Adolescent time attitude scale (ATAS) scores and academic outcomes in secondary school females in New Zealand

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Abstract: Multiple associations between time-related variables and several educational outcomes have been established previously. Of these time-related variables, the majority have focused on attitudes and perceptions related to the future, but not to the present or the past. This paper examined the psychometric properties of a multidimensional measure of time attitudes, and whether time attitudes were related to several academic variables and to attitudes to teachers and towards school. A total of 579 students at an all-female New Zealand high school completed the adolescent time attitude scale (ATAS). Results from the confirmatory factor analysis showed that the six-factor ATAS model had acceptable fit indices with robust internal consistency estimates for each of the factors in that model. Time attitudes had no meaningful relationships with GPA, academic self-ranking or wagging/cutting school, but were related to attitudes toward school and teacher. However, time attitude *profiles* had meaningful relationships to all variables except wagging school.

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1   Introduction

Researchers have been examining the relationship between variables related to time and a variety of behavioural, educational, and psychological outcomes for many years (e.g., Adelabu, 2007; Ho et al., 2010; Jessor et al., 1990; Nurmi, 1991; Scheier and Carver, 1985; Wyman et al., 1993, 1992; Zimbardo et al., 1997). Much of the educational research in this area has been conducted in the USA and has focused on variables related

to the future, including hope (Snyder et al., 1996; Worrell and Hale, 2001), optimism (Matthew, 2011), goal orientation (Pintrich, 2000), perceived life chances (Worrell et al., 1999), possible selves (Leondari et al., 2009; Oyserman et al., 1995), and future orientation (Seginer, 2008). In general, findings have been mixed, with some researchers reporting meaningful relationships between future-oriented constructs and academic achievement (e.g., Adelabu, 2007; Seginer, 2008) and others reporting more modest relationships (e.g., Adelabu, 2007; Worrell and Mello, 2007, 2009). However, it is not clear if time variables are not meaningfully related to academic outcomes, or if the mixed findings are due to the nature of the analyses used.

The work of Zimbardo and his colleagues (Gonzalez and Zimbardo, 1985; Zimbardo and Boyd, 2008; Zimbardo et al., 1997) provided a substantial impetus to the research on time attitudes. In 1999, Zimbardo and Boyd introduced the Zimbardo time perspective inventory (ZPTI) to the extant literature, a multidimensional scale that assesses attitudes toward the past, the present, and the future, and demonstrated that ZPTI scores had meaningful relationships to several psychological constructs. Zimbardo and Boyd (2008) criticised research on time perspective for focusing on only one time period – that is, the future – and for not assessing time profiles based on assessments of attitudes toward all three time periods, a criticism echoed by Buhl and Lindner (2009) and Andretta (2011).

In this paper, we examined the psychometric properties of a new multidimensional measure of time attitudes for adolescents in a sample of secondary school girls from New Zealand, an English-speaking country with a diverse set of ethnic groups and achievement gaps that are similar to the USA among those groups. We examined the relationship of time attitudes to academic variables, but more importantly, we also examined the relationship of time attitude *profiles* to several academic variables, as we expected person-centred analyses to yield more meaningful results than variable-centred analyses. To date, this hypothesis has only been examined in Germany (Buhl and Lindner, 2009) and the USA (Andretta, 2011), and if supported in New Zealand, this finding can provide a rationale for developing interventions that are focused on changing attitudes toward time. In the following sections, we define time attitudes, describe scales that measure this construct, and provide an overview of the relationship of time attitudes to educational outcomes, including a review of the limited extant literature on time attitude profiles.

2   Literature review

Educational researchers are on a continual quest to identify psychosocial variables that allow for more refined prediction of educational outcomes and interventions with students who are at risk. Although variables such as motivation, self-efficacy, and self-concept are among the most frequently examined variables in this area, several researchers (e.g., Mello, 2008; Nurmi, 1991; Seginer, 2008) have examined the role of time constructs as important predictors of educational functioning. In most cases, researchers have focused on attitudes toward the future, based on the assumption that expectations for a positive future will lead to increased efforts in the present whereas expectations for a negative future will lead to decreased efforts in the present. Zimbardo and Boyd's (1999, 2008) contention that a balanced time perspective including the past, present, and future is an important personality factor with implications for behaviour and

cognition (Zimbardo and Boyd, 1999, 2008) has provided an organising structure for the field. This study is in keeping with the combined approach.

2.1   Measuring attitudes toward time

Although time perspective is used as an umbrella term in this literature, the majority of the time constructs that are assessed are attitudinal. That is, they assess beliefs or opinions about time that include affective and evaluative components. Time attitudes consist of cognitions about different time periods – that is, past, present, or future – that are typically of a particular valence (i.e., positive or negative), and belong to the group of personality variables such as self-efficacy that are related to developmental outcomes. The ZPTI (Zimbardo and Boyd, 1999) is currently the most frequently used measure of time attitudes in the literature. It consists of five subscales – past positive, past negative, present hedonistic, present fatalistic, and future – and has been translated into several languages. ZPTI scores have shown a network of theoretically-consistent and substantial correlations with psychological constructs like aggression, depression, risk-taking, conscientiousness, and self-esteem. Despite its frequent use, concerns have been raised in the literature about the internal consistency and structural validity of ZPTI scores (D'Alessio et al., 2003; Milfont et al., 2008), especially with adolescent samples (Worrell and Mello, 2007), as the ZPTI was developed for and validated with college samples.

In 2007, Mello and Worrell developed the adolescent time attitude scale (ATAS) to provide an instrument that was useful for studying time attitudes in secondary school students. The ATAS consists of six subscales – past positive, past negative, present positive, present negative, future positive, and future negative – and is intended to assess attitudes toward time in adolescent populations without additional embedded constructs such as hedonism and fatalism as the ZPTI does. To date, ATAS scores have been examined in samples in both Germany and the USA. Internal consistency estimates for the scores have ranged from .77 to .88, with confidence intervals from .72 to .90, and structural validity analyses have supported the six-factor structure in both national contexts (Buhl and Lindner, 2009; Worrell et al., 2011). Moreover, Worrell and Mello (2009) reported strong criterion-related validity evidence for the six subscale scores. Thus, the ATAS was used to examine time attitudes in this sample of adolescent New Zealanders.

