	NS	NS	NS
Reaction time				
r	-.27	-.19	-.34	-.04
N	29	29	29	29
sig.	NS	NS	NS	NS

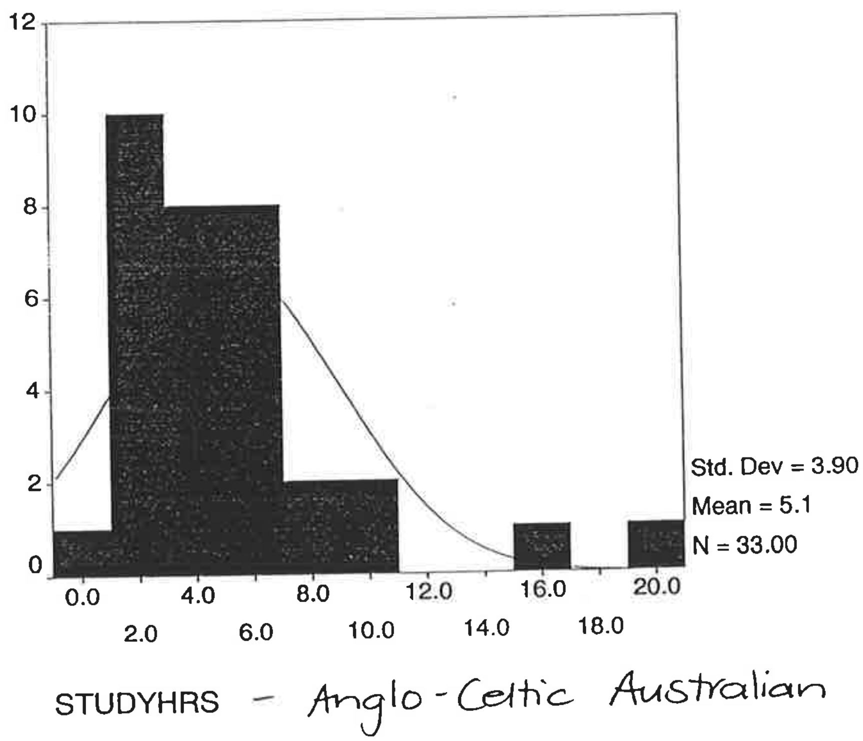
4. Anglo-Celtic Australian Group 2

	Matrices	ACER total	ACER quantitative	ACER verbal
Inspection time				
r	-.17	-.21	-.28	-.11
N	27	27	27	27
sig.	NS	NS	NS	NS
Reaction time				
r	-.19	-.39	-.49	-.22
N	27	27	27	27
sig.	NS	< .05	< .01	NS

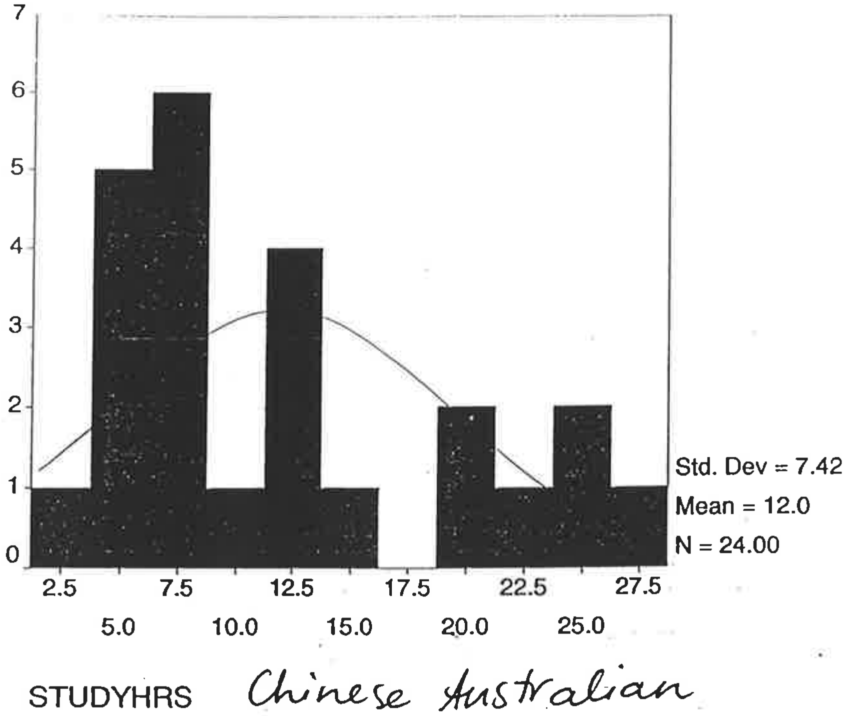
Appendix 3.7: Frequency distributions for study diary data



