This study examined motivational beliefs and self-regulated learning strategies and their association with academic achievement. In addition, the changes in students’ perceptions of motivation and self-regulation over time were taken into account by considering students’ perceptions at weeks 2 and 10 of the 14-week academic semester. The findings of the research found strong associations between the self-regulated learning strategies and motivational beliefs at both the pre- and post stages of measurement. Second, strong associations were found between the post measures of self-efficacy and intrinsic value and grade average formulated at the end of the academic semester. Moreover, students’ self-efficacy and intrinsic value scores had strong associations with grade average when measured prior to the final examination period in week 10. Consequently, there is an intriguing interaction between engagement in self-regulated learning strategies at the beginning and end of the semester in terms of driving the corresponding measures of motivational beliefs and their direct affect on academic achievement. Moreover, learning and educational strategies were considered to ameliorate the problems related to sustaining engagement in self-regulated learning strategies over the semester period which affect motivational beliefs and academic achievement.

**Key words:** motivation, self-regulation, self-efficacy, intrinsic value, academic achievement

Investigating the learning experiences of students who encounter academic problems and making connections with motivational and self-regulatory variables is a complex process given the wide range of interweaving variables. The need for research in the area has been identified and acknowledged (Pintrich, 2003; Pintrich & Schunk, 2002; Pintrich & Zusho, 2007). This study is an extension of earlier research using static expectancy-value models (Klomegah, 2007; Pintrich & De Groot, 1990; Tempelaar, Gijselaers, van der Loeff, & Nijhuis, 2007; Wang, Spencer, & Xing, 2009) as it considers the dynamic nature of perceptual change over time. The present study concentrates on several issues, namely students’ perception in relation to motivation and self-regulation, the impact of time, and the connection between students’ perceptions and their academic achievement.

Eccles and Wigfield (2002) describe expectancy-value theory in relation to achievement-related choices whereby motivation is moderated by perceptions around the issue of task engagement and the probability of success. In education this is particularly significant as students will tend to attach more value to subjects and courses in which they are achieving academically. Pintrich and Zusho (2007) suggest that the expectancy value
model is a useful framework for understanding motivation within the educational context. According to Pintrich and Zusho there are three main components: (1) expectancy related to beliefs about ability or skill to complete or perform a task; (2) value in relation to perceived importance of task engagement; and (3) affective involvement in terms of the emotional or feeling aspects related to task engagement. Expectancy, value and affect are assumed to interact with other, and are posed to influence academic achievement and engagement in self-regulatory processes. This idea stems from earlier research (Pintrich and De Groot, 1990), whereby these theoretical concepts were measured using an abbreviated version of the Motivated Strategies for Learning Questionnaire (MSLQ). This questionnaire has two overarching scales: motivational beliefs (self-efficacy, intrinsic value, test anxiety) and self-regulated learning strategies (cognitive strategy use and self-regulation). In Pintrich and De Groot’s study, the MSLQ measures of self-regulation, self-efficacy and test anxiety were significant predictors of students’ academic performance.

Further research has demonstrated that students’ self-report measures of perceived motivation and self-regulation predict academic success, such that high levels of motivation and self-regulation predict a high probability of academic attainment (Klomegah, 2007; Lynch, 2006; Pintrich & De Groot, 1990; Wang et al., 2009). For example, Lynch (2006) utilised the MSLQ and identified variables including effort, self-efficacy, and external goal orientation that predicted academic achievement. Lynch also found that students’ grades could be predicted from different variable combinations depending upon the level of study being engaged in (upper level; freshman). Moreover, Klomegah (2007) found that several factors were related to academic performance namely, perseverance and setting of personal goals, self-efficacy and meta-cognitive strategy use. Wang et al. (2009) also found that self-efficacy and meta-cognitive strategy use were important in predicting student performance related to language tasks. In addition, Bruinsma (2004) found a negative relationship between deep processing and academic achievement and the author suggested that self-efficacy plays a critical role in facilitating cognitive engagement.

Fewer studies have established a link between intrinsic-value in learning and academic achievement. Nonetheless, Shih (2005) found that mastery learning intentions were significantly related to intrinsic interest in learning and these translated into higher levels of academic competency and less likelihood to engage in dysfunctional learning approaches, such as self-handicapping. In addition, Rao, Moely and Sachs (2000) found some differences between high and low achievers in terms of a time versus intrinsic value effect. Unlike their high achiever peers, low achievers showed a decrease in intrinsic value over time and a correspondingly lower level of study strategy use. The authors proposed that a self-handicapping strategy may have been established over time.

