ACADEMIC MOTIVATION AND ENGAGEMENT: AN EXAMINATION OF ITS FACTOR STRUCTURE IN SENIOR SCHOOL YEARS

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Abstract

Student motivation and engagement are crucial in senior school years when students are required to make important decisions about their future pursuits of education and career choices. The purpose of this study was to comprehensively examine the factor structure of student motivation and the associations among the motivational constructs at three time points (Year 10 (N=537); Year 11 (N=383) and Year 12 (N=299). Students from four non-government senior high schools completed the Student Motivation and Engagement Scale (Martin, 2007) in the second semester of the school year for three years. The results showed that student motivation is complex and multifaceted. A range of core motivational theories was needed to explain the network of associations among the facets of motivation. The 11-factor structure of motivation and engagement was identified at all three time-points consistent with Martin's findings (2007). Adaptive cognitions and behaviors showed positive correlations with each other and mostly negative associations with maladaptive cognitions and behaviors. The findings have valuable practical implications for those wanting to support learning experiences of students, especially in the final years of schooling.

Keywords: Motivation, engagement, senior school, cognitions, behaviours

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1. Introduction

Adolescents stand on the brink of a world whose expectations and standards of success are greater than they were a decade ago due to a competitive scenario in the field of education and employment. In this context, students are more likely to get swayed by various factors that apparently influence their behaviour, such as developmental changes and social relationships. In addition to these disruptions, the Generation Y students tend to treat the educational process 'as just another appointment in their diaries' (Krause, 2006, p.5). This lack of seriousness towards learning at school is further intensified by the growth of the 'addictive distractions of improved computer games, ipods and the like' (Bok, 2006, p.112-3). Against this background, teachers face a formidable task of sustaining or enhancing students' motivation and engagement in the learning process if effective learning is to occur. They believe that to achieve this goal, it is necessary that students need to get involved in the learning process.

Both motivation and engagement are crucial to the learning process. Motivation has been shown consistently to strengthen the ability to concentrate on school work and consequently with achievement, while their absence is associated with disengagement from learning behaviours and failure in school work. High levels of motivation to do well at a valued activity have been shown to be associated with academic achievement (Martin, 2003; Green et al., 2006; McInerney & Van Etten, 2004), mental wellbeing and the feeling of being in control of learning (Ryan & Deci, 2000; Smith, 2004). Intrinsic motivation is found to be positively related to self-esteem and negatively related to depression and anxiety (Kasser & Ryan, 1996). Students who lack motivation believe that their actions will not increase their chances of a positive outcome (Seligman, 1975). Skinner and Pitzer (2012) suggest that engagement also shapes students' everyday experiences in school and is a critical contributor to students' academic development. Research shows that students who report higher levels of engagement also report enjoying learning more and finding it more meaningful than students who are not engaged (Deneen, 2010; Dowson & McInerney, 2001; Hancock & Betts, 2002; Voke, 2002). Motivation and engagement, thus, can be a powerful process as on the one hand it can energise students to develop new skills whereas on the other hand an absence of it can result in disengagement and self-sabotage. To capture this complex phenomenon, a deeper and more comprehensive understanding of the nature of students' orientations towards learning is needed.

2. An integrated approach to academic motivation

Student performance is greatly influenced by their motivation and engagement in the learning process. There is a wide range of theories that focus on specific motivational constructs, such as, self-efficacy (Bandura, 1986, 1997), need for achievement (Atkinson, 1964) and self-worth (Covington, 1992), attribution and control (Skinner, Wellborn, & Connell, 1990; Weiner, 1985), expectancies and values (Ryan & Deci, 2000; Wifield & Eccles, 2000) and achievement goals (Ames, 1992). Martin recognised this limitation and developed his model (2001, 2003). He argued that students exhibit many attitudes and behaviours toward learning and that simply assessing one of the motivational constructs does not necessarily reflect their overall style or level of motivation. He developed the Student Motivation and Engagement Wheel (the Wheel) which incorporates the core themes of the major theories to capture the complexity of academic motivation more adequately. His model reflects the

significant commonalities across various theories and models of motivation that include i) cognitive and behavioural components (Pintrich & DeGroot, 1990), ii) strategies and behaviours driven by individuals' characteristics orientations and cognitions (Buss & Cantor, 1989), iii) approaches to engagement emphasizing the effects of cognitive change on behavioural change (Beck, 1995), iv) categorization of engagement into cognitive- affective and behavioural dimensions (Miller et al., 1996; Miserandino, 1996) and vii) assessments of differential effects and strength of distinct aspects of motivation and engagement, such as, self-efficacy reflecting highly adaptive motivation (Bandura, 1997), anxiety impeding students' engagement (Sarason & Sarason, 1990) and self- handicapping reflecting maladaptive engagement (Martin, Marsh, & Debus, 2001).