2.2   Attitudes toward time and educational outcomes

As early as the 1980s, researchers were claiming that attitudes toward time were related to academic achievement. For example, Ekstrom et al. (1986) conducted a study using a stratified national probability sample of over 24,000 students in the high school and beyond database. They found that dropouts had a lower sense of agency – operationalised as being in control of their destiny – than students who graduated from high school, although they did not differ on global self-esteem. Fine (1986) arrived at a similar conclusion in an interview study of graduates and dropouts from a large inner city high school in the USA. She reported that graduates were more naively optimistic about the world than dropouts. However, Worrell and Hale (2001) contended that what Fine was dismissing as naive optimism could be interpreted as hope, and they showed that high school dropouts and graduates who were equally at risk differed in their hope in the

future, with dropouts expecting to have a more dismal future. These studies comparing more successful and less successful students yielded strong positive results in support of attitudes toward time as a potential explanatory variable.

Despite these findings based on group differences, studies of the *association* between variables assessing time attitudes and educational achievement have yielded mixed results. Bickel (1989) and Bickel and Lange (1995) found that belief in the payoff from schooling accounted for 20% of the variance in high school graduation rates. In contrast, Zimbardo and Boyd (1999) reported correlations near zero ($-.08 \leq r \leq .21$) for the five ZPTI scores and college GPA in several samples. Similarly, Worrell and Hale (2001) reported a correlation of .15 between hope in the future and grade point average in a sample of at-risk high school students. Adelabu (2007) examined the relationship between the two subscale scores (present hedonistic and future) from the short version of the ZPTI and academic achievement in a sample of 232 African American adolescents. Only the relationship between the present hedonistic score and academic achievement achieved a medium effect size ($r = -.31$), and it is not clear if this relationship was being driven by attitudes toward the present or hedonism, one of the concerns that arises in interpreting results based on ZPTI scores. Additionally, the relationship between the future ZPTI score and time achievement ($r = .12$) was as modest as the relationship reported by Worrell and Hale. Mello and Worrell (2006) also reported low relationships between ZPTI subscale scores $-.16 \leq \beta \leq .13$) and academic achievement, and similar findings were reported between the six ATAS scores and academic achievement ($-.27 \leq r \leq .20$; Worrell and Mello, 2009).

Thus, although studies comparing dropouts and graduates have yielded substantial differences on time constructs between these groups, studies that examined the relationship of time constructs to achievement yield weak relationships. We contend that the low correlations between time attitude constructs and academic achievement may be misleading in suggesting that time attitudes are not related to academic outcomes. It may be the case that correlations using individual time variables are not capturing time attitudes as a combined construct and are therefore underestimating the relationship of time attitudes to academic outcomes.

2.3 Time attitude profiles and academic achievement

Zimbardo and Boyd (1999) made one of the most interesting suggestions for ongoing research on time attitudes. They contended that "future research may profit from the use of combined 'profile patterns' of the five ZPTI subscales" (p.1284). Zimbardo and Boyd (1999, p.1285) went on to speculate about the importance of looking at different time attitude profiles arguing,

> "The future focus gives people wings to soar to new heights of achievement, the past (positive) focus establishes their roots with tradition and grounds their sense of personal identity, and the present (hedonistic) focus nourishes their daily lives with the playfulness of youth and the joys of sensuality. People need all of them harmoniously operating to realise fully their human potential."

Despite this bold call, there have been very few researchers who have actually examined time profiles. We found four studies that examined time attitude profiles in the extant literature, two using the ZPTI and two using the ATAS, and only the two using the ATAS examined educational outcomes in adolescents.

2.3.1 *Clusters based on ZPTI scores*

The first test of the profile hypothesis using the ZPTI was conducted in 2010 by Boniwell et al.. Boniwell et al. clustered the five ZPTI scores in samples of British (n = 179) and Russian (n = 289) undergraduate students. The British sample yielded four clusters, which they labelled as follows: hedonistic present (high present hedonistic and present fatalistic, average past positive and past negative, and low future scores); future (high future, above average past negative, below average past positive and present fatalistic, and low present hedonistic scores); balanced (above average past positive and future, below average present hedonistic, and low past negative and present fatalistic scores); and negative (high past negative and present fatalistic, average present hedonistic and low past positive and future scores). Individuals in the hedonistic present and balanced clusters were generally similar in outcomes, reporting the highest life satisfaction and lowest negative affect scores. Individuals in the negative cluster reported the lowest life satisfaction and highest negative affect, and scores for the future cluster fell between these two extremes.

The same four clusters emerged in the Russian sample, as well as a fifth cluster labelled risk-taking (above average past negative and present fatalistic and average past positive, present hedonistic, and future scores). Boniwell et al. (2010) compared the clusters in the Russian sample on five variables – life satisfaction, subjective happiness, purpose in life, optimism, and general self-efficacy – and found patterns similar to the British sample. In general, the balanced group had the highest scores, the future and hedonistic present group made up a second tier, the risk-taking group, was third, and the negative group had the lowest scores.

In the second study using the ZPTI, Qin et al. (2012) used cluster analysis to create profiles of the five ZPTI subscale scores in samples of undergraduate students from northern California (n = 219) and Shanghai (n = 227). They found three similar clusters in both samples, which they labelled balanced, fatalistic, and future-orientated. The balanced cluster was similar to Zimbardo and Boyd's (1999) characterisation: high scores on past positive, present hedonistic, and future attitudes and low scores on past negative and present fatalistic attitudes. The fatalistic cluster had high scores on past negative and present fatalistic attitudes and low scores on past positive, present hedonistic, and future attitudes, and the future-orientated cluster had low scores on present hedonistic attitudes, high scores on past negative attitudes, and moderate scores on future and present fatalistic attitudes. As in the Boniwell et al. study, students in the balanced cluster had higher well being and positive affect scores and lower negative affect scores than students in the other clusters. The fatalistic and future-orientated groups did not differ.

The two ZPTI cluster studies (Boniwell et al., 2010; Qin et al., 2012) yielded interpretable clusters and findings in keeping with Zimbardo and Boyd's (1999) hypothesis that a balanced time perspective is optimal in terms of psychological well being. However, in both studies, clusters were found that were labelled on the basis of constructs other than time (e.g., hedonistic, risk-taking, and fatalistic). Furthermore, academic achievement was not examined in either study, so it is not clear if time attitude clusters based on ZPTI clusters are related to academic functioning.

2.3.2 Clusters based on ATAS scores

The first analysis of profiles using ATAS scores was conducted by Buhl and Lindner (2009) using a substantial sample of adolescents ($N = 1,691$) attending high schools in Germany and a German version of the ATAS (Worrell et al., 2011). Using latent class analysis, Buhl and Lindner identified six time attitude profiles: balanced (moderately high positive attitudes and moderately low negative attitudes toward all three time periods); optimistic (very high positive and very low negative attitudes); tendentially pessimistic (low scores on both positive and negative attitudes toward all three time periods); past-pessimistic/future-optimistic (low past positive, moderate past negative, high future positive, and low future negative scores); ambivalent (similar scores on both positive and negative attitudes); and pessimistic (very high negative attitudes and very low negative attitudes toward all three time periods).

