THE STRUCTURAL MODEL ON THE ROLES OF ACHIEVEMENT EMOTIONS BETWEEN ACTION CONTROL AND LEARNING STRATEGIES OF UNDERGRADUATES IN HONG KONG

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Abstract

The present study aims to examine the mediating effects of achievement emotions between action control and learning strategies. Two hundreds and twenty-six undergraduates (125 males and 101 females) participated to complete a questionnaire consisting of three scales. To analyze the data, path analyses and structural equation modeling were used. Two structural equation models could be validly confirmed. The first model indicates action orientation (disengagement and initiation) can be desirable predictor on positive achievement emotions (enjoyment, hope and pride), and subsequently to all learning strategies (rehearsal, elaboration, organization, critical thinking and metacognitive self-regulation). The second model indicates state orientation (preoccupation, hesitation and volatility) can be desirable predictor on both activating negative achievement emotions (anxiety and shame) and deactivating negative achievement emotions (hopelessness and boredom), and subsequently to learning strategies differently. Anxiety and shame positively predict rehearsal, elaboration and metacognitive self-regulation, whereas hopelessness and boredom negatively predict all learning strategies. The present study may be the first one establishing a structural model integrating action control, achievement emotions and learning strategies, and validating the instruments for investigating Chinese undergraduates. The additive value is to provide new perspectives for state-oriented students to reduce hopelessness and boredom for better learning.

Keywords: Action control; Achievement emotions; Learning strategies

Introduction

Over the past few decades, rigorous educational researches have been focused predominantly on achievement goal and motivation but concerned little on the action control theory. In fact, it relates personality with motivation which is useful in understanding how individuals deal with failures and handle distracters by regulating emotions, thoughts and volition during the learning process (Kuhl, 1994). The heightened high demands and academic challenges nowadays for university students induce much pressures and distractions to them. Following failures in learning, students with different capacities of action control may cause different achievement emotions and thus influences the adoption of different learning strategies (Papantoniou, Moraitou, Dinou, & Katsadima, 2010). Besides, no attempts are ever tendered to examine the structural relationships among action control, achievement emotions and learning strategies for Hong Kong university students.

The present research aims to explore the action control theory to understand the individual differences on action control. More importantly, it attempts to establish a structural model consisting of action control, achievement emotions and learning strategies. Also, it is aimed to further discuss suitable implications for educators to implement corresponding strategies for students based on the results.

Literature Review

Action Control

Action control theory suggests a personality construct called action-state orientation which refers to

the individual difference in the capacity of action control to regulate emotions, cognitions and volitions. It is described on a continuum with two polar ends: action orientation (AO) and state orientation (SO). AO refers to good ability in action control to regulate cognitive resources towards desired goals. In contrast, SO refers to poor ability in action control which interfere cognitive resources for striving goals (Jaramillo & Spector, 2004; Papantoniou et al., 2010). Kuhl (1992, 1994) further suggests three dimensions in distinguishing and measuring action-state orientation.

The first dimension is disengagement versus preoccupation. It refers to the ability to disengage from distracting thoughts related to the past, present or future state. Disengagement (belongs to AO) refers to detach from thoughts about alternative goals or undesirable events which avoids interference on task at hand. Alternatively, preoccupation (belongs to SO) refers to persevere thoughts on unpleasant experiences that often involve failures which causes impaired information processing.

The second dimension is initiative versus hesitation. It refers to the behavioral capacity to initiate intended goal-directed activities. Initiative (belongs to AO) refers to start academic tasks and works easily. Alternatively, hesitation (belongs to SO) refers to the difficulties in initiating tasks.

The third dimension is persistence versus volatility. It refers to the ability to stay focus to work during an interesting or necessary task even when being distracted. Persistence (belongs to AO) refers to the maintenance on intention and attention effectively until the task is completed. Alternatively, volatility (belongs to SO) refers to the failure on keeping focus and cause off-task behaviors easily.