The Wheel represents two levels of motivational constructs. The first-order constructs include self-efficacy, valuing, mastery orientation, planning, study management, persistence, anxiety, failure avoidance, uncertain control, self-handicapping and disengagement. While Martin (2007) argued that these eleven constructs provide an adequate basis that are required to assess the complexity of motivation and engagement in educational practice, he also claimed that the second-order conceptualization with four dimensions of motivation and engagement aims at enhancing parsimony, providing a unifying approach to educational and psychological theory and increasing the prospects of understanding the basic structure of students' motivation and engagement from an applied perspective. Martin proposed that the four second-order groups include adaptive cognitions (self-efficacy, value on school and mastery orientation), adaptive behaviours (planning, study management and persistence), impeding cognitions (anxiety, failure avoidance and uncertain control) and maladaptive behaviours (self-handicapping and disengagement). The factor analysis of responses of 12,237 high school students from 38 Australian high schools provided empirical support for this two level model (Martin, 2007) suggesting a clearer picture of how and why students think and behave in particular ways towards school and learning.

Although research findings from other countries are valuable in providing an understanding of motivation and its complex processes, it should not be assumed that the experience of Australian students is identical to that of students from other countries. In the Australian Capital Territory (ACT), for Year 12 students, in particular, achieving the required Australian Tertiary Admission Rank (ATAR) is important if they intend to pursue their studies at the universities. The ACT has a system of assessment practice which requires students to work towards attaining Year 12 certificate through a combination of course scores achieved in Year 11 and Year 12 and the ATAR position for tertiary courses. Therefore, understanding the dynamics of academic motivation and engagement of students in Years 10, 11 and 12 (Time 1, Time 2 and Time 3 respectively) in the ACT, through a comprehensive motivational model is crucial, considering the role of motivation and engagement in the learning process. Furthermore, understanding the associations among the motivational constructs at each time point would be helpful to teachers and parents to identify adaptive and maladaptive patterns of motivation early and to foster adaptive cognitions and behaviours and work against the maladaptive motivation of students towards learning.

3. The aims of the present study

The present study set out to examine the suitability of Martin's (2007) comprehensive model of school motivation and engagement (SMES-HS) to assess motivation and engagement

of senior school students in the ACT. The present study had two primary aims in assessing students' motivation and engagement. The first aim was to examine the first-order (11 factors) and the second-order (4 factors) factor structures of student motivation and engagement against the integrated model proposed by Martin (2007) at each time-point. This would enable us to understand the underlying factors of motivation and engagement of senior school students, in their final three years of schooling. It was hypothesised that the factor structure of motivation and engagement would reflect both first-order and second-order factor structures. The second aim was to examine the associations among the motivational constructs on all three measurement occasions, as suggested by Martin (2007). It was expected that the relationships among the motivational constructs would be consistent with the relationships identified in the original model (Martin, 2007) where adaptive cognitions and behaviours showed positive correlations with each other and negative associations with maladaptive cognitions and behaviours.

4. Method

4.1. Participants

Students from four non-government senior high schools in the Australian Capital Territory (ACT) participated in the study. Two schools were coeducational, the third was a boys' school and the fourth was a girls' school. All four schools offered Years 10, 11 and 12 (Time 1, Time 2 and Time 3 respectively) in the same campus. The students completed the questionnaires for three consecutive years. At Time 1 of the study 315 students were enrolled. To increase the power of the study, a second group of Year 10 students (N= 222) was recruited one year after the first group. Data were collected as shown in Table 1, over a period of two years. The mean age of students at the initial stage of data collection was 15.67 (SD = .49). Considering that participants were at the same educational levels and similar type of schools the sample was drawn from, it was believed that the two sets of Time 1 students would be very similar in their school- related experiences. The selected schools followed the same academic curriculum and shared a similar ranking on the Index of Community Socio-Educational Advantage (ICSEA) (ACARA, 2010). Ranks on the ICSEA are based on the student's educational level and measures of occupational and educational level of parents/carers, and/or socio- economic characteristics of the areas where students live, location of the school in a metropolitan, regional or remote area and proportion of Indigenous students enrolled at the school. The selected schools were above the average ICSEA value of 1000 (SD) with values of 1018, 1093, 1104 and 1124. The SD will show if 1100 is significantly higher than the mean.