Buhl and Lindner (2009) reported that adolescents with optimistic, balanced, and ambivalent profiles had significantly higher scores on several psychological (life satisfaction, self-efficacy, perspective taking) and educational (trust in school, perceived support in school, teacher/student relationships) constructs than adolescents with the tendentially pessimistic and pessimistic profiles. The pessimistic profile reported the worst outcomes and past pessimist/future optimist profile reported scores between the two extremes. Although academic achievement was not assessed directly, higher percentages of adolescents with balanced and optimistic profiles planned to attend college.

The second study using the ATAS was conducted by Andretta (2011) with a sample of 300 high school students in the USA. Using cluster analysis, Andretta identified three clusters labelled optimistic (very high positive attitudes and very low negative attitudes toward the three time periods), tendentially pessimistic (average and similar attitudes toward the past, present, and future), and balanced (moderately high positive attitudes and moderately low negative attitudes toward the three time periods). Importantly, Andretta's study included academic achievement [grade point average (GPA)] as well as psychological functioning, and he reported that the optimistic group had the highest GPA and self-esteem, and the lowest perceived stress; the tendentially pessimistic group had the worst outcomes, and the balanced group fell in the middle. Effect sizes indicated that the balanced group was generally similar to the optimistic group, and both of these groups differed from the tendentially pessimistic group. Specifically with regard to GPA, the optimistic and balanced groups' GPA was meaningfully higher than the tendentially pessimistic group ($d = .65$ and .42, respectively), but the two former groups' GPA was similar ($d = .25$). This pattern of relationships was similar for self-esteem and perceived stress, although the optimistic group did differ meaningfully from both the balanced ($d = .85$) and tendentially pessimistic ($d = 1.57$) group on self-esteem.

2.4 The current study

Research has indicated that time attitudes can be reliably assessed in adolescents and adults (Worrell et al., 2011; Zimbardo and Boyd, 1999), and some studies have suggested that dropouts and graduates differ on time constructs related to the future (Bickel, 1989; Eckstrom et al., 1986; Fine, 1986; Worrell and Hale, 2001). However, time attitudes have generally not been meaningfully correlated with academic achievement (Adelabu, 2007;

Mello and Worrell, 2006; Worrell and Hale, 2001; Zimbardo and Boyd, 1999), although they have exhibited robust bivariate relationships with other psychological constructs (Keough et al., 1999; Mello and Worrell, 2006; Zimbardo and Boyd, 1999). Person-centred analyses have yielded interpretable clusters of time attitudes (Andretta, 2011; Buhl and Lindner, 2009; Boniwell et al., 2010; Qin et al., 2012), with members of different clusters differing meaningfully on constructs such as life satisfaction, self-efficacy, self-esteem, positive and negative affect, and academic achievement. Interestingly, Andretta's (2011) findings in particular suggest that profiles may be better predictors of the relationship between time attitudes and achievement than bivariate correlations. This hypothesis provides the rationale for this manuscript.

In the current study, we examined three major questions. The first question focused on the reliability and structural validity of ATAS scores in adolescents attending a school in a high socioeconomic area of New Zealand. We hypothesised that scores on the six ATAS subscales would yield reliability estimates in the .70 to .90 range, in keeping with findings in the USA and Germany, and that the six-factor structure would provide the best fit to the data. For the second question, we examined bivariate correlations between the six ATAS scores and five self-reported educational variables, including academic self-rating, attitudes toward school, attitudes toward teachers, marks, and wagging (i.e., cutting or skipping) school. We hypothesised that relationships between time attitudes and these variables would be modest with small effect sizes (i.e., generally < .30). The third question was the major question in the study. We used cluster analysis to identify time attitude profiles in the sample, and hypothesised that we would find interpretable time attitude profiles. We further hypothesised that students with different profiles would differ significantly and meaningfully (i.e., with medium to large effect sizes) on academic achievement, academic self-rating, wagging school, and attitudes toward schools and teachers, in contrast to the more modest results from the correlational analyses.

3   Method

3.1   Context

This study was conducted in a large multi-ethnic high school in Auckland, New Zealand. The Auckland metropolitan area, in the North Island of New Zealand, is the largest and most populous urban area in the country with 1,354,900 residents, 31% of the country's population (Ministry of Social Development, 2010). Multi-ethnic schools in New Zealand are schools in which students from at least two other ethnic groups together comprise at least 20% of the school's population (Ministry of Education, 2011). In New Zealand, the Ministry of Education ranks state schools into decile groupings. Decile one schools are in areas of greatest socioeconomic disadvantage. Areas of least socioeconomic disadvantage fall into the decile ten category. About 60% of multicultural schools are in the lowest four deciles, 6% are in the highest decile. Most of the multicultural schools are in the North Island, particularly in Auckland. The multiethnic Auckland high school involved in this study was decile nine (Ministry of Education, 2011).

3.2 Participants

Participants consisted of 579 students at an all-female high school in New Zealand, all of whom were in years 9 and 10. They ranged in age from 13 to 15, with 14 (44%) and 15 (36.1%) being the modal ages. Half of the study sample (*n* = 289, 49.9%) identified themselves as Pakeha (i.e., New Zealanders of European descent). Individuals of South East Asian descent (*n* = 181, 31.3%) were the second largest ethnic group, with Maori (i.e., indigenous New Zealanders; *n* = 31, 5.4%), Pasifika (those from one of the Pacific islands; *n* = 23, 4%), and other (*n* = 45, 7.8%) making up the rest of the sample. Ten students did not report an ethnicity. A little more than half of the participants (56.6%) had lived in New Zealand all their lives; the other participants had lived in New Zealand for varying lengths of time (*M* = 7.3 years) and 48% of them spoke another language in addition to English. Students did not provide any information on socioeconomic status, but the school that the students attended was located in a high socioeconomic area.

Although a sample of convenience from an all-female school, the participants in this study provided a useful preliminary sample in New Zealand for several reasons. First, the school was willing to allow the survey to be administered to all students in the grade levels assessed. Second, the school had sufficient representation from the major ethnic groups to allow for the examination of internal consistencies by subgroup. Third, in a high decile school, concerns with the psychometric properties of scores cannot be attributed to other factors such as socioeconomic status or student achievement levels.