Achievement Emotions

Achievement emotions refer to the competence-relevant activities or outcomes in the academic contexts (Pekrun, 2000, 2006). These emotions differ systematically in terms of three dimensions: valence (positive versus negative) and activation (activating versus deactivating). This study focused on the eight types of learning-related achievement emotions namely enjoyment, hope, pride, anger, anxiety, shame, hopelessness and boredom. Enjoyment, hope and pride belonged to positive activating emotions. Anger, anxiety and shame belonged to activating negative emotions whereas hopelessness and boredom belonged to deactivating negative emotions (Pekrun, Goetz, & Titz, 2002).

Learning Strategies

Learning strategies are defined as the cognitive, metacognitive and resource management strategies used in self-regulated learning to achieve academic goals (Pintrich, 1999). This study focused on the five types of cognitive and metacognitive learning strategies. The first type is rehearsal which refers to the verbal repetition for information processing. The second type is elaboration which refers to the summarizing of information. The third type us organization which refers to outline, take notes and connect different aspects of learning materials. The fourth type is critical thinking which refers to the evaluations of ideas and application of knowledge to new situations. The fifth type is metacognitive self-regulation which refers to plan, monitor and regulate the use of cognitive strategies. (Pintrich, Smith, Garcia, & McKeachie, 1991; Zimmerman, 1989).

Action Control and Achievement Emotions

According to the personality systems interactions (PSI) theory (Kuhl, 2000; Kuhl & Koole, 2004), action control is associated with the intuitive affect regulation. Some studies suggest that there are two dimensions of action control relate to achievement emotions, which are disengagement verse preoccupation and initiative versus hesitation (Perry, Hladkyj, Pekrun, & Pelletier, 2001). It is suggested that action orientation is associated with better intuitive affect regulation skills than state orientation to relief from negative states and generate positive affects when facing obstacles in learning (Kazen, Kaschel, & Kuhl, 2008; Koole & Jostmann, 2004). Therefore, it is expected that action orientation predicts positive achievement emotions, whereas state orientation predicts negative achievement emotions in learning.

Achievement Emotions and Learning Strategies

The cognitive-motivational model (Pekrun, 1992) suggests that achievement emotions affect the cognitive resources and motivational mechanisms in learning. Different emotions influence the adoption of different cognitive and metacognitive learning strategies. For positive achievement emotions, some studies suggest they relate positively to attention and motivation to facilitate the flexible and holistic use of learning strategies. For example, enjoyment and hope are associated with the use of elaboration, organization, critical thinking and metacognitive strategies to avoid superficial learning and enhance information processing (Pekrun et al., 2002).

In contrast, general negative achievement emotions are found to cause fewer use of learning strategies. For example, boredom and helplessness are associated with reduction of attention and motivation in learning. However, some studies suggest that negative activating achievement emotions promote more rigid ways of information processing (Pekrun, Elliot, & Maier, 2009). For example, anger, anxiety and shame are positively related to the use of rehearsal strategy (Pekrun et al., 2002).

Action Control and Learning Strategies

There are limited researches to show the relationship between action control and learning strategies. It is expected that students with better ability of action control are more likely to use various kinds of learning strategies which can result in better academic performance (Bembenutty, Karabenick, Mckeachie & Lin, 1998). Some studies suggest that there are two dimensions of action control relate to the use of cognitive and metacognitive learning strategies, which are disengagement verse preoccupation and initiative versus hesitation (Papantoniou et al., 2010). It is suggested that action orientation is associated with better use of learning strategies than state orientation due to the disengagement of distracting thoughts during learning and behavioral capacity to initiate academic works (Diefendorff, Hall, Lord, & Strean, 2000; Perry et al., 2001; Roy, Vezeau, & Bouffard, 2008).

Method

Research Hypotheses

Referring to the literature review, two hypotheses are formed to show the result expectations.

1. The levels of action control (disengagement, preoccupation, initiative, hesitation, persistence and volatility) would predict positive achievement emotions (enjoyment, hope and pride), and positive achievement emotions (enjoyment, hope and pride) would predict the use of learning strategies (rehearsal, elaboration, organization, critical thinking and metacognitive self-regulation).

2. The levels of action control (disengagement, preoccupation, initiative, hesitation, persistence and volatility) would predict negative achievement emotions (anger, anxiety, shame, hopelessness and boredom), and negative achievement emotions (anger, anxiety, shame, hopelessness and boredom) would predict the use of learning strategies (rehearsal, elaboration, organization, critical thinking and metacognitive self-regulation).