In addition, Smith (2004) investigated high school students in Australia during their last year of study. She took motivation and self-regulation measures at three stages, at the beginning, middle and end of the year. At the end of the year there were high stakes examinations that determined some major career and academic choices. The findings between beginning and middle of the year showed significant increases in anxiety and self-handicapping strategies, along with a decrease in the use of performance-approach
goals and academic self-efficacy. This trend, however, did not continue to the end of the year where a decrease in a sense of self-efficacy and an increase in avoidance were replaced by a perceived loss of confidence manifested by increased feelings of depression-related symptoms. Smith’s conclusions implied that students showed a sustained level of task goal orientation, such that students were still working hard at their studies even though they were experiencing higher levels of stress and feelings of despair.

In addition, Remedios, Ritchie, and Lieberman (2005) indicated that some students may have lowered interest before examinations while others have heightened interest due to the challenge of examinations, the opposing effects thus balancing each other out. They also inferred that the pressures of examinations appeared to undermine interest and aspects of denial (or other emotions) and this may distort students’ ability to accurately perceive their level of interest. The notions of time and change in perceived levels of motivational beliefs and self-regulated learning strategies were the main areas of interest in the present study.

The aim of the present study was to explore the expectation that measures on motivational beliefs and self-regulated learning strategies would predict academic achievement measures. Moreover, the stability of these measures over time was of interest and it was expected that an interaction between time and motivational beliefs and self-regulated learning strategies would be found.

**METHOD**

*Participants*

Three hundred and seventeen participants (241 female, 76 male) voluntarily participated in the study, which was conducted at AUT University (AUT), Auckland, New Zealand. The average age of the sample was 24.91 years ($SD = 9.22$, minimum = 16, maximum = 55). Two hundred and two participants (63.7%) were in their first year of study. The sample comprised of self-selected volunteers chosen from several faculties at the university. One hundred and forty seven participants responded to both surveys (pre and post); indicating a 46% response rate.

*Procedure*

This study was conducted over a one-and-a-half year period at three different times (Semester 1 of 2005; Semester 2 of 2005; Semester 1 of 2006). At the beginning of each semester (at week 2) students were asked to fill in a demographic survey, and a shortened version of the MSLQ (Pintrich & De Groot, 1990). This was followed up at the end of the semester (at week 10) with a further invitation to complete the same version of the MSLQ. Students engaged in their final examinations for their chosen course of study at weeks 13 to 14. At the beginning of the semester students were asked to fill in the questionnaires in face-to-face classroom environments and collection of data occurred during class time. At the end of the semester (in Week 10), questionnaires were mailed to all participants with a self-addressed envelope, and a reminder was sent to those students who did not reply on the first occasion after two weeks. The researcher collected participants’ completed questionnaires.

*Measures*

Two main measures were incorporated into the study design, namely self-report scores from the MSLQ and grade average (GA).

An earlier version of the MSLQ version (Pintrich & De Groot, 1990) was incorporated into this study. This version has 44 items and five subscales that include self-efficacy, intrinsic value, test anxiety, cognitive strategy use, and self-regulation. These five subscales are classified into two components: motivational beliefs (first three subscales) and self-regulated learning strategies (the last two subscales). This shortened
version was preferred to the 81-item version (Pintrich, Smith, Garcia, & McKeachie, 1991) as it encapsulated the areas of interest related to the present study. Other studies have used similar shortened versions (Ackerman & Beier, 2006), and the refinement complies with the administration instructions of the authors (Pintrich et al., 1991), who suggest that the MSLQ can be used either in its entirety or in part as considered appropriate by the researcher.

The GA scores were computed by averaging the summative grades of all completed assignments at the end of the respective semester in which the participant engaged in their course of study. These measures were obtained either from students directly or through the University data collection services after the University examination board had ratified their summative grade. The procedure for allocating grades at AUT University follows that the lecturer in charge of the paper computes a final grade by considering the weighting of several small evaluations and the final examination grade. Each faculty and discipline has their own assessment system but nearly all faculties use a summative letter grade. Faculties not using a summative letter grade system were omitted from the analyses. Letter grades were converted to a numerical scale, which is common practice for these types of analyses (Edwards, 2005). The conversions were as follows, A+=11, A=10, A-=9, B+=8, B=7, B-=6, C+=5, C=4, C-=3, D=2, E=1. Papers that were not completed were omitted from the analyses.

In addition, the covariate age was considered. After investigating the demographic information provided by the participants and a review of the literature, age was considered as a significant variable that might have an impact on the results (Heckhausen & Dweck, 1998; Hoskins & Hooff, 2005).