3.3 Measures

3.3.1 Time attitudes

Time attitudes were measured with the ATAS (Mello and Worrell, 2007), a 30-item scale consisting of six five-item subscales: past positive, past negative, present positive, present negative, future positive, and future negative. Reliability estimates for ATAS scores have typically been in the .70 to .90 range and the six-factor structure has been supported in both American and German adolescents (Buhl and Lindner, 2009; Worrell et al., 2011). Subscales have shown convergent validity with other time constructs, but have not been meaningfully related to age or to academic achievement (Worrell and Mello, 2009).

3.3.2 Academic variables

Five school-related variables – three single-item and two composites – were used. Students reported their academic achievement in the past 12 months on a six-point Likert scale (ranging from 1 = *less than 40%*, to 6 = *greater than 80%*). Students also rated themselves academically on a single-item relative to other students at their school on a 1 (*among the worst*) to 5 (*among the best*) scale to assess their perceived academic self-ranking. The third school-related variable was a single item asking students to indicate how often they wagged or cut school on a five-point Likert scale (1 = *0 times*, 2 = *a few times*, 3 = *once a month*, 4 = *once a week*, 5 = *more than once a week*). We recognise the potential limitations of single-item variables. However, in the absence of access to data from school records, self-report has proved to be an important way to gather this information from adolescents. There is a well-established literature on student self-report of academic achievement and risk variables such as wagging school using single-item Likert scale items (e.g., Webber, 2011; Worrell and Hale, 2001). Not only are

these metrics commonly used in national studies of adolescents (e.g., National Center for Educational Statistics, 2002; Darr, 2012), it has been demonstrated that that there is strong agreement between self-reported and actual achievement (e.g., Crockett et al., 1987).

Finally, two three-item scales asked students to rate their attitudes toward school and teachers 'today' using seven-point Likert scales. Each of the three items on the subscales had its own set of anchors. The items on their attitudes toward school asked students if they

a   were *miserable* (1) or *thrilled to be here* (7)

b   *did not fit in* (1) or *definitely fit in* (7)

c   were *NOT welcome* (1) or *very welcome* (7).

The three items on attitudes toward teachers asked students if they

a   *do NOT feel comfortable with them* (1) or *are very comfortable with them* (7)

b   *do NOT like them* (1) or *like them* (7)

c   *do not respect them* (1) or *respect them* (7).

The internal consistency estimates for these two subscales were acceptable for ethnic subgroups and for the whole sample (see Table 3). The structural validity for these two attitudinal scales was also assessed using exploratory factor analyses (principal axis extraction of a single factor). Factor coefficients were generally high – .59 to .86 for attitudes to school and .76 to .95 for attitudes toward school – as were the construct reliability estimates calculated from the coefficients (also in Table 3).

3.4   Procedure

Ethical approval was gained for this study (Ref. 7659/2011) from the University of Auckland Human Participants Ethics Committee (UAHPEC). Following approval, the third author met with the principal and year 9 and year 10 deans at the girls' high school to explain the research, and provided them with participant information sheets containing details of the research. After receiving parent consent and student assent, student participants completed the anonymous questionnaires at a time that was convenient for the class teachers. Once the questionnaires had been completed, these were couriered back to the third author along with consent forms from the principal, teachers, and parents. Data were analysed using the statistical software packages, SPSS and EQS. Some items were negatively worded and hence needed to be reverse-scored prior to analyses. ATAS items were grouped into factors according to their subscales (Mello and Worrell, 2007). Demographics were coded as dummy variables.

4   Results

4.1   Descriptive statistics

For the three single-item Likert-scale variables, we first examined frequency distributions. With regard to academic self-rating, almost half of the sample (48.7%)

described themselves as *average* (3 on the five-point scale), with percentages decreasing on either side. Seven students (1.2%) described themselves as *among the worst* students and 44 (7.6%) described themselves as among the best. School marks followed a generally similar pattern, but the modal score was the second highest category (*between 70% and 80%*), with 153 students (26.4%) choosing that rating. Seventy-four students (12.8%) chose the lowest category (*less than 40%*). In keeping with the literature, most students indicated that they did not wag school the previous year (53.4%) or they only wagged *a few times* (33.5%); only 3.5% indicated that they wagged school *more than once a week*. We also examined scatter plots between these variables and the time attitude variables and the scatter plots did not reveal non-linear relationships. Given these findings and the fact that parametric statistics are robust with ordinal data (Norman, 2010), these variables were used in all subsequent analyses.

Descriptive statistics for the variables are presented in Table 1. As can be seen, the means for the time attitude subscales are around the mid-point of the scale, with positive attitudes having slightly higher means than negative attitudes in keeping with the findings from Germany and the USA (Worrell et al., 2011). Also, as in previous examinations of the ATAS, time attitude subscales were generally normally distributed with minimal skew and kurtosis. Most of the school-related variables were also normally distributed, with the exception of wagging school, which had slightly elevated skew and kurtosis values, indicating that the majority of the sample did not engage in this behaviour frequently. Additionally, the mean for wagging school was quite low (between *zero* and a *few times*) suggesting that this behaviour was quite low in frequency.

Table 1   Means and standard deviations for major variables

Variables	M	SD	Skew	Kurtosis
Time attitudes (1–5)				
Past positive	3.48	0.87	–0.43	–0.35
Past negative	2.30	1.06	0.51	–0.69
Present positive	3.77	0.85	–0.42	–0.21
Present negative	2.36	0.93	0.33	–0.46
Future positive	3.40	0.81	–0.51	–0.29
Future negative	2.14	0.86	0.59	–0.01
Academic variables				
Academic self-ranking (1–5)	3.37	0.80	0.31	0.24
Attitude toward school (1–7)	5.19	1.18	–0.69	0.40
Attitude toward teachers (1–7)	5.32	1.37	–0.73	–0.04
Marks (1–6)	3.31	1.35	–0.32	–1.10
Wagging school (1–5)	1.65	–0.94	1.90	3.79

Correlations among the time attitude subscales are reported in Table 2, and these fit the theoretical pattern, with positive attitudes correlating positively, negative attitudes correlating positively, and positive and negative attitudes having inverse relationships. Relationships involving the single-item variables were examined using both Spearman's ρ and Pearson's r (see Table 5). Only two of the relationships among the five academic variables had medium effect sizes (i.e., $r \geq .30$). Attitude to school and attitude to teacher

were correlated, and academic self-ranking was correlated to school marks in keeping with theoretical expectations.