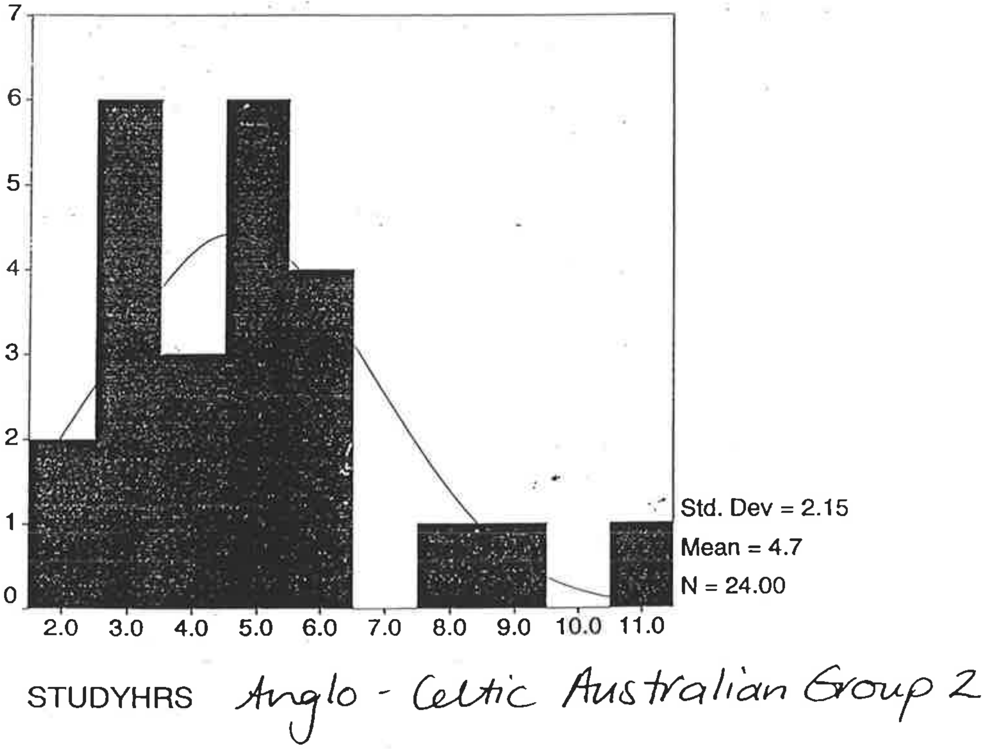
– Vietnamese Australian Schoolchildren



– Anglo-Celtic Australian Group 1



7
6
5
4
3
2
1
0
2.5
7.5
12.5
17.5
22.5
27.5
5.0
10.0
15.0
20.0
25.0
Std. Dev = 7.42
Mean = 12.0
N = 24.00
STUDYHRS
Chinese Australian



7
6
5
4
3
2
1
0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
Std. Dev = 2.15
Mean = 4.7
N = 24.00
STUDYHRS
Anglo - Celtic Australian Group 2

Appendix 3.8: Summary of analyses comparing full sample and reduced sample used in regression analyses for measures of IQ, achievement and time spent studying