4.2. Materials

The Student Motivation and Engagement Scale: Martin's (2007) Student Motivation and Engagement Scale-High School (SMES-HS) was used to examine cognitive motivation and behavioural engagement of students in senior schools. This scale consists of 44 items measuring 11 dimensions of academic motivation and engagement. The adaptive cognitions include self-efficacy, valuing on school and mastery orientation. The adaptive behaviours include planning, study management, and persistence. The maladaptive cognitions include anxiety, failure avoidance, and uncertain control while the maladaptive behaviours are self-

handicapping and disengagement (see Martin (2007) for more details). Each construct is hypothesised to reflect four items, and students rated themselves on a scale of 1 (strongly disagree) to 7 (strongly agree) for each item.

4.3. Procedure

The approval from the Australian National University and the Catholic Education Office research ethic bodies was obtained. The schools were invited to participate in the study. When the principals of the schools agreed to take part, information and consent forms were sent home with students. All students whose parents provided written consent were included in the study. The questionnaires were completed during normal lesson time in the second semester of the school year in October. Before completing the questionnaire, the participants were informed that the purpose of the research was to learn more about their attitudes, feelings and behaviours regarding school. They were informed that there were no right or wrong answers. They were ensured that their responses would be kept confidential. Students were encouraged to give honest responses to the questionnaire. Students were asked to put names on questionnaires, but explained that this was only for coding purposes. The researcher assisted them with their queries. They completed the questionnaire independently at their own pace. This took 40-50 minutes. The procedure was repeated one and two years later with the students. No behaviour was seen that was considered likely to affect the accuracy and honesty of the answers.

4.4. Statistical Procedures

This study used SPSS Version 16.0 (2007) for examining the descriptive statistics and the interpretations of correlations were made on the basis of Evans' (1996) recommendations (very weak = 0-.19; weak = .20-.39; moderate = .40-.59; strong = .60-.79; and, very strong = .80-1.00). Chi-square test was performed through SPSS Version 16.0 (2007) to detect any differences in understanding and interpreting the questionnaire items between two groups of students from two years, who constituted the Time 1 sample. The fit of the model proposed by Martin (2007) was tested using CFA in the current study. The factor indicators are continuous variables and hence the factors were correlated. Using the Mplus software (Muthèn & Muthèn, 2007), with the Maximum Likelihood estimator, the intercepts and residual variances of the factor indicators and the variances of the factors were estimated to test the model fit.

The Goodness-of-Fit indices (GOF) including the Comparative Fit Index (CFI), and the Tucker-Lewis Index (TLI) were also used to determine the model fit. Values for these indices, ranging from .90 and above, are indicative of optimal fit. (Hu & Bentler, 1995; Schumaker & Lomax, 1996). The Root Mean Square Error of Approximation (RMSEA) was also used as it is not influenced by model or sample size (Meade, Johnson & Braddy, 2008). If the discrepancy between covariance matrices equals zero there is an exact fit (Guttmannova, Szanyi, & Cali, 2008). Values less than .06 indicate good fit, and values of .07 to .10 indicate mediocre fit, and values above .10 indicate poor fit (MacCullum, Browne, & Sugawara, 1996; Brown & Cudeck, 1993). Generally, values of RMSEA at or less than .08 (Marsh et al., 2004) are considered to reflect an acceptable fit (Hu & Bentler, 1999).

5. Results

5.1. Description of the Sample

The data was entered into SPSS Version 16.0 (2007) and screened to ensure accuracy of data entry. The details about the number of participants according to gender from each school at all three time points are shown in Table 1. The chi-square test was performed through SPSS to ascertain that there is no difference between the two groups of students from two years, who constituted the Time 1 sample. An overall chi-square supported a reasonable similarity between the groups showing non-significance ($\chi2$= 1.35, df=1, p >.05).

Table 1. Participants at Time 1, Time 2 and Time 3

Time	School	Females	Males	Total
Time 1	1	113	79	
	2	118	109	
	3	-	21	
	4	97	-	
Total		328	209	537
Time 2	1	105	40	
	2	55	94	
	3	-	21	
	4	68	-	
Total		228	155	383
Time 3	1	74	54	
	2	53	50	
	3	-	19	
	4	49	-	
Total		176	123	299

5.2. First-Order Factor Structure of the SMES-HS

The first-order factor structure of the SMES-HS was examined in order to test whether Martin's model of motivation with 11-factors fit the current data of senior school students' motivation and engagement. A CFA was performed on the current dataset using Mplus (Muthén & Muthén, 2007) to examine whether the same numbers of factors were identified in the sample. In Table 2, the CFA fit statistics of the first-order 11-factors for Time 1, Time 2 and Time 3 are presented.