Participants

Two hundreds and twenty-six university students (125 males and 101 females) in Hong Kong participated (Age: $M = 19.83$, $SD = 1.63$). All of them will be based on convenient sampling. They studied in different universities in Hong Kong.

Action Control Questionnaire

Action control was measured by adapting Diefendorff et al.'s (2000) 22-item Action Control Scale (ACS) and changing it into rating scale. The reported reliabilities of ACS are from .56 to .76. The Action Control Questionnaire used in this study contains 44 items divided into six subscales. The 5-point Likert scale from 1 (not at all like me) to 5 (very much like me) was used for rating on each item. The subscales, number of items and sample items were shown in Table 1.

Achievement Emotions Scale

Achievement emotions were measured by using self-constructed scale by referral to the Pekrun et al.'s (2002) Achievement Emotions Questionnaire (AEQ) as well as some scales used in Chinese researches on achievement emotions. The reported reliabilities of AEQ are from .89 to .95. The Achievement Emotions Scale used in this study contains 32 items which measures eight types of emotions. The 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree) was used for rating on each item. The subscales, number of items and sample items were shown in Table 1.

Learning Strategies Scale

Learning strategies were measured by adapting and modifying the Learning Strategy Section in Pintrich et al.'s (1991) Motivated Strategies for Learning Questionnaire (MSLQ). The reported reliabilities of MSLQ are from .64 to .80.The Learning Strategies Scale used in this study contains 31 items divided into five subscales. The 7-point Likert scale from 1 (not at all true of me) to 7 (very true of me) was used for rating on each item. The subscales, number of items and sample items were shown in Table 1.

Table 1
Number of Items and Sample Items of the Three Scales

Scales and Subscales	No. of Items	Sample Item
Action Control Questionnaire	44	
Disengagement	8	When I am told that my work has been completely unsatisfactory, I don't let it bother me for too long.
Preoccupation	8	When I am told that my work has been completely unsatisfactory, I feel paralyzed.
Initiation	8	When I know I must finish something soon, I find it easy to get it done and over with.
Hesitation	8	When I know I must finish something soon, I have to push myself to get started.
Persistence	6	When I read something I find interesting, I will sit and read the article for a long time.
Volatility	6	When I read something I find interesting, I sometimes still want to put the article down and do something else.
Achievement Emotions Scale	32	
Enjoyment	4	I enjoy acquiring new knowledge.
Hope	4	I have an optimistic view toward studying.
Pride	4	I'm proud of my capacity.
Anger	4	Studying makes me irritated.
Anxiety	4	I get tense and nervous when studying.
Shame	4	I feel ashamed that I can't absorb the simplest of details.
Hopelessness	4	I feel hopeless when I think about studying.
Boredom	4	Studying for my course bores me.
Learning Strategies Scale	31	
Rehearsal	4	When I study, I practice saying the material to myself over and over.
Elaboration	6	When I study, I write brief summaries of the main ideas from the readings and lectures.
Organization	4	I make simple charts, diagrams, or tables to help me organize course material.
Critical Thinking	5	Whenever I read or hear an opinion or conclusion in a course, I think about possible alternatives.
Metacognitive Self-Regulation	12	If I get confused taking notes, I make sure I sort it out afterward.

Results

Descriptive Statistics and Correlational Analysis

Means, standard deviations and correlational analysis for the 19 observed variables from the three instruments in this study are conducted by using SPSS which shown in Table 2. One hundred and seven out of 171 correlations were statistically significant.