T-Test

Group Statistics

	split acc. to complete data (IQ tests and study)	N	Mean	Std. Deviation	Std. Error Mean
inspection time	incomplete	30	108.9200	36.3323	6.6333
	complete	123	115.7520	42.5490	3.8365
reaction time	incomplete	31	681.1445	174.8377	31.4018
	complete	126	664.0038	145.0395	12.9211
Standard Prog. Matrices raw score	incomplete	31	41.1935	6.3949	1.1486
	complete	129	42.4419	6.0916	.5363
ACER intermediate test F (total score)	incomplete	29	37.4483	13.1708	2.4458
	complete	129	39.0930	13.2973	1.1708
quantitative reasoning subscore	incomplete	29	13.8621	6.0043	1.1150
	complete	129	14.9457	5.9191	.5212
verbal comprehension subscore	incomplete	29	7.0345	3.0993	.5755
	complete	129	7.3256	2.6785	.2358
verbal reasoning subscore	incomplete	29	16.5517	5.4615	1.0142
	complete	129	16.8217	5.9220	.5214
v.comp plus v.reason	incomplete	29	23.5862	8.0734	1.4992
	complete	129	24.1473	8.1692	.7193
school achievement (teacher ratings), average of 8 curriculum areas	incomplete	31	3.6871	1.1198	.2011
	complete	129	3.9565	.9157	8.062E-02
combined scores for english language (teacher ratings)	incomplete	31	3.555645	1.215074	.218234
	complete	129	3.944767	1.067761	9.40111E-02
average score for both maths areas (teacher ratings)	incomplete	31	3.766129	1.266451	.227461
	complete	129	3.974806	1.084943	9.55239E-02
STUDYHRS	incomplete	2	4.5625	3.2704	2.3125
	complete	127	7.6381	6.2291	.5527

Independent Samples Test

		Levene's Test for Equality of Variances	
		F	Sig.
inspection time	Equal variances assumed	.442	.507
	Equal variances not assumed		
reaction time	Equal variances assumed	.642	.424
	Equal variances not assumed		
Standard Prog. Matrices raw score	Equal variances assumed	.001	.978
	Equal variances not assumed		
ACER intermediate test F (total score)	Equal variances assumed	.105	.746
	Equal variances not assumed		
quantitative reasoning subscore	Equal variances assumed	.155	.694
	Equal variances not assumed		
verbal comprehension subscore	Equal variances assumed	.230	.632
	Equal variances not assumed		
verbal reasoning subscore	Equal variances assumed	.771	.381
	Equal variances not assumed		
v.comp plus v.reason	Equal variances assumed	.231	.632
	Equal variances not assumed		
school achievement (teacher ratings), average of 8 curriculum areas	Equal variances assumed	3.722	.056
	Equal variances not assumed		
combined scores for english language (teacher ratings)	Equal variances assumed	1.372	.243
	Equal variances not assumed		
average score for both maths areas (teacher ratings)	Equal variances assumed	2.397	.124
	Equal variances not assumed		
STUDYHRS	Equal variances assumed	.715	.399
	Equal variances not assumed		

Independent Samples Test

		t-test for Equality of Means		
		t	df	Sig. (2-tailed)
inspection time	Equal variances assumed	-.810	151	.419
	Equal variances not assumed	-.892	50.308	.377
reaction time	Equal variances assumed	.565	155	.573
	Equal variances not assumed	.505	40.739	.616
Standard Prog. Matrices raw score	Equal variances assumed	-1.015	158	.312
	Equal variances not assumed	-.985	44.019	.330
ACER intermediate test F (total score)	Equal variances assumed	-.603	156	.547
	Equal variances not assumed	-.607	41.822	.547
quantitative reasoning subscore	Equal variances assumed	-.889	156	.376
	Equal variances not assumed	-.880	41.141	.384
verbal comprehension subscore	Equal variances assumed	-.513	156	.608
	Equal variances not assumed	-.468	37.958	.642
verbal reasoning subscore	Equal variances assumed	-.225	156	.822
	Equal variances not assumed	-.237	44.084	.814
v.comp plus v.reason	Equal variances assumed	-.335	156	.738
	Equal variances not assumed	-.337	41.888	.737
school achievement (teacher ratings), average of 8 curriculum areas	Equal variances assumed	-1.406	158	.162
	Equal variances not assumed	-1.244	40.174	.221
combined scores for english language (teacher ratings)	Equal variances assumed	-1.773	158	.078
	Equal variances not assumed	-1.638	41.830	.109
average score for both maths areas (teacher ratings)	Equal variances assumed	-.930	158	.354
	Equal variances not assumed	-.846	41.214	.403
STUDYHRS	Equal variances assumed	-.695	127	.488
	Equal variances not assumed	-1.294	1.117	.402