Data Analysis

For this study, three analytical steps were conducted. First, the MSLQ measures were checked between participants who completed both the pre- and post-MSLQ measures, and those that completed only the pre-measures. Second, to appraise effect of time over the semester on the self-report measures, a series of paired samples t-tests were conducted. In addition, summary statistics for the pre- and post-MSLQ measures were computed. Finally, a path analysis was conducted using AMOS version 18. The data were entered based on the expected model that the pre- and post measures of motivational beliefs and self-regulated learning strategies would clearly affect GA scores. The model fit was evaluated using chi-square ($\chi^2$), the comparative fit index (CFI), and the root mean square error of approximation (RMSEA) values (Hu & Bentler, 1999).

RESULTS

Step 1

Using Wilks’ Lambda as the test statistic, a preliminary investigation was conducted with respect to the two groups who completed the questionnaire (both pre- and post-sessions; only pre-session) over the five response measures of self-efficacy, intrinsic value, test anxiety, cognitive strategy use, and self-regulation. The finding showed no significant differences between the two groups, $F(5, 311) = .85, \ p = .51$. Thus, no anomalies were highlighted between the two groups.

Step 2

A series of paired samples t-tests (pre- and post-measures) were computed for each of the MSLQ scales, namely self-efficacy, intrinsic value, test anxiety, cognitive strategy use, and self-regulation (see Table 1 below). The results yielded only one significant effect for intrinsic value, $t(146) = 4.27, \ p < .00$. The trends of all measures, as shown in Table 1, indicated that intrinsic value showed a downward trend (Pre-mean = 4.12, Post-mean = 3.99). In addition, self-efficacy showed a marginal but non-significant upward trend (Pre-mean = 3.53, Post-mean = 3.60). All other measures appeared to show no discernable trend either upward or downward over time, indicating stability over time.
The path model (see Fig. 1 below) suggests that GA is affected by students’ motivational beliefs at the end of the learning period as well as by student age. The model also suggests that self-regulated learning strategies do not have a direct impact on GA but an indirect impact via motivational beliefs at the end of the learning period (post measures). A negligible change over time was noted with respect to self-regulated learning strategies since the correlation (standardised regression weights, which can be regarded as correlations) between pre- and post measures was high (r = .89). In contrast, motivation beliefs did appear to change over time (r = .40). Interestingly, self-regulated learning strategies are strongly correlated with motivational beliefs at both the beginning and end of the semester (r = .76 pre; r = .54 post). However, the correlation is smaller at the post phase suggesting that during the learning period students’ motivational beliefs have changed independently to self-regulated learning strategies which remained constant. An important point is the impact of age (r = .21) which had the same impact on GA as motivational beliefs (r = .22). This finding suggests that age is a potential confounder and hence including age in the model is essential. It is important to note that the model yielded acceptable psychometric qualities ($\chi^2$/df = 3.39; CFI = .88; RMSEA = .087), particularly given the small number of students (n = 147) who completed both pre- and post MSLQ instruments (Hu & Bentler, 1999).

### Table 1. Summary Statistics for the Pre and Post Measures of the MSLQ.

<table>
<thead>
<tr>
<th>MSLQ sub-scales</th>
<th>Pre-measures</th>
<th>Post measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Self efficacy</td>
<td>3.53</td>
<td>.54</td>
</tr>
<tr>
<td>Intrinsic value</td>
<td>4.12</td>
<td>.48</td>
</tr>
<tr>
<td>Test anxiety</td>
<td>2.88</td>
<td>.92</td>
</tr>
<tr>
<td>Cognitive strategy use</td>
<td>3.69</td>
<td>.50</td>
</tr>
<tr>
<td>Self-regulation</td>
<td>3.19</td>
<td>.40</td>
</tr>
</tbody>
</table>

### Table 2. Paired Samples T-Tests for Step 1.

<table>
<thead>
<tr>
<th>Paired comparison (pre- and post-measures)</th>
<th>Paired Differences</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Deviation</td>
<td>t</td>
<td>df</td>
<td>Sig</td>
</tr>
<tr>
<td>Self efficacy</td>
<td>-.073</td>
<td>.520</td>
<td>-1.689</td>
<td>146</td>
<td>.093</td>
</tr>
<tr>
<td>Intrinsic value</td>
<td>.164</td>
<td>.466</td>
<td>4.268</td>
<td>146</td>
<td>.000</td>
</tr>
<tr>
<td>Test anxiety</td>
<td>-.044</td>
<td>.876</td>
<td>-.604</td>
<td>146</td>
<td>.547</td>
</tr>
<tr>
<td>Cognitive strategy use</td>
<td>-.028</td>
<td>.406</td>
<td>-.827</td>
<td>146</td>
<td>.409</td>
</tr>
<tr>
<td>Self-regulation</td>
<td>-.022</td>
<td>.368</td>
<td>-.718</td>
<td>146</td>
<td>.474</td>
</tr>
</tbody>
</table>