Table 2   Correlation matrix for the adolescent time attitude scale

		1	2	3	4	5	6
1	Past positive	1.00	*−.72*	*.61*	*−.43*	*.43*	*−.27*
2	Past negative	−.64	1.00	*−.49*	*.76*	*−.29*	*.60*
3	Present positive	.53	−.42	1.00	*−.75*	*.63*	*−.43*
4	Present negative	−.39	.67	−.66	1.00	*−.41*	*.76*
5	Future positive	.39	−.25	.59	−.37	1.00	*−.64*
6	Future negative	−.24	.54	−.37	.66	−.53	1.00

Notes: $N = 579$. Correlations below the diagonal are for the manifest variables. Italic correlations above the diagonal are for latent variables and were obtained from Model 3 of the confirmatory factor analysis reported in Table 5.

4.2   Psychometric properties of ATAS scores

4.2.1   Internal consistency

Internal consistency estimates were calculated for the six ATAS subscale scores by ethnic group and for the whole sample, and these are presented in Table 3. As can be seen, alpha estimates ranged from .71 to .91 for subgroups and from .82 to .90 for the whole sample. Confidence intervals for the whole-sample alphas (Fan and Thompson, 2003) ranged from .80 to .91, and omega estimates based on the coefficients from an analysis of the six-factor structure using confirmatory factor analyses (CFAs) fell in the same range.

Table 3   Internal consistency estimates by subgroup

	α	α	α	α	α	α (95% C.I.)	ω[a]
	Pakeha (289)	*Maori (31)*	*Pasifika (23)*	*Asian (181)*	*Other (45)*	*All*	*All*
Past positive	.85	.84	.71	.86	.82	.85 (.82, .87)	.84
Past negative	.91	.85	.90	.86	.90	.89 (.88, .91)	.90
Present positive	.91	.89	.88	.89	.88	.90 (.89, .92)	.90
Present negative	.87	.75	.84	.84	.84	.86 (.84, .88)	.84
Future positive	.90	.92	.90	.90	.84	.90 (.88, .91)	.90
Future negative	.86	.72	.81	.77	.85	.82 (.80, .84)	.82
Attitude to school	.80	.86	.89	.84	.67	.81 (.78, .84)	.82
Attitude to teachers	.89	.81	.82	.91	.90	.89 (.88, .91)	.90

Notes: $N = 561$. Individuals with missing values for ethnicity are not included.
[a]ω estimates calculated using coefficients from the six-factor structure reported in Table 5.

4.2.2 Structural validity

As this was the first examination of ATAS score in a New Zealand sample, we began by examining the six individual subscales. Item-intercorrelations were moderate to high (rs > .30) and Kaiser-Meyer-Olkin values were .76 and higher. Parallel analysis and the scree test supported one-factor structures for each of the scales, and coefficients from EFAs of the individual subscales yielded coefficients ranging from .62 to .85. CFAs were used to examine the six-factor structure. In keeping with the initial validation study by Worrell et al. (2011), we examined three models in addition to the null model (Model 1). Model 2 consisted of two factors (items assessing positive attitudes and negative attitudes). Model 3 assessed three factors based on time period (i.e., items assessing the past, the present, and the future). Finally, Model 4 assessed the six-factor structure accepted by Buhl and Lindner (2009) and Worrell et al. (2011).

Based on the recommendations of multiple theorists (e.g., Byrne, 2001, 2006; Thompson, 2004), we used multiple criteria to assess goodness of fit. The criteria used included

a   the Satorra-Bentler scaled chi-square (Satorra and Bentler, 1994), which corrects for non-normality in the data

b   the chi-square to degrees of freedom ratio

c   the non-normed index (NNFI), which takes model complexity into account

d   the comparative fit index (CFI; Bentler, 1990), which takes sample size into account

e   standardised root mean square residual (SRMR), or average value across the standardised residuals

f   the root mean square error of approximation (RMSEA), with a 90% confidence interval around RMSEA values.

The NNFI and CFI are indices of fit (greater values indicating better fit) and the SRMR and RMSEA are indices of misfit (smaller values indicating better fit).

Hair et al. (1995) indicated that a chi-square to degrees of freedom ratio between 1 and 2 indicates acceptable fit. Byrne (2006, 2008) and Marsh et al. (2004) contended that NNFI and CFI values in the .92 to .95 range, and SRMR and RMSEA values in the .05 to .08 range indicate acceptable fit for item-level scales. We used maximum-likelihood extraction procedures to analyse the covariance matrices based on raw scores using EQS, Version 6.1 (Bentler, 2005) and scaled the latent variables by setting a single indicator for each of the factors at unity. The use of robust statistics resulted in corrected test statistics and standard errors.

Table 4 contains the CFA results. The null model (Model 1) was rejected, as the chi-square to degrees of freedom ratio was the highest in this model. Neither the two-factor model (Model 2) with positive items making up one factor and negative items making up the other factor nor the three-factor model (Model 3; factors for past, present and future items) fitted the data well, with all of the fit indices falling well short of an acceptable fit. However, all of the indices for Model 4 were acceptable, even by the more stringent criteria for acceptable fit suggested by Hu and Bentler (1999).

Table 4   Fit indices for the ATAS scores derived from confirmatory factor analyses (maximum likelihood robust)

Model	χ^2 s-b	df	χ^2/df	NNFI	CFI	SRMR	RMSEA	(90% C.I.)
1 Null	8,889.03*	435	20.43					
2 Two-factor (valence)	2,677.52*	404	6.63	.710	.731	.101	.099	.095, .102
3 Three-factor (time periods)	2,423.17*	403	6.01	.742	.761	.561	.093	.089, .097
4 Six-factor	767.51*	390	1.97	.950	.955	.045	.041	.037, .045

Notes: $N = 579$; ATAS = adolescent time attitude scale; s-b = Satorra-Bentler;
   NNFI = robust non-normed fit index; CFI = robust comparative fit index;
   SRMR = standardised root mean square residual; RMSEA = robust root mean
   square error of approximation; C.I. = confidence interval; *$p < .001$.

4.3   Correlations between time attitudes and school-related variables

Next, we examined the relationships between the ATAS subscale scores and the five school-related variables, again using non-parametric and parametric correlations for the single-item variables. Differences between Spearman's ρ and Pearson's r for the 18 comparisons ranged from zero to .04 (*Mdn* = .01). We had hypothesised that the ATAS scores would not be meaningfully related to academic achievement or to the other academic constructs. This hypothesis was only partly supported. As can be seen in Table 5, time attitudes were not associated with school marks, academic self-ranking, or wagging school; however, all six time attitudes had meaningful relationships (i.e., $r > .30$) with attitudes to school and present negative and positive attitudes were related to attitude to teachers. Additionally, the relationships were in the direction that one would expect, with positive attitudes having positive relationships and negative attitudes having negative relationships. It is noteworthy that relationships between attitude to school and teachers were highest with present positive and present negative time attitudes. Given that school and teacher attitude variables asked students to rate how they felt 'today', this pattern adds to the nomological network of correlational evidence in support of the time attitude variables.