Independent Samples Test

		t-test for Equality of Means	
		Mean Difference	Std. Error Difference
inspection time	Equal variances assumed	-6.8320	8.4357
	Equal variances not assumed	-6.8320	7.6629
reaction time	Equal variances assumed	17.1407	30.3266
	Equal variances not assumed	17.1407	33.9563
Standard Prog. Matrices raw score	Equal variances assumed	-1.2483	1.2302
	Equal variances not assumed	-1.2483	1.2676
ACER intermediate test F (total score)	Equal variances assumed	-1.6447	2.7281
	Equal variances not assumed	-1.6447	2.7115
quantitative reasoning subscore	Equal variances assumed	-1.0837	1.2196
	Equal variances not assumed	-1.0837	1.2308
verbal comprehension subscore	Equal variances assumed	-.2911	.5670
	Equal variances not assumed	-.2911	.6220
verbal reasoning subscore	Equal variances assumed	-.2700	1.2006
	Equal variances not assumed	-.2700	1.1403
v.comp plus v.reason	Equal variances assumed	-.5611	1.6753
	Equal variances not assumed	-.5611	1.6628
school achievement (teacher ratings), average of 8 curriculum areas	Equal variances assumed	-.2694	.1916
	Equal variances not assumed	-.2694	.2167
combined scores for english language (teacher ratings)	Equal variances assumed	-.389122	.219478
	Equal variances not assumed	-.389122	.237622
average score for both maths areas (teacher ratings)	Equal variances assumed	-.208677	.224362
	Equal variances not assumed	-.208677	.246705
STUDYHRS	Equal variances assumed	-3.0756	4.4265
	Equal variances not assumed	-3.0756	2.3776

Independent Samples Test

		t-test for Equality of Means	
		95% Confidence Interval of the Difference	
		Lower	Upper
inspection time	Equal variances assumed	-23.4993	9.8352
	Equal variances not assumed	-22.2211	8.5570
reaction time	Equal variances assumed	-42.7661	77.0476
	Equal variances not assumed	-51.4487	85.7301
Standard Prog. Matrices raw score	Equal variances assumed	-3.6781	1.1815
	Equal variances not assumed	-3.8030	1.3064
ACER intermediate test F (total score)	Equal variances assumed	-7.0335	3.7440
	Equal variances not assumed	-7.1175	3.8280
quantitative reasoning subscore	Equal variances assumed	-3.4927	1.3254
	Equal variances not assumed	-3.5690	1.4016
verbal comprehension subscore	Equal variances assumed	-1.4110	.8288
	Equal variances not assumed	-1.5503	.9681
verbal reasoning subscore	Equal variances assumed	-2.6415	2.1015
	Equal variances not assumed	-2.5681	2.0281
v.comp plus v.reason	Equal variances assumed	-3.8704	2.7482
	Equal variances not assumed	-3.9170	2.7949
school achievement (teacher ratings), average of 8 curriculum areas	Equal variances assumed	-.6478	.1090
	Equal variances not assumed	-.7073	.1684
combined scores for english language (teacher ratings)	Equal variances assumed	-.822612	4.43675E-02
	Equal variances not assumed	-.868720	9.04754E-02
average score for both maths areas (teacher ratings)	Equal variances assumed	-.651812	.234458
	Equal variances not assumed	-.706830	.289475
STUDYHRS	Equal variances assumed	-11.8349	5.6836
	Equal variances not assumed	-26.7235	20.5722

Appendix 4.1: Parent Survey (Study 3)

Your Child's Education

A Questionnaire for Parents

The following questionnaire is designed to obtain some information concerning your views on education and your child's performance at school. All answers will be treated as confidential and used for the purpose of this study only.

The questionnaire may be completed by the child's father, mother, or both.

You may answer the questions in your preferred language.

Section A.

The questions in this section should be completed in relation to <u>one child between 6 and 14 years old</u>.

Please indicate the age of the child about whom you will be answering these questions;

Age: .... years old.

Please indicate the child's gender (please circle):

Male / Female

Please indicate the school your child currently attends:

School: ....

A. INFORMATION ABOUT YOUR CHILD

1. How many hours of television does your child watch per week on average?

☐ 1 - 5 hours

☐ 6 - 10 hours

☐ 11 - 15 hours

☐ 16 - 20 hours

☐ more than 20 hours

2. Do you monitor how much television he/she watches?

☐ YES

☐ NO

3. Do you monitor which programs he/she watches?

☐ YES

☐ NO

4. What sort of home and family tasks do you expect your child to help with (for example doing the dishes, helping with the family business, babysitting)?