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Table 2
Zero-Order Correlations, Mean and Standard Deviations for Study Variables (N = 226)

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. Disengagement	--																		
2. Preoccupation	-.43***	--																	
3. Initiation	.48***	-.23***	--																
4. Hesitation	-.16*	.60***	-.28***	--															
5. Persistence	.10	.05	.33***	-.02	--														
6. Volatility	.22**	.32***	-.04	.38***	-.44***	--													
7. Enjoyment	.22**	-.02	.30***	.01	.28***	-.10	--												
8. Hope	.25***	-.05	.41***	-.05	.19**	-.03	.69***	--											
9. Pride	.25***	-.02	.25***	.02	.10	.04	.49***	.48***	--										
10. Anger	.02	.28***	-.07	.28***	.01	.21**	-.18**	-.17**	-.03	--									
11. Anxiety	-.18**	.45***	-.07	.25***	.12	.03	.17*	.03	.27***	.50***	--								
12. Shame	-.19**	.42***	-.14*	.26***	.04	.13*	.07	.09	.15*	.41***	.57***	--							
13. Hopelessness	.10	.33***	.10	.23**	-.02	.45***	.13*	14*	.11	.17*	.09	.19**	--						
14. Boredom	-.02	.29***	-.13	.33***	-.13	.24***	-.41***	-.26***	-.18**	.57***	.22**	.31***	.15*	--					
15. Rehearsal	-.03	.21**	.12	.07	.15*	.03	.24***	.22**	.12	-.02	.17*	.10	-.16*	-.19**	--				
16. Elaboration	.07	.08	.22**	-.09	.21**	-.05	.40***	.43***	.31***	-.08	.18**	.16*	-.16*	-.28***	.57***	--			
17. Organization	.01	.08	.21**	-.04	.22**	-.07	.37***	.37***	.35***	-.07	.07	.06	-.16*	-.28***	.51***	.66***	--		
18. Critical Thinking	.22**	.05	.32***	-.02	.23**	.01	.46***	.47***	.43***	-.04	.06	.02	-.24***	-.27***	.17**	.48***	.33***	--	
19. Metacognitive Self-Regulation	.15*	.13*	.33***	-.01	.20**	.05	.49***	.47***	.37***	-.08	.10	.14*	-.17*	-.34***	.39***	.61***	.51***	.61***	--
M	20.95	25.43	25.83	25.24	20.88	16.89	14.12	14.04	13.85	11.08	12.08	11.50	12.30	11.17	17.46	26.57	18.44	21.63	49.48
SD	4.28	4.87	3.81	4.22	3.23	3.62	3.17	2.94	2.91	3.38	3.80	3.85	1.67	4.10	4.85	6.71	4.63	5.92	11.00

*$p < .05$, ** $p < .01$, *** $p < .001$

Reliability Analysis

Reliability analyses are conducted by using SPSS. In pilot test, all three instruments indicated satisfactory reliabilities, $\alpha > .70$. In main study, the reliability analysis with Cronbach's alpha was also conducted for the three instruments (see Table 3). For the action control questionnaire, the items of preoccupation, hesitation and volatility were revised since they are opposite orientation of disengagement, initiation and persistence respectively. All subscales indicated satisfactory reliabilities, $\alpha > .65$. For the achievement emotions scale, eight subscales indicated good reliabilities, $\alpha > .78$. For the learning strategies scale, five subscales also indicated good reliabilities, $\alpha > .79$.

Table 3
Reliability Cronbach's Alphas for the Three Instruments in the Main Study

Scales	α
Action Control Questionnaire	
1. Disengagement vs. Preoccupation	.76
2. Initiation vs. Hesitation	.65
3. Persistence vs. Volatility	.69
Achievement Emotions Scale	
1. Enjoyment	.88
2. Hope	.84
3. Pride	.78
4. Anger	.81
5. Anxiety	.85
6. Shame	.88
7. Hopelessness	.89
8. Boredom	.91
Learning Strategies Scale	
1. Rehearsal	.79
2. Elaboration	.86
3. Organization	.83
4. Critical Thinking	.89
5. Metacognitive Self-Regulation	.86

Confirmatory Factor Analysis

Exploratory factor analyses (EFA) were computed by using SPSS for item parceling and deletion before confirmatory factor analysis (CFA) by using Lisrel. The results of CFA showed that all three instruments had good fit to the data concerning CFI or GFI is higher than .90. For the action control questionnaire, since it consists of two opposite orientations of three dimensions, CFA is conducted separately for the action orientation and state orientation. For the action orientation dimensions, $\chi2(41) = 75.68$, RMSEA = .06, GFI = .94, CFI = .94. All factor loadings were significant, and the average factor loading was .55. For the state orientation dimensions, $\chi2(41) = 68.10$, RMSEA = .06, GFI = .95, CFI = .97. All factor loadings were significant, and the average factor loading was .57. For the achievement emotions scale, $\chi2(436) = 1034.33$, RMSEA = .08, GFI = .77, CFI = .95. All factor loadings were significant, and the average factor loading was .78. For the learning strategies scale, $\chi2(160) = 493.44$, RMSEA = .098, GFI = .82, CFI = .95. All factor loadings were significant, and the average factor loading was .76.