4.4   Cluster analyses

As the sample size was substantial and this was a preliminary examination of clusters in this context, only participants with no missing data on the time attitude subscales were included in these analyses ($n = 463$; 80% of the original sample). Several steps were used in clustering the time attitude scores. First, scores on the six time attitude subscales were converted to T scores ($M = 50$, $SD = 10$). Next, Ward's agglomerative, hierarchical method (Bergman et al., 2003) suggested both a three- and four-cluster solution. Third, we validated the Ward's solutions with the K-means iterative partitioning method. Fourth, the two cluster solutions were assessed for homogeneity of attitudes *within* each cluster using Bergman et al.'s (2003) algorithm, $EV = 100 \times (Et - Ec) / Et$. Two of the three clusters in the three-cluster solution had less than acceptable levels of homogeneity (i.e., EVs < .67, Bergman et al., 2003); however, all of the clusters in the four-cluster solution had acceptable homogeneity levels ($.69 \leq EV \leq .84$), so the four-cluster solution was accepted.

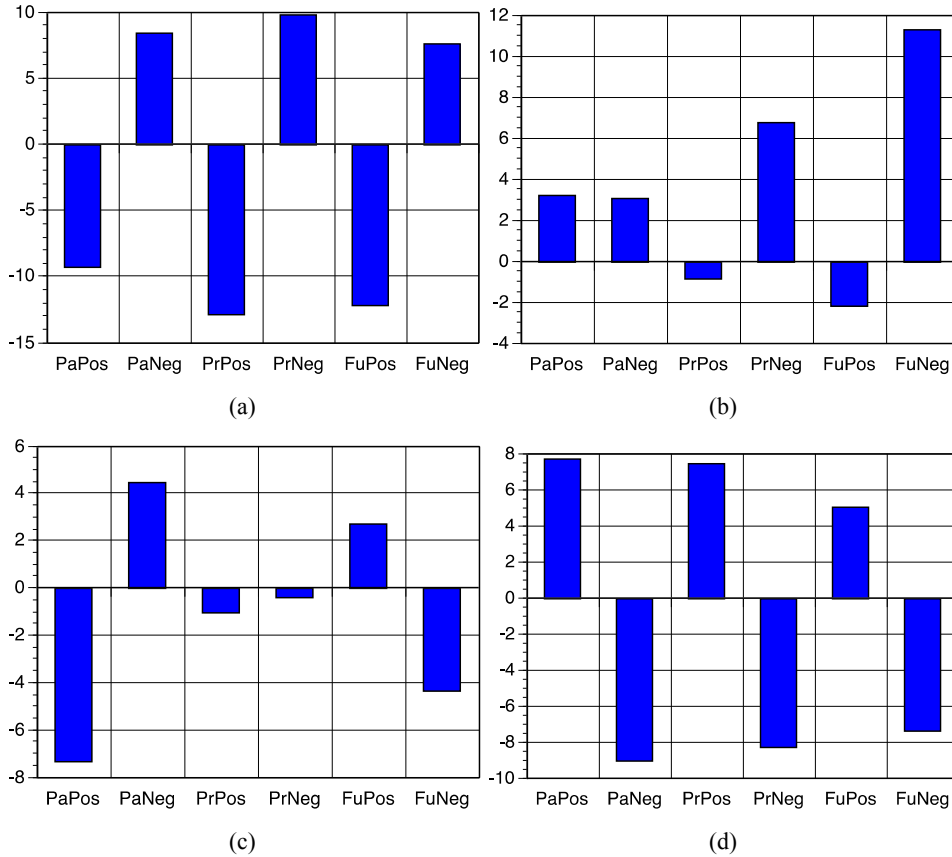**Table 5**   Correlations between time attitude and education variables

	Academic self-ranking	Attitude to school	Attitude to teachers	School marks	Wagging school
Past positive	.11/.14	*.33*	.28	.13/.13	−.04/−.07
Past negative	−.15/−.16	*−.34*	−.24	−.14/−.14	.14/.18
Present positive	.17/.18	*.46*	*.38*	.16/.15	−.14/−.12
Present negative	−.19/−.21	*−.48*	*−.31*	−.17/−.18	.15/.18
Future positive	.09/.09	*.34*	.24	.06/.06	−.08/−.07
Future negative	−.28/−.27	*−.37*	−.27	−.25/−.25	.15/.18
Academic self-ranking	-				
Attitude to school	.17/.15	-			
Attitude to teacher	.28/.25	*.55/.52*	-		
School marks	*.66/.62*	.17/.18	.28/.28	-	
Wagging school	−.18/−.22	−.21/−.21	−.14/−.18	−.17/−.19	-

Notes: All correlations of .15 and higher are significant at the .001 level. Correlations
   ≥ .30 are in italics and interpreted. Correlations before the slash are Spearman's ρs
   and the correlations after the slash are Pearson rs.

The four time attitude cluster profiles are presented in Figure 1. Clusters were interpreted and named based on the variability of the scores relative to each other and to the mean of the sample. Profile 1 ($EV = 71$, $n = 100$, 21.6%), consisted of adolescents with negative attitudes that were substantially above average ($\geq$ .7 *SD*s) and positive attitudes substantially below average ($\geq$ .9 *SD*s). This profile was labelled negatives. Profile 2 ($EV = 69$, $n = 86$, 18.6%), labelled pessimists, had past positive and negative attitudes .3 *SD*s above the sample mean, present positive attitudes at the sample mean, future positive attitudes .2 *SD*s below the sample mean, and substantially above average present negative (.6 *SD*s) and future negative (> 1 *SD*) attitudes. The third profile ($EV = 76$, $n = 95$, 20.5%) was labelled optimists. It was characterised by very low past positive (.7 *SD*s) and above average past negative scores ($\approx$ .4 *SD*s), below average present positive and above average present negative scores ($\approx$ .5 to .7 *SD*s), but above average future positive scores ($\approx$ .3 *SD*s) and below average future negative scores ($\approx$ .4 *SD*s). The fourth profile, labelled positives ($EV = 84$, $n = 182$, 39.3%), had substantially above average positive attitudes ($\approx$ .5+ *SD*s) and substantially below average negative attitudes ($\approx$ .8+ *SD*s) toward all three time periods.