....

....

....

....

....

....

5. How many hours of homework does your child do <u>per week</u> on average?

☐ 1 - 5 hours

☐ 6 - 10 hours

☐ 11 - 15 hours

☐ 16 - 20 hours

☐ more than 20 hours

6. Is there a place in your house which is set aside for your child to do his/her homework?

☐ YES

☐ NO

7. Your child's achievement in school

a. There is a mathematics test in which there are 100 points. The average score in the class is 50. What score do you think your child would get? What score would you be satisfied with your child achieving?

My child would get a score of ....

I would be satisfied with a score of ....

b. There is a spelling test in which there are 100 points. The average score in the class is 50. What score do you think your child would get? What score would you be satisfied with your child achieving?

My child would get a score of ....

I would be satisfied with a score of ....

8. Your child's future

8a. Below are several career options available to your child once he/she has finished high school. Please place a tick next to the <u>one</u> that you would <u>prefer</u> your child to choose.

"I would prefer my child to ......

- ☐ get an apprenticeship/traineeship
- ☐ go to University
- ☐ go to other tertiary institution eg. Institute for Technical and Further Education (TAFE), College of Advanced Education (CAE)
- ☐ get a job
- ☐ work in the family business
- ☐ other - please specify:

8b. How many years of education <u>would you like</u> your child to complete? Please tick the box next to the <u>highest level</u> you would like your child to complete.

- ☐ finish year 10
- ☐ finish year 11
- ☐ finish year 12/Matriculation
- ☐ one or two years beyond high school ie. complete traineeship
- ☐ three years or four years beyond high school ie. complete Bachelors Degree
- ☐ complete Postgraduate Degree eg. Masters degree, Ph.D

8c. How many years of education <u>do you expect that your child will complete</u>?

Please tick the box next to the highest level you think your child will complete.

- ☐ finish year 10
- ☐ finish year 11
- ☐ finish year 12/Matriculation
- ☐ one or two years beyond high school ie. complete traineeship
- ☐ three years or four years beyond high school ie. complete Bachelors Degree
- ☐ complete Postgraduate Degree eg. Masters degree, Ph.D

Section B.
The questions in this section require information about yourself ie. the child's parent(s). There are questions about the child's mother and father but they may be completed by either parent.
Please indicate who will be completing this information:

☐ mother

☐ father

☐ guardian (eg. grandparent)

B. INFORMATION ABOUT YOURSELF

1. Ethnic Identity
Please tick the box next to the ethnic/cultural group with which you identify;

☐ Chinese

☐ Chinese-Australian

☐ Vietnamese

☐ Vietnamese-Australian

☐ Australian

☐ Other cultural group (please specify):

2. English Language Skills.

How confident are you about your English language skills, that is, how good do you think you are at speaking English?
Please rate your confidence by circling the appropriate number on the scale below. The scale is from 0 to 4, where 0 means no confidence (no good) and 4 means very confident (very good).

0	**1**	**2**	**3**	**4**
no confidence	not very confident	average confidence	pretty confident	very confident

Information about the child's father.

3. What is your place of birth?:

______________________________ (city or town)

______________________________ (country)

3a. If you weren't born in Australia;
How long have you lived in Australia?

______________________________ (months or years)

4. What is your occupation? (If you are unemployed or retired please indicate this as well as your previous occupation).

____

5. Level of education.
Please tick the box next to the highest level of education you have completed.

primary school ☐

secondary (high) school ☐

tertiary (eg. University) ☐

Information about the child's mother.

3. What is your place of birth?:

______________________________ (city or town)

______________________________ (country)

3a. If you weren't born in Australia;
How long have you lived in Australia?

______________________________ (months or years)

4. What is your occupation? (If you are unemployed or retired please indicate this as well as your previous occupation).

____

5. Level of education.
Please tick the box next to the highest level of education you have completed.

primary school ☐

secondary (high) school ☐

tertiary (eg. University) ☐

Do you have any other comments, either about this questionnaire or in general?

....

....

....

....

....

....

....

....

....

Thank you very much for your assistance. Please return this questionnaire to the investigator, Justine Dandy.