Table 2. Fit Statistics of the First Order 11-Factors

Time	χ^2	df	CFI	TLI	RMSEA
1	1404.21	834	.923	.913	.046
2	1453.49	837	.929	.920	.044
3	1432.80	833	.915	.904	.049

The fit of the model to the data at Time 1 showed the best fit compared to the other two time points. As its chi-square/degree of freedom (df) ratio, TLI, CFI and RMSEA were within the range of the recommended values, a decision was made that the 11-factor model, as suggested by Martin (2007, 2009) fitted the data sufficiently on all three occasions.

5.3. Second-Order Factor Structure of the SMES-HS

If a higher-order factor structure also fitted the data set, it would be of great advantage in terms of its parsimony and practicality. This would facilitate understanding the dynamics of motivation with a simple model that may highlight the important relationships between motivational constructs. Therefore, the next step was to test whether a four-factor second-order structure fit the data set. The four second-order factors are adaptive cognitions and behaviours, and maladaptive cognitions and behaviours (Martin, 2007). Table 3 below presents the model fit statistics for the second-order four-factor structure.

At Time 1, the second-order factor structure with four factors showed an adequate fit but at Time 2 and Time 3, the model fit resulted in a non-positive definite latent variable covariance matrix. This may be due to the decrease in sample size over the years. The correlations were not explored further as modifying the models at two time points would affect the consistency of the models and understanding of the dynamics of motivation in senior school years.

Table 3. Fit Statistics of the Second Order Four-factor Model

Time	χ^2	df	CFI	TLI	RMSEA
1	1889.923	876	.913	.906	.046
2*	1922.432	885	.880	.872	.055
3*	1899.284	885	.857	.847	.062

Note. * = non-positive definite covariance matrix

The range and means for the 11-factors of student motivation and engagement at Time 1, Time 2 and Time 3 are shown in Table 4. The descriptive statistics of the eleven motivational constructs including their skewness, kurtosis and reliability coefficients are presented in Table 5.

5.4. Concurrent Associations among the Motivational Constructs

The correlations between the constructs were fairly consistent across the time points. Most correlations amongst the constructs were in the expected direction and of the expected strength, generally supporting the lower-order construct validity of the model, similar to Martin's (2007) findings. As expected, all adaptive constructs correlated significantly positively with each other, significantly negatively with the maladaptive behavioural constructs and slightly negatively with maladaptive cognitive constructs except anxiety.

Maladaptive cognitions were significantly positively correlated as were maladaptive behaviour constructs. Tables 6, 7 and 8 show the bivariate correlations between the motivational constructs for Time 1, 2 and 3, respectively.

Table 4. CFA loadings range and means for11-factor structure of student motivation and engagement at Time 1, 2 and 3

	Time 1 CFA Loadings		Time 2 CFA Loadings		Time 3 CFA Loadings	
	Range	Mean	Range	Mean	Range	Mean
Adaptive Cognitions						
Self-efficacy	.68 - .76	.72	.63 - .74	.70	.65 - .78	.71
Valuing school	.58 - .77	.70	.49 - .79	.68	.47 - .76	.67
Mastery orientation	.68 - .80	.75	.68 - .87	.77	.71 - .73	.72
Adaptive Behaviours						
Planning	.46 - .72	.63	.48 - .69	.62	.44 - .74	.65
Study Management	.68 - .83	.74	.68 - .86	.74	.69 - .87	.77
Persistence	.69 - .80	.76	.73 - .78	.76	.71 - .80	.77
Impeding Dimensions						
Anxiety	.68 - .76	.72	.62 - .82	.75	.62 - .84	.74
Failure Avoidance	.47 - .89	.68	.42 - .84	.66	.54 - .79	.68
Uncertain Control	.62 - .82	.73	.71 - .83	.77	.70 - .85	.77
Maladaptive Dimensions						
Self-handicapping	.66 - .81	.75	.70 - .81	.77	.78 - .84	.80
Disengagement	.61 - .84	.74	.63 - .86	.75	.55 - .86	.73

At all three time points, the adaptive cognitions correlated positively very strongly with each other, ranging between $r = .71$ to .85. However, the adaptive behaviour of planning showed particularly very strong positive relationship with study management ($r = .94$ at Time 1). The strength of this relationship showed a declining trend in the following years (.85 and .87 at Time 2 and Time 3 compared to .94 at Time 1). The adaptive cognitions showed positive relationships with the adaptive behaviours and negative associations with maladaptive cognitions and behaviours except anxiety. Consistent with Martin's model (2007, 2009), the adaptive behavioural constructs positively correlated with each other.