### Step 3

The path model (see Fig. 1 below) suggests that GA is affected by students’ motivational beliefs at the end of the learning period as well as by student age. The model also suggests that self-regulated learning strategies do not have a direct impact on GA but an indirect impact via motivational beliefs at the end of the learning period (post measures). A negligible change over time was noted with respect to self-regulated learning strategies since the correlation (standardised regression weights, which can be regarded as correlations) between pre- and post measures was high (r = .89). In contrast, motivation beliefs did appear to change over time (r = .40). Interestingly, self-regulated learning strategies are strongly correlated with motivational beliefs at both the beginning and end of the semester (r = .76 pre; r = .54 post). However, the correlation is smaller at the post phase suggesting that during the learning period students’ motivational beliefs have changed independently to self-regulated learning strategies which remained constant. An important point is the impact of age (r = .21) which had the same impact on GA as motivational beliefs (r = .22). This finding suggests that age is a potential confounder and hence including age in the model is essential. It is important to note that the model yielded acceptable psychometric qualities ($\chi^2$/df = 3.39; CFI = .88; RMSEA = .087), particularly given the small number of students (n = 147) who completed both pre- and post MSLQ instruments (Hu & Bentler, 1999).
DISCUSSION

Research into the area of motivation and self-regulation and its impact on academic achievement is an ongoing and complex manner, but a very important one (Pintrich & Schunk, 2002). The aim of the present research was to explore the interactions of motivational beliefs and self-regulated learning strategies with respect to academic achievement in a university setting, and to appraise the stability of these entities over time.

The findings of the present study showed some intriguing patterns. First, strong associations were found between the self-regulated learning strategies and motivational beliefs at both the pre- and post stages of measurement. Second, strong associations were found between the post measures of self-efficacy and intrinsic value and GA formulated at the end of the academic semester. Moreover, students’ self-efficacy and intrinsic value scores had strong associations with GA when measured prior to the final examination period in week 10. Consequently, the findings of the present study are linked to the notion of expectancy-value models which emphasize the components of self-efficacy and intrinsic value (Pintrich & De Groot, 1990; Tempelaar et al., 2007). Hence, several variables appear to be of significance to this study, first self-efficacy and intrinsic value. And second, there is an intriguing interaction between engagement in self-regulated learning strategies and motivational beliefs.
learning strategies at the beginning and end of the semester in terms of driving the corresponding measures of motivational beliefs.

This interaction promotes and supports a very intuitive and sound educational process (Pintrich & Zusho, 2007), whereby students who work hard and engage in appropriate study-related strategies will inevitably have higher self-belief and have a higher sense of intrinsic value and this relationship is likely able to continue over time. Moreover, the feedback from the preliminary assessments during the semester that contribute to the final grade will likely positively affect the students using effective self-regulated learning strategies, and the converse is likely true for students not using such strategies. So that prior to examinations, students with higher self-efficacy and intrinsic value ultimately gain higher academic grades. Correspondingly, Wang et al. (2009) found that measures taken one week before students engaged in examinations yielded similar results such that confidence and self-efficacy were able to significantly predict academic attainment. In a similar study (Klomegah, 2007), self-efficacy and self-set goals were found to be significant predictors of academic achievement, although it is unclear from the findings when the measures were obtained as the authors state the measures were acquired ‘during the semester’ and thus the measures may not have been aligned to one specific time period. In addition, Bruinsma (2004) found that self-efficacy facilitated cognitive engagement, while the present findings indicate that cognitive engagement may in fact facilitate self-efficacy. However, these three comparison studies (Bruinsma, 2004; Klomegah, 2007; Wang et al., 2009) did not factor in the concept of time and this is likely to be a major point of difference; the present authors suggest that students will change over time in terms of their interest and expectancies and these are likely moderated by engagement in self-regulated learning strategies.

Pintrich and Zusho (2007) presented a general model for student motivation and self-regulated learning as it relates to the college classroom. In this model, the personal variables and classroom context are somewhat mediated by the motivational and self-regulatory process which determine levels of academic achievement. In the present study, the findings do not contradict this model but add a further variable ‘time’. The results of the present study suggest that students who have clear academic goals at the beginning and end of the semester are likely to have high levels of confidence and firm ideas in relation to task value and therefore work harder to reinforce implied expectancies of success. There are possible scenarios that underlie the current findings, such that prior academic success may be a potent variable that predetermines success in the subsequent year. In future studies it would be interesting to incorporate not only personal and classroom context but also antecedent learning patterns.