Path Analysis of Action Control, Positive Achievement Emotions and Learning Strategies

Path analyzes are conducted by using Lisrel. Figure 1 exhibited relationships between action control (disengagement, preoccupation, initiation, hesitation, persistence, volatility), positive achievement emotions (enjoyment, hope, pride) and learning strategies (rehearsal, elaboration, organization, critical thinking, metacognitive self-regulation).

For the relationship between action control and positive achievement emotions, the result indicated that initiation was a significant positive predictor of all positive achievement emotions, including enjoyment ($\beta = .21$, $p < .05$), hope ($\beta = .37$, $p < .01$) and pride ($\beta = .19$, $p < .05$). Disengagement was a significant positive predictor of enjoyment ($\beta = .20$, $p < .05$) and pride ($\beta = .24$, $p < .05$). However, there was no significant relationship between preoccupation, hesitation, persistence, volatility and all positive achievement emotions.

For the relationship between positive achievement emotions and learning strategies, the result indicated that enjoyment was a significant positive predictor of the use of all learning strategies, including rehearsal ($\beta = .17$, $p < .05$), elaboration ($\beta = .17$, $p < .05$), organization ($\beta = .17$, $p < .05$), critical thinking ($\beta = .20$, $p < .05$) and metacognitive self-regulation ($\beta = .29$, $p < .01$). Hope was a significant positive predictor of elaboration ($\beta = .28$, $p < .01$), organization ($\beta = .17$, $p < .05$), critical thinking ($\beta = .24$, $p < .01$) and metacognitive self-regulation ($\beta = .23$, $p < .01$). However, there was no significant relationship between hope and the use of rehearsal. Pride was a significant positive predictor of organization ($\beta = .20$, $p < .05$), critical thinking ($\beta = .24$, $p < .01$) and metacognitive self-regulation ($\beta = .14$, $p < .05$). However, there was no significant relationship between pride and the use of rehearsal and elaboration.
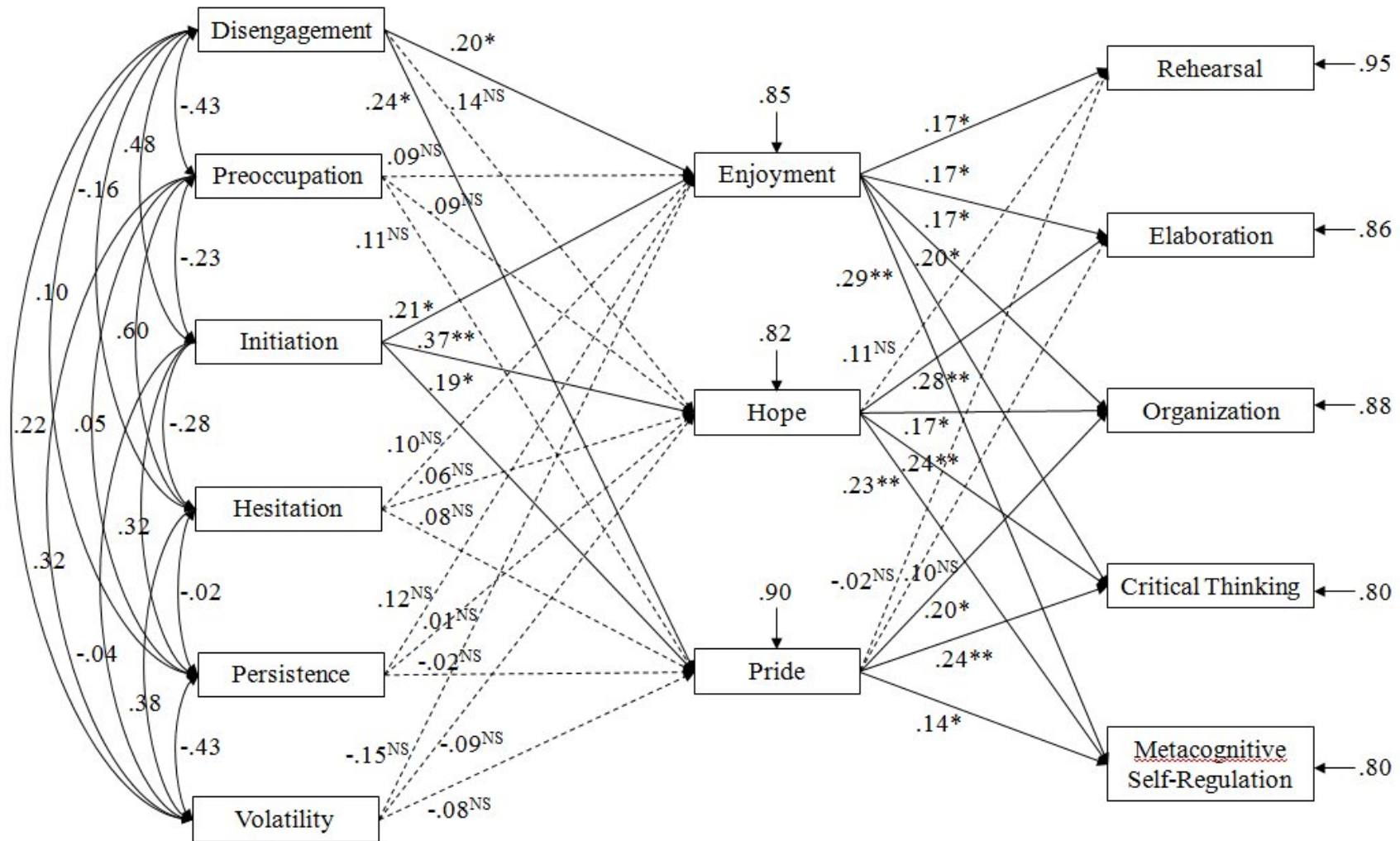
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Figure 1. The path model of the relationships between action control, positive achievement emotions and learning strategies.
Note: * $p < .05$, ** $p < .01$, the non-significant pathways are presented with dotted lines ($^{NS} p > .05$)