Consistent with expectations, the maladaptive cognitions tended to correlate most strongly with each other. Failure avoidance and uncertain control showed non- significant relationships with mastery orientation at all three time points. Anxiety was associated with adaptive cognitions at Time 1 and 2, whereas it positively associated with adaptive behaviours at Time 2 and Time 3 except with persistence at Time 3. As hypothesised, the two maladaptive behaviours, self-handicapping and disengagement were positively correlated.

Table 5. Descriptive Statistics of the Motivational Constructs including their Reliability Coefficients at Time, 1, 2 and 3

Motivational Constructs	*Time 1*					*Time 2*					*Time 3*				
	M	SD	Skew	Kurtosis	α	M	SD	Skew	Kurtosis	α	M	SD	Skew	Kurtosis	α
Self-efficacy	21.76	4.35	-.83	.995	.819	21.94	4.12	-1.02	1.696	.794	22.15	3.91	-.736	.190	.801
Valuing school	22.14	3.84	-1.04	1.89	.797	21.94	3.60	-.916	1.245	.774	21.86	3.59	-.763	.294	.789
Mastery orientation	22.74	4.10	-1.14	1.76	.840	22.76	3.99	-1.19	2.00	.858	22.54	3.77	-.648	.071	.838
Planning	15.01	4.80	-.06	-.36	.770	15.44	4.73	-.124	-.379	.760	15.74	4.75	-.136	-.323	.777
Study Management	17.19	5.16	-.17	-.46	.823	17.35	5.10	-.361	-.174	.822	17.33	5.20	-.269	-.179	.853
Persistence	17.67	4.91	-.25	-.35	.847	17.43	4.75	-.301	-.277	.849	17.74	4.84	-.252	-.419	.866
Anxiety	18.23	5.53	-.31	-.29	.817	18.45	5.80	-.278	-.658	.837	17.55	5.52	-.320	-.321	.830
Failure avoidance	12.85	5.10	.34	-.54	.771	12.68	4.89	.488	.035	.737	12.94	5.32	.357	-.280	.791
Uncertain control	14.90	5.18	.02	-.44	.816	14.46	5.38	.144	-.640	.853	13.94	5.38	.020	-.613	.847
Self-handicapping	13.20	5.46	.29	.57	.840	12.34	5.48	.162	-.874	.855	11.72	5.42	.317	-.563	.882
Disengagement	12.70	5.64	.53	.29	.827	12.54	5.71	.457	-.501	.841	14.08	5.84	.186	-.694	.821

Note. M=Mean; SD= Standard Deviation; Skew=Skewness; α= Cronbach's Alpha.

Table 6. Time 1 11-Factor Model Correlations between Motivational Factors

	SE	V	MO	PL	M	PE	A	FA	UC	SH
SE	-									
V	.80	-								
MO	.73	.85	-							
PL	.64	.53	.61	-						
M	.55	.47	.53	.94	-					
PE	.74	.64	.62	.74	.66	-				
A	.13	.30	.28	-	-	-	-			
FA	-.16	-	-	-.16	-	-	.50	-		
UC	-.40	-.23	-	-.34	-	-.35	.52	.57	-	
SH	-.36	-.28	-.21	-.37	-.28	-.43	.16	.44	.44	-
D	-.66	-.70	-.63	-.57	-.53	-.67	-	.33	.34	.56

Note. N=536. SE = self-efficacy, V = valuing, MO= mastery orientation, PL = planning, M = study management, PE = persistence, A = anxiety, FA = failure avoidance, UC = uncertain control, SH = self- handicapping, D = disengagement, Values above .09, $p<.05$.