All of the clusters had substantial numbers and were similar to ones obtained by Buhl and Lindner (2009) or Andretta (2011). One-way ANOVAs were calculated to examine the differences in each of the time attitudes among clusters. All of the ANOVAs were significant with large effect sizes: past positive = $F(3, 459) = 196.98$, $p < .001$, partial $\eta^2 = .56$; past negative – $F(3, 459) = 174.15$, $p < .001$, partial $\eta^2 = .53$; present positive = $F(3, 459) = 186.68$, $p < .001$, partial $\eta^2 = .55$; present negative = $F(3, 459) = 196.66$, $p < .001$, partial $\eta^2 = .56$; future positive = $F(3, 459) = 118.70$, $p < .001$, partial $\eta^2 = .44$; future negative = $F(3, 459) = 236.30$, $p < .001$, partial $\eta^2 = .61$. About 60% of the adolescents were grouped under one of the two clusters with a positive valence (i.e., optimists or positives).

Figure 1   Time attitude profiles based on positive and negative attitudes toward the past, the
present, and the future, (a) Negatives (b) Pessimists (c) Optimists (d) Positives
(see online version for colours)

Notes: Zero indicates *average* attitudes relative to the sample (*SD* = 10).
PsPos = past positive, PaNeg = past negative, PrPos = present positive,
PrNeg = present negative, FuPos = future positive, FuNeg = future negative.

4.5   *Differences on educational outcomes by cluster*

In general, we expected the students in clusters with a positive valence (i.e., optimists and
positives) to report higher scores on school marks, academic self-rating, attitude to
school, and attitude to teacher and lower scores on wagging school than students in
clusters with a negative valence (pessimists and negatives). We hypothesised that
negatives and positives would differ significantly on all of these variables and that the
effect sizes of the difference would be at least in the medium range. Five one-way
ANOVAs were conducted with the alpha at .01 to control the error rate. Four of
the five comparisons were significant at that alpha level: academic self-ranking,
$F(3, 456) = 8.67$, $p < .001$, $\eta_p^2 = .05$; attitude to school, $F(3, 456) = 37.23$, $p < .001$,
$\eta_p^2 = .20$; attitude to teacher $F(3, 456) = 23.84$, $p < .001$, $\eta_p^2 = .14$; school marks
$F(3, 454) = 6.12$, $p < .001$, $\eta_p^2 = .04$; and wagging school $F(3, 455) = 3.49$, $p = .016$,
$\eta_p^2 = .02$.

Post-hoc contrasts generally confirmed the hypotheses, which are contextualised with effect sizes. These results are presented in Table 6, and only differences with effect sizes of at least .40 are interpreted. Positives reported substantially higher academic self-ranking scores than did negatives or pessimists, and this pattern was repeated for school marks. In both cases optimists fell between the positives and the two negative groups, but did not differ substantially from either extreme. The largest differences were reported for the attitudinal variables. Positives reported substantially more positive attitudes toward both school and teachers than did the other three groups, and optimists reported more positive attitudes than negatives, but did not differ meaningfully from pessimists on these variables. We calculated effect sizes for wagging school as well, although the ANOVA was not significant, but all differences on this variable had small effect sizes (see Table 6).

Table 6 Cluster differences on educational outcomes

	Academic self-ranking*	Attitude to school*	Attitude to teachers*	School marks*	Wagging school
Clusters (n)	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*
Negatives (100)	3.19 (0.92)	4.39 (1.13)	4.58 (1.33)	3.02 (1.60)	1.81 (1.05)
Pessimists (86)	3.17 (0.75)	4.94 (1.04)	5.27 (1.27)	3.15 (1.45)	1.71 (0.95)
Optimists (95)	3.39 (0.72)	5.28 (1.05)	5.19 (1.47)	3.55 (1.41)	1.53 (0.80)
Positives (182)	3.60 (0.72)	5.74 (1.02)	5.88 (1.08)	3.82 (1.33)	1.49 (0.79)
d^a *(group differences)*					
Negatives/positives	0.51	1.27	1.10	0.56	−0.36
Negatives/optimists	0.24	0.81	0.43	0.35	−0.30
Negatives/pessimists	−0.02	0.50	0.53	0.08	−0.10
Pessimists/positives	0.59	0.78	0.53	0.49	−0.26
Pessimists/optimists	0.30	0.32	−0.06	0.28	−0.21
Optimists/positives	0.29	0.45	0.56	0.20	0.29

Notes: [a]Unbiased estimates.
$*p < .01$

5   Discussion

In this study, we examined the psychometric properties of ATAS scores (Mello and Worrell, 2007) in adolescent, female New Zealanders, as well as the possibility that these adolescents in New Zealand could be grouped on the basis of their attitudes toward time as in Germany and the USA. Results supported the ATAS factor structure accepted in other studies (Buhl and Lindner, 2009; Worrell et al., 2011), and reliability estimates were in the moderate to high range. Four clusters similar to clusters found in Germany and the USA were found, and cluster membership predicted differences in some academic outcomes, as in other countries, and as hypothesised, in most cases, the cluster differences were more substantial than the correlational results. These findings are discussed briefly.

5.1   Psychometric properties of ATAS scores

5.1.1   Structural validity

The ATAS (Mello and Worrell, 2007) was developed on the premise that there are positive and negative attitudes to the past, present, and future, and that each of these attitudes should be assessed, even though they are related. In 2009, Buhl and Lindner reported support for the six-factor structure in a substantial sample of German adolescents. However, these authors did not assess alternative models. Worrell et al. (2011) examined the ATAS structure in two independent samples of approximately 300 each from Germany and the USA. In the Worrell et al. (2011) study, the authors compared the six-factor structure to a three-factor structure (based on a single factor for each time period) and a two-factor structure (based on separate individual factors for positive and negative attitudes). Worrell et al. (2011) found that the best fit in both Germany and the USA was for the six-factor structure, and this finding was replicated in the current sample of New Zealanders. This preliminary evidence suggests that the structural validity of ATAS scores in New Zealand are similar to the USA and Germany. Worrell et al. (2011) also showed that there was strong invariance in ATAS scores between the USA and Germany. Further research will need to be conducted to see how ATAS scores in New Zealand compare to these scores in other national contexts.

5.1.2   Reliability

In addition to finding support for the structural validity of ATAS scores, analyses also provided strong support for their internal consistency. Given our interest in using these scores to make inferences, it is also critical that they have high internal consistency estimates.