Additional questions for Vietnamese and Chinese parents

B. INFORMATION ABOUT YOURSELF

1. Ethnic Identity
Please tick the box next to the ethnic/cultural group with which you identify;

☐ Chinese

☐ Chinese-Australian

☐ Vietnamese

☐ Vietnamese-Australian

☐ Australian

☐ Other cultural group (please specify):

2. English Language Skills.

How confident are you about your English language skills, ie. how good do you think you are at speaking English?

Please rate your confidence by circling the appropriate number on the scale below. The scale is from 0 to 4, where 0 means no confidence (no good) and 4 means very confident (very good).

0	**1**	**2**	**3**	**4**
no confidence	not very confident	average confidence	quite confident	very confident

3. Languages other than English

3a. What language(s) do you speak at home?

....

....

....

....

....

3b. How confident are you about your Chinese [Vietnamese] language skills, ie. how good do you think you are at <u>speaking</u> Chinese [Vietnamese]?

Please indicate your confidence by circling the appropriate number on the scale below. The scale is from 0 to 4, where 0 means no confidence (no good at speaking) and 4 means very confident (very good).

0	**1**	**2**	**3**	**4**
no confidence	not very confident	average confidence	quite confident	very confident

3c. Can you read and write Chinese [Vietnamese]?

Please tick the option that best describes your Chinese [Vietnamese] language skills.

☐ I can read Chinese [Vietnamese]

☐ I can read <u>and</u> write Chinese [Vietnamese]

Appendix 4.2: Summary of analyses for academic standards – excluding cases with scores below 50

T-Test

Group Statistics

	cultgrp with ses	N	Mean	Std. Deviation	Std. Error Mean
MATHEXP	vietnamese	52	79.5481	12.4307	1.7238
	anglo - low ses	64	71.6641	13.3898	1.6737

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MATHEXP	Equal variances assumed	.591	.444	3.256	114	.001	7.8840	2.4214	3.0873	12.6807
	Equal variances not assumed			3.281	111.945	.001	7.8840	2.4027	3.1234	12.6447

T-Test

Group Statistics

	cultgrp with ses	N	Mean	Std. Deviation	Std. Error Mean
MATHSAT	vietnamese	55	84.8182	13.3927	1.8059
	anglo - low ses	67	71.2090	12.3249	1.5057

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MATHSAT	Equal variances assumed	.166	.684	5.836	120	.000	13.6092	2.3320	8.9920	18.2264
	Equal variances not assumed			5.788	111.206	.000	13.6092	2.3512	8.9502	18.2683

T-Test

Group Statistics

	cultgrp with ses	N	Mean	Std. Deviation	Std. Error Mean
SPELLEXP	vietnamese	51	79.3333	14.3393	2.0079
	anglo - low ses	62	76.3306	15.1002	1.9177

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
SPELLEXP	Equal variances assumed	1.265	.263	1.076	111	.284	3.0027	2.7907	-2.5273	8.5326
	Equal variances not assumed			1.081	108.691	.282	3.0027	2.7766	-2.5006	8.5059

T-Test

Group Statistics

	cultgrp with ses	N	Mean	Std. Deviation	Std. Error Mean
SPELLSAT	vietnamese	53	84.9528	14.0867	1.9350
	anglo - low ses	66	75.5455	13.3194	1.6395

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
SPELLSAT	Equal variances assumed	.005	.943	3.732	117	.000	9.4074	2.5206	4.4155	14.3992
	Equal variances not assumed			3.709	108.661	.000	9.4074	2.5361	4.3806	14.4341

T-Test

Group Statistics

Mathdifferential	cultgrp with ses	N	Mean	Std. Deviation	Std. Error Mean
mathsat - mathexp ~~(all cases)~~	vietnamese	50	5.8700	13.7958	1.9510
	anglo - low ses	62	.4597	14.1242	1.7938

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
mathsat - mathexp (all cases)	Equal variances assumed	.171	.680	2.036	110	.044	5.4103	2.6571	.1447	10.6760
	Equal variances not assumed			2.041	106.007	.044	5.4103	2.6503	.1558	10.6648

T-Test

Group Statistics

Spell differential	cultgrp with ses	N	Mean	Std. Deviation	Std. Error Mean
spellsat - spellexp ~~(all cases)~~	vietnamese	48	5.7604	10.7010	1.5446
	anglo - low ses	59	.2288	15.1752	1.9756