Table 7. Time 2 11-Factor Model Correlations between Motivational Factors

	SE	V	MO	PL	M	PE	A	FA	UC	SH
SE	-									
V	.74	-								
MO	.71	.82	-							
PL	.53	.61	.59	-						
M	.48	.53	.51	.85	-					
PE	.54	.56	.54	.76	.66	-				
A	.12	.31	.36	.34	.22	.16	-			
FA	-.21	-	-	-	-	-	.37	-		
UC	-.35	-.17	-	-	-	-.19	.52	.60	-	
SH	-.32	-.26	-.26	-.30	-.26	-.44	.19	.45	.53	-
D	-.57	-.64	-.59	-.57	-.53	-.61	-	.29	.44	.47

Note. N=383. SE = self-efficacy, V = valuing, MO = mastery orientation, PL = planning, M = study management, PE = persistence, A = anxiety, FA = failure avoidance, UC = uncertain control, SH = self- handicapping, D = disengagement, Values above .09, $p<.05$.

Also as expected, the two maladaptive behaviours, self-handicapping and disengagement were negatively associated with all the adaptive constructs and positively with the maladaptive constructs. However, at all three time points, disengagement showed stronger negative associations with the adaptive cognitions and persistence at Time 1 and Time 2 and with planning at Time 3, rather than self-handicapping.

Table 8. Time 3 11-Factor Model Correlations between Motivational Factors

	SE	V	MO	PL	M	PE	A	FA	UC	SH
SE	-									
V	.72	-								
MO	.72	.82	-							
PL	.32	.47	.52	-						
M	.34	.41	.47	.87	-					
PE	.53	.53	.54	.71	.60	-				
A	-	.21	.27	.20	.16	-	-			
FA	-.20	-	-	-	-	-	.41	-		
UC	-.49	-	-	-	-	-.25	.52	.52	-	
SH	-.37	-.36	-.33	-.21	-.22	-.36	.21	.48	.53	-
D	-.34	-.51	-.51	-.63	-.49	-.52	-	-	.23	.35

Note. N=299. SE = self-efficacy, V = valuing, MO= mastery orientation, PL = planning, M = study management, PE = persistence, A = anxiety, FA = failure avoidance, UC = uncertain control, SH = self-handicapping, D = disengagement, Values above .09, p<.05.

6. Discussion and conclusion

The current study aimed to examine the factor structure of motivation on three measurement occasions. The key research questions considered were whether Martin's model fits the current data and whether the associations among the motivational constructs are as found in Martin's study (2007). Firstly, the CFA confirmed that the 11-factor model of motivation and engagement fit the data. Secondly, and most importantly, the results supported most of the relationships among the motivational constructs as suggested by Martin (2007) at all three time points.

6.1. Factor Structure of Academic Motivation

The current results found that the 11-factor lower-order structure reflected the data well, in line with the hypothesis and previous research finding (Green et al., 2007; Martin & Marsh, 2005; Martin, 2007). The poor fit of the 4-factor model indicates that academic motivation is to be assessed individually on the basis of its salient factors rather than summed together as global indicators such as cognitions and behaviours. This warrants the need for considering each motivational construct as unique. For example, research applying a valuing framework often combines intrinsic and utility values together (Fredricks & Eccles, 2002; Singh et al., 2002). But, the current results showed that while valuing of school and mastery orientation were strongly associated with each other and showed similar relationships with other motivational constructs, they did differ in the strength and direction of those relationships.

All motivational constructs within the Wheel demonstrated that they need to be assessed individually as academic motivation could not be reduced to a simpler factor structure. It is not only Martin (2007) who groups different aspects of a single construct together. It is done more broadly as seen in previous research. For example, 'effort' is considered to be a global construct (Chouinard et al., 2007; Legault, Green-Demers &

Pelletier, 2006; Green et al., 1999). However, the first-order CFAs in the current results showed that study planning, study management, persistence, failure-avoidance and disengagement were all distinct constructs. Thus, research that combine constructs to form a global measure of motivation are at the risk of overlooking important nuances in the relationships amongst motivational constructs. Sometimes, global concepts may be helpful and sometimes they may not. It depends on the aims of research. In the current results, the aim was to understand the underlying factors of motivation and engagement of senior school students and the emergence of 11-factor model captures the dynamics of motivation and engagement much more in-depth.

Unexpectedly, the four-factor structure of the SMES-HS showed a poor fit to the data. Previous research has supported the four-factor higher-order structure (Martin, 2007, 2009) in the cross- sectional studies of motivation and engagement of secondary and senior secondary students. Though the four-factor structure fit the data at Time 1 in this study, it did not fit the data at Time 2 and Time 3. This may be due to a decrease in the sample size. However, at Time 1, there were strong correlations between some constructs belonging to different quadrants of the Wheel. Nevertheless, the relationships were so complex that no clear pattern emerged to enable grouping of the constructs. For example, though persistence and planning were strongly associated, only persistence was strongly correlated with the adaptive cognitions. The results also suggest that academic motivation needs to be conceptualised at a first-order structure in the senior school years, rather than the parsimonious second-order framework and it further reiterates the uniqueness of the motivational constructs which requires a closer examination.