The time variable was investigated by reviewing the measures at the beginning of the semester (week 2) against those at the end of the semester (prior to final examinations). The findings showed that all measures with the exception of intrinsic value were stable over time. Students are involved in a dynamic relationship with their educational environment and this interaction may have a dampening effect on motivation, such as lowering a student’s sense of value about their course of study, and this dampening effect is also likely to be linked to academic achievement (Rao et al., 2000; Wilkins &
Kuperminc, 2009). Smith (2004) explored the effect of time on motivational variables in relation to high school students. Smith found significant increases in anxiety and self-handicapping strategies as students approached their trial examination period, with noticeable declines in goal-oriented behaviour and academic self-efficacy and the lowered scores for self-efficacy continued to the final examination period. In the present study, there was a marginal but non-significant decrease in self-efficacy and a significant decrease in intrinsic value over time. However, the present study has an interesting twist that extends the findings presented by Smith, such that students with lowered self-efficacy are likely to be those not achieving academically and also likely to be those who have not been engaged in putting in place sustained self-regulatory strategies beginning at the start of the semester and continuing on throughout the semester. The present findings suggest that sustained action of implementing cognitive, metacognitive and effort regulation strategies may develop intrinsic value and self-efficacy.

Furthermore, it was expected that the examination process will likely have an impact on student perceptions. Remedios et al. (2005) suggested that some students may have lowered interest before examinations while others have heightened interest due to the challenge of examinations. They also inferred that the pressures of examinations appeared to undermine interest and exacerbate emotions. The present findings appear to show that students who are more prepared for their study are more likely to be confident and interested in their study and thus more capable in terms of achieving high academic grades. However, the present findings did not show a significant increase in test anxiety before the final examination period, and this may be due to the cumulative assessment process at AUT University whereby it is usual for students to have several assignments during the semester which are weighted and added to the weighting of the final examination grade, thus reducing the high stakes effect on anxiety found elsewhere (Smith, 2004).

Additionally, Pintrich and Zusho (2007) presented a further model with regards to the phases and areas of self-regulated learning. The present findings are consistent with their model in that the first phase of forethought, planning and activation is a critical regulatory antecedent for appropriate use of self-regulatory strategies, affect management, engagement in on task behaviour and working with contextual facets of learning. Furthermore, these self-regulated learning strategies impact positively on self-efficacy and intrinsic value which in turn influence the attainment of high academic grades. This interesting interaction between self-regulated learning strategies and motivational beliefs has some educational implications.

In the promotion of learning, several areas of development can be employed, such as: (1) incorporating engagement at a very pragmatic level early in the process of learning by emphasising self-regulatory strategy use; (2) inculcating active planning in line with systems that encourage retention and meaningfulness of information; (3) developing insightful critiquing processes; (4) embracing partnership; and (5) encouraging effective time management activities (Boekaerts & Corno, 2005; Pintrich & Schunk, 2002; Pintrich & Zusho, 2007).

As a final note, it is acknowledged that there are several limitations associated with
this study. First, measures of motivation and self-regulation relied on the Pintrich and DeGroot (1990) MSLQ instrument. On reflection, the full MSLQ instrument could have been employed to further the scope of investigation (Pintrich et al., 1991). In addition, other commonly cited measures in this area of research could have been considered, such as the Learning and Study Strategies Inventory (Weinstein & Palmer, 2002), the Academic Motivation Scale (Vallerand et al., 1993), Goal Orientation and Learning Strategies Survey (Dowson & McInerney, 2004), and the Student Motivation Scale (Martin, 2004). Next, the assumption that GA is a continuous variable and consistent across time, faculties, universities, and disciplines may have inherent problems (Ellison, 2008; Felton & Koper, 2005). In addition, it would have been interesting to administer the MSLQ after the final examination period before the summative grade was dispensed by the examination board. This would have assessed the impact of the final examination on the students’ self perceived regarding their motivational status. However, the students would likely still be anxious as they wait for their final grades.

It is further hypothesised that a student’s academic journey through the semester and following the semester has many critical points. The present authors feel that it would be interesting to track this journey by assessing changes in motivational beliefs and engagement in self-regulated learning strategies across the semester using a variety of techniques such as critical incident analyses and/or journaling in addition to self-report measures (Cleland, Arnold, & Chesser, 2005; Crooks & Peters, 2005). As a result, there is scope for further research, especially in the area of investigating the influence of time and contextual factors on motivation within the university setting.

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