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
spellsat - spellexp (all cases)	Equal variances assumed	5.231	.024	2.130	105	.035	5.5316	2.5967	.3828	10.6804
	Equal variances not assumed			2.206	103.057	.030	5.5316	2.5077	.5581	10.5051

T-Test

Group Statistics

	cultgrp with ses	N	Mean	Std. Deviation	Std. Error Mean
MATHEXP	chinese	56	80.9464	12.5037	1.6709
	anglo- hi ses	47	79.1277	12.0675	1.7602

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MATHEXP	Equal variances assumed	.060	.807	.747	101	.457	1.8188	2.4346	-3.0108	6.6483
	Equal variances not assumed			.749	99.011	.455	1.8188	2.4270	-2.9969	6.6344

T-Test

Group Statistics

	cultgrp with ses	N	Mean	Std. Deviation	Std. Error Mean
MATHSAT	chinese	57	88.6842	9.5561	1.2657
	anglo- hi ses	43	76.7442	10.2576	1.5643

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MATHSAT	Equal variances assumed	.318	.574	5.993	98	.000	11.9400	1.9922	7.3866	15.8935
	Equal variances not assumed			5.934	87.023	.000	11.9400	2.0122	7.9405	15.9395

T-Test

Group Statistics

	cultgrp with ses	N	Mean	Std. Deviation	Std. Error Mean
SPELLEXP	chinese	56	82.0714	12.6547	1.6910
	anglo- hi ses	49	82.2041	13.1434	1.8776

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
SPELLEXP	Equal variances assumed	.579	.448	-.053	103	.958	-.1327	2.5204	-5.1314	4.8661
	Equal variances not assumed			-.052	100.019	.958	-.1327	2.5269	-5.1459	4.8806

T-Test

Group Statistics

	cultgrp with ses	N	Mean	Std. Deviation	Std. Error Mean
SPELLSAT	chinese	58	89.2155	10.3987	1.3654
	anglo- hi ses	43	80.3721	12.6317	1.9263

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
SPELLSAT	Equal variances assumed	.382	.538	3.855	99	.000	8.8434	2.2940	4.2915	13.3953
	Equal variances not assumed			3.745	79.937	.000	8.8434	2.3612	4.1445	13.5423

T-Test

Group Statistics

Math differential	cultgrp with ses	N	Mean
mathsat - mathexp ~~(all cases)~~	chinese	56	7.7143
	anglo- hi ses	41	-.8171

Group Statistics

	cultgrp with ses	Std. Deviation	Std. Error Mean
mathsat - mathexp ~~(all cases)~~	chinese	12.0954	1.6163
	anglo- hi ses	10.1142	1.5796

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
mathsat - mathexp ~~(all cases)~~	Equal variances assumed	1.897	.172	3.672	95	.000	8.5314	2.3234	3.9189	13.1438
	Equal variances not assumed			3.775	93.259	.000	8.5314	2.2600	4.0436	13.0191

T-Test

Group Statistics

Spell differential	cultgrp with ses	N	Mean
spellsat - spellexp ~~(all cases)~~	chinese	56	6.7768
	anglo- hi ses	43	-.1163

Group Statistics

	cultgrp with ses	Std. Deviation	Std. Error Mean
spellsat - spellexp ~~(all cases)~~	chinese	10.7593	1.4378
	anglo- hi ses	10.6619	1.6259

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
spellsat - spellexp ~~(all cases)~~	Equal variances assumed	.042	.838	3.172	97	.002	6.8931	2.1731	2.5801	11.2060
	Equal variances not assumed			3.176	90.914	.002	6.8931	2.1704	2.5817	11.2044

Appendix 4.3: Summary of analysis of covariance for academic standards

Between-Subjects Factors

		Value Label	N
cultgrp with ses	1.00	vietnamese	43
	2.00	anglo - low ses	67
	3.00	chinese	54
	4.00	anglo- hi ses	41

Multivariate Tests[c]