6.2. Concurrent Associations among the Motivational Constructs

This investigation confirmed that most associations among the motivational constructs were in line with Martin's model (2007). The correlations among the eleven factors were very similar to the four second-order factors (quadrants) which Martin identified. Constructs within a second- order factor or quadrant correlated moderately or strongly with each other while correlations across factors or quadrants were markedly lower. These factors were based on a strong theoretical grounding in Martin's model. Even though the factors did not emerge, the intra- quadrant correlations are as expected. The discussion of the concurrent associations among the eleven motivational constructs will therefore be presented under the four domains corresponding to the second-order factors, adaptive cognitions and behaviours and maladaptive cognitions and behaviours.

6.3. Adaptive Cognitions

The correlations among the adaptive cognitions were fairly consistent and positive at all three time points with their strength ranging from .71 to .85. The results are consistent with the earlier research arguing that competence beliefs, valuing of school and students' satisfaction about their school work are closely related (Chouinard & Roy, 2008; Jacobs et al., 2002; Middleton et al., 2004). This suggests that students tend to be focused on learning, solving problems and feeling satisfied with their success in school work because they consider school work as valuable and meaningful for them. This, in turn, tends to enhance their strong belief in their ability.

All the adaptive cognitions at all three time points were highly positively associated with adaptive behaviours. The current results are consistent with previous research that students who are strong in their self-efficacy work harder and exhibit perseverance (Bandura, 1997; Smith, 2004). This has important implications as students with poor competency and value beliefs were particularly at risk of poor perseverance, attention and effort in their studies. Those who are interested in promoting student motivation in senior school years need to focus on developing students' self-beliefs that if they tried hard, they are capable of doing their school work well.

The main relevance of adaptive cognitive constructs of motivation as unique constructs was in relation to the maladaptive cognitions of motivation. They were more varied in their relationships with anxiety, failure avoidance and uncertain control. For example, anxiety was weakly positively associated with adaptive cognitions at Time 1 and 2 and with only valuing of school and mastery orientation at Time 3 whereas failure avoidance and uncertain control weakly negatively associated with adaptive cognitions on most occasions. However, consistent with Martin's findings (2007), anxiety was positively related to students' self-efficacy, value beliefs and mastery orientation. Consistent with Anderson's (1990) suggestion that anxiety's positive correlation with self-efficacy, valuing and mastery orientation is meaningful as students tend to be anxious to do well at school which in turn contributes to their adaptive cognitions. Further, if anxiety levels are too high, this is likely to have negative effects. The unexpected direction of the associations between adaptive cognitions and anxiety may be due to low levels of anxiety among students.

Students who had low competence beliefs, tend to sabotage their chance of success (Urdan et al., 1998) and show behaviours of helplessness (Smiley & Dweck, 1994) whereas students with strong belief in their ability tend to achieve success without wasting their time on most occasions and be engaged in the learning process. The adaptive cognitions showed moderate negative association with disengagement and this suggests that disengagement is more of a concern than self-handicapping in senior school students. In a nutshell, having incentive values towards learning may work with self-efficacy to reduce the likelihood of students' inclination towards procrastination of work and withdrawal from school.

6.4. Adaptive Behaviours

All three constructs of adaptive behaviour domain consistently showed positive relationships with adaptive cognitions. Interestingly, persistence was more strongly associated with the adaptive cognitions than planning and study management at all three time points. The adaptive behaviours showed high associations with each other at all three time points. Students, who approach studies with systematic planning, also tend to work towards a regular study routine and put in consistent effort into their studies to achieve their goals.

While the relationships between adaptive behaviours and maladaptive cognitions were examined, at Time 2 and 3, weak positive associations were found between planning, study management and anxiety, consistent with Martin's results (2007). Once again, it is clear that students, who are keen to do well at school, plan and manage their study time effectively are anxious about the results. Interestingly, there was no significant relationship between failure avoidance and any of the adaptive behaviours at Time 2 and Time 3. This is contrary to the expectations along with their inconsistent relationships with uncertain control. This may mean

that concerns about judgment of others and a poor sense of control are irrelevant in encouraging adaptive behaviours among students.