> "Poor score reliability compromises the capacity to obtain all three types of significance. At the extreme, perfectly unreliable scores are perfectly random and cannot yield statistically, or practically, or clinically significant results. Thus, establishing that the data being investigated in a given study are reliable is a prerequisite for even subsequently analysing any of the three types of significance." [Thompson, (2003), p.5]

We were particularly interested in the utility of the scores for subgroup comparisons as well as for creating clusters. Thus, we investigated the alpha estimates in all of the racial/ethnic subpopulations, examined the confidence intervals for the alpha estimates, and calculated omega estimates using the structural validity coefficients. Each analysis provided strong support for the internal consistency of ATAS scores.

5.2   Correlations between time attitudes and academic outcomes

As hypothesised, the correlations between the time attitudes and three of the academic variables – academic self-ranking, school marks, and wagging school – were small in size. This finding replicates findings about time attitudes and academic performance in several studies in the literature (Adelabu, 2007; Mello and Worrell, 2006; Worrell and Hale, 2001; Worrell and Mello, 2009; Zimbardo and Boyd, 1999). The preponderance of evidence indicates quite clearly that time attitudes are not meaningfully related to academic achievement in particular.

However, in the current study, all of the time attitudes had moderate relationships with attitude to school, and both present positive and present negative attitudes had moderate relationships to attitude toward teachers. These results bring several ideas to mind. First, there is the issue of construct relatedness, with time attitudes being related to attitudes to school and teachers, and common method bias. Thus, an important question to ask in future research is if this relationship is being driven by the fact that all of the constructs involved are self-reported attitudes. Although this may play a role, there are two factors that suggest that there is more to these relationships. First, all of the outcome variables are self-report, but only the attitudinal variables had meaningful relationships with time attitudes. The second reason is related to concurrent validity. Although not hypothesised, the fact that attitudes toward the present had stronger relationships with attitudes to school and teachers than did attitudes toward the past and future time attitudes suggests that the relationships are not being driven solely by mono-informant bias or construct relatedness. This finding also provides psychometric support for the specificity of the time constructs, and replicates a finding also previously reported by Worrell and Mello (2009).

5.3   Differences in academic outcomes by cluster

Many of our theoretical models imply relationships between focal constructs and other constructs – in this study, time attitudes and academic outcomes, respectively – and examine these relationships through correlational analyses. Cluster analyses provide another potential way to examine these relationships and are person – rather than construct-centred (York and John, 1992). The implication is that whereas one attitude may not be a useful predictor by itself, profiles of attitudes form personality structures that may provide windows into psychological and behavioural functioning. The major hypothesis in this study is that adolescents fall into interpretable clusters of attitudes toward time and that individuals with different profiles will differ in outcomes in predictable ways (Zimbardo and Boyd, 2008). Previous analyses using ATAS scores had provided support for this hypothesis in American and German adolescents.

In keeping with the hypothesis, four interpretable clusters were found: positives, optimists, pessimists, and negatives. The positives and negatives reflected profiles in which attitudes to time were similar across all three time periods. In the case of positives, that meant high positive attitudes to the past, present, and future, and low negative attitudes to those periods; the negatives were the inverse of this group. Buhl and Lindner (2009) found similar groups, but labelled them optimists and pessimists. We opted for the use of the terms positives and negatives, as both pessimism and optimism are forward-looking, and the profiles were based on similar attitudes across all three time periods.

We reserved the labels, pessimists and optimists for two other profiles. We gave the optimists label to a profile that reflected low-positive, high-negative past attitudes, average attitudes toward the present, and high-positive, low-negative future attitudes, reflecting a shift in outlook from a negative past to an optimistic future. Similarly, the pessimists label was given to the profile with similar attitudes toward the past, but high and higher negative attitudes toward the present and future respectively. One can hypothesise a continuum of four profiles based on valence from most negative to most positive:

a   negatives

b   pessimists

c   optimists

d   positives

– and results indicated that on the six individual time attitudes, profiles differed significantly and meaningfully.

As expected, there are general linear trends in the means reported in Table 6, with the differences most evident between the two most extreme groups, the Positives and Negatives; individuals in these two clusters reported statistically and practically significant differences on four of the five academic outcomes. Moreover, the positives had substantially better outcomes than not only the negatives, but also the pessimists on academic self-ranking and school marks, and all other groups on attitude toward school and teacher. Differences were largest on the attitudinal variables, so to the extent that these attitudes play a major role in directing achievement-related behaviours, it is likely that these groups behave differently in school.

Substantial differences were also found between groups on academic self-ranking and school marks, in support of the hypothesis that attitudes may affect achievement-related behaviours. Interestingly, the difference was not statistically or practically significant for wagging school, but this behaviour was low in frequency, and it is probable that in a sample where there is more wagging (e.g., schools across all decile levels and boy schools), the outcome on wagging may also be meaningful. although the practical significance of this difference was lower. Overall, the findings suggest that students' attitudes to and engagement in school may be related to the time attitude profiles that they hold. If this contention proves to be correct, time attitudes may prove to be a useful construct in developing interventions for with low-achieving youth.

5.4   Limitations and conclusions

Despite the robust findings, this study had several limitations. First, the sample is limited to females attending a high decile school in a suburban area. Thus, it is not clear how generalisable the findings are to males and to students from other socioeconomic backgrounds. Second, because several of the ethnic groups' numbers were too small, we did not examine structural validity by subgroup. Thus, we cannot conclude with certainty that the factor structure is the same across the ethnic groups, although there is evidence that internal consistency of scores is similar. Third, all of our outcome variables were self-report, and three were based on single-items. It will be important for future studies to assess if time clusters predict differences in school achievement from school records and behavioural and psychological functioning as reported by informants other than the participants (e.g., teachers and parents). For example, do teachers perceive differences in engagement and motivation in students with different time attitude profiles?

5.5   Conclusions

Limitations notwithstanding, this study has yielded some potentially interesting and important findings. It seems as if ATAS scores are reliable and structurally valid in adolescent New Zealanders, and that these adolescents do fall into interpretable clusters

with regard to attitudes, clusters that mirror those found in other countries. A larger number of adolescents had positive profiles, although a substantial minority had negative profiles, and this warrants further investigation. Zimbardo and Boyd's (1999) balanced profile was not found in this study, although this has been found in other studies of adolescents (Andretta, 2011; Buhl and Lindner, 2009) and college students (Boniwell et al., 2010; Qin et al., 2012). Moreover, as in this study, positives reported the best outcomes as in other studies where both positive and balanced profiles were found. Thus, this study raises questions about the generalisability of the balanced profile and its characterisation as ideal. The ATAS seems to be a useful instrument to help us examine such questions in New Zealand and across national and cultural contexts.

Acknowledgements

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