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.825	232.611[a]	4.000	197.000	.000
	Wilks' Lambda	.175	232.611[a]	4.000	197.000	.000
	Hotelling's Trace	4.723	232.611[a]	4.000	197.000	.000
	Roy's Largest Root	4.723	232.611[a]	4.000	197.000	.000
GENDER	Pillai's Trace	.044	2.241[a]	4.000	197.000	.066
	Wilks' Lambda	.956	2.241[a]	4.000	197.000	.066
	Hotelling's Trace	.046	2.241[a]	4.000	197.000	.066
	Roy's Largest Root	.046	2.241[a]	4.000	197.000	.066
CULTGRP	Pillai's Trace	.296	5.439	12.000	597.000	.000
	Wilks' Lambda	.713	5.931	12.000	521.505	.000
	Hotelling's Trace	.391	6.373	12.000	587.000	.000
	Roy's Largest Root	.359	17.836[b]	4.000	199.000	.000

a. Exact statistic

b. The statistic is an upper bound on F that yields a lower bound on the significance level.

c. Design: Intercept+GENDER+CULTGRP

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
MATHEXP	1.629	3	201	.184
MATHSAT	1.772	3	201	.154
SPELLEXP	5.444	3	201	.001
SPELLSAT	2.455	3	201	.064
mathsat - mathexp (all cases)	2.530	3	201	.058
spellsat - spellexp (all cases)	5.885	3	201	.001

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept+GENDER+CULTGRP

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	MATHEXP	6966.986[a]	4	1741.747	7.166	.000
	MATHSAT	12968.464[b]	4	3242.116	17.880	.000
	SPELLEXP	5245.977[c]	4	1311.494	4.513	.002
	SPELLSAT	8035.139[d]	4	2008.785	9.438	.000
	mathsat - mathexp (all cases)	2611.837[e]	4	652.959	3.393	.010
	spellsat - spellexp (all cases)	1925.577[f]	4	481.394	2.398	.052
Intercept	MATHEXP	135235.376	1	135235.376	556.385	.000
	MATHSAT	127745.221	1	127745.221	704.493	.000
	SPELLEXP	149684.561	1	149684.561	515.084	.000
	SPELLSAT	145887.935	1	145887.935	685.408	.000
	mathsat - mathexp (all cases)	106.688	1	106.688	.554	.457
	spellsat - spellexp (all cases)	24.385	1	24.385	.121	.728
GENDER	MATHEXP	849.173	1	849.173	3.494	.063
	MATHSAT	9.707E-02	1	9.707E-02	.001	.982
	SPELLEXP	1726.424	1	1726.424	5.941	.016
	SPELLSAT	299.617	1	299.617	1.408	.237
	mathsat - mathexp (all cases)	867.429	1	867.429	4.508	.035
	spellsat - spellexp (all cases)	587.617	1	587.617	2.927	.089
CULTGRP	MATHEXP	5894.595	3	1964.865	8.084	.000
	MATHSAT	12941.205	3	4313.735	23.790	.000
	SPELLEXP	3365.604	3	1121.868	3.860	.010
	SPELLSAT	7600.839	3	2533.613	11.903	.000
	mathsat - mathexp (all cases)	1854.138	3	618.046	3.212	.024
	spellsat - spellexp (all cases)	1418.273	3	472.758	2.355	.073
Error	MATHEXP	48612.123	200	243.061		
	MATHSAT	36265.845	200	181.329		
	SPELLEXP	58120.498	200	290.602		
	SPELLSAT	42569.659	200	212.848		
	mathsat - mathexp (all cases)	38485.363	200	192.427		
	spellsat - spellexp (all cases)	40156.574	200	200.783		
Total	MATHEXP	1213208.500	205			
	MATHSAT	1330140.750	205			
	SPELLEXP	1279966.750	205			
	SPELLSAT	1397554.500	205			
	mathsat - mathexp (all cases)	44215.250	205			
	spellsat - spellexp (all cases)	45398.250	205			

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Total	MATHEXP	55579.110	204			
	MATHSAT	49234.310	204			
	SPELLEXP	63366.476	204			
	SPELLSAT	50604.798	204			
	mathsat - mathexp (all cases)	41097.200	204			
	spellsat - spellexp (all cases)	42082.151	204			

a. R Squared = .125 (Adjusted R Squared = .108)

b. R Squared = .263 (Adjusted R Squared = .249)

c. R Squared = .083 (Adjusted R Squared = .064)

d. R Squared = .159 (Adjusted R Squared = .142)

e. R Squared = .064 (Adjusted R Squared = .045)

f. R Squared = .046 (Adjusted R Squared = .027)