At all three measurement times, mostly moderate negative relationships between adaptive and maladaptive behaviours were found, consistent with the expectations. In summary, adaptive behaviours promote student engagement in learning when they have strong competency and value beliefs. It is pertinent that student behaviours of planning, study management and persistence are to be consistently established in order to facilitate effective learning at school. Overall, the results indicate that to increase adaptive behaviours a particular focus should be made on developing students' self-efficacy and value beliefs.

6.5. Maladaptive Cognitions

Maladaptive cognitions showed varied relationships with other motivational constructs in the current results. The relationships among the maladaptive motivational constructs were positive and their relationships with adaptive cognitions were mostly weak or non-significant. However, an unexpected positive relationship between anxiety and competency and value beliefs and mastery orientation of students may reflect their natural keenness to do well at school (Anderson, 1990; Wigfield & Meece, 1988). Students who enjoy learning at school have some concern regarding doing well at school whereas those who avoid failure tend to worry about the outcomes and be unsure of doing well at school.

The relationships between maladaptive cognitions and adaptive behaviours were inconsistent over the years. While there was no significant relationship between anxiety and adaptive behaviours at Time 1, there were positive relationships between them at Time 2, contrary to the expectations. This inconsistent pattern of relationships may be attributed to the developmental changes in students. However, the negative relationships between failure avoidance, uncertain control and adaptive motivational constructs are consistent with the expectations based on Martin's model (2007).

At all three time points, maladaptive cognitions showed moderate positive relationship with each other and with maladaptive motivational behaviours. Among them, the relationship between failure avoidance and uncertain control was the strongest on all occasions with its strength ranging from .52 to .60, alerting that when not monitored may lead to maladaptive behaviours towards learning. Furthermore, the absence of a significant relationship between anxiety and disengagement on all testing occasions is noteworthy. This may mean that anxiety is irrelevant to a student who has withdrawn from school work.

6.6. Maladaptive Behaviours

Self-handicapping and disengagement were negatively associated with all of the adaptive motivational constructs at all three time-points, as expected. While self-handicapping was a reflection of amotivation as well as competence and value beliefs of students, high levels of disengagement indicated low levels of competence and value beliefs, planning and persistence. The higher adaptive cognitions and behaviours are more likely to prevent risks of maladaptive behaviours.

Unexpectedly and contrary to Martin's study (2007) the results reported that there was no significant relationship between disengagement and anxiety at all three points. One explanation for this is that students who have demonstrated withdrawing behaviours may not

worry about their school work as learning no longer holds any personal meaning for them due to their acceptance of failure.

The positive relationship between self-handicapping and disengagement was consistent with previous research (Martin, Marsh, & Debus, 2003). Though the strength of their relationship gradually declined over the years, the positive significant relationship between the two motivational constructs highlights that those students who sabotage their chances of success are more likely to give up being involved in school work. This in turn, may reflect on their low competence and value beliefs, leading to increasing poor control and fear of failure which may result in accepting failure and behaving in ways that demonstrate helplessness (Balfanz & Bocanfuzo, 2007).

In a nutshell, the patterns of relationship within the Wheel were largely consistent at three time points. This supports the soundness of the model and the consistency with which motivational experiences are related to each other. Most of the motivational constructs were associated with other concurrent experiences, although some constructs were more interconnected than others. This pattern of correlations demonstrates the complex nature of motivation.

The current study fit 11-factor structure of Australian senior high school students' motivation and engagement. However, its results are to be interpreted within the context of following limitations: i) the current research is limited to schools selected from the Australian Capital Territory. The generalization of the findings needs to be done with care. Including schools from other States and Territories of Australia in future research would highlight the pattern of motivation and engagement of senior school students on a large scale. ii) The present research was based on self-report data. In its own right, it is a logical and justifiable methodology to capture the underlying forces of motivation of students and also it is the prime source of information with regards to the individual's motivation. Such motivation can be more fully understood by incorporating reports from parents and teachers to get different perspectives of student motivation and using objective measures of performance such as achievement scores and descriptions of study habits.

The current study is important for several reasons. First, it was identified that the Student Motivation and Engagement Wheel is a useful framework and a robust scale which assessed student motivation and engagement comprehensively and consistently in the final three years of senior schooling. Second, the current study highlighted the associations among the motivational constructs. The teachers of senior school students would benefit from an awareness of the web of these associations. The understanding of why students may or may not have a particular drive and energy towards school work would assist teachers in designing intervention programs to enhance student motivation and engagement. Finally, and most importantly, the present study paves the way for further exploration of student motivation and engagement in a longitudinal context which could examine stability and gender differences in student motivation.

Acknowledgements

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