Path Analysis about Action Control, Negative Achievement Emotions and Learning Strategies

Figure 2 exhibited relationships between action control (disengagement, preoccupation, initiation, hesitation, persistence, volatility), negative achievement emotions (anger, anxiety, shame, hopelessness, boredom) and learning strategies (rehearsal, elaboration, organization, critical thinking, metacognitive self-regulation).

For the relationship between action control and negative achievement emotions, the result indicated that preoccupation was a significant positive predictor of all negative achievement emotions, including anger ($\beta = .19$, $p < .05$), anxiety ($\beta = .50$, $p < .01$), shame ($\beta = .39$, $p < .01$), hopelessness ($\beta = .29$, $p < .05$) and boredom ($\beta = .22$, $p < .05$). Hesitation was a significant positive predictor of anger ($\beta = .20$, $p < .05$) and boredom ($\beta = .20$, $p < .05$). Volatility was a significant positive predictor of hopelessness ($\beta = .44$, $p < .01$). However, there was no significant relationship between disengagement, initiation, persistence and all negative achievement emotions.

For the relationship between negative achievement emotions and learning strategies, the result indicated that there was no significant relationship between anger and the use of all learning strategies. Anxiety and shame positively predicted the use of some types of learning strategies while hopelessness and boredom negatively predicted the use of all types of learning strategies significantly. Specifically, anxiety was a significant positive predictor of rehearsal ($\beta = .17$, $p < .05$) and elaboration ($\beta = .16$, $p < .01$). Shame was a significant positive predictor of the use of elaboration ($\beta = .22$, $p < .05$) and metacognitive self-regulation ($\beta = .26$, $p < .05$). Alternatively, hopelessness and boredom were significant negative predictors of all learning strategies, including rehearsal (hopelessness: $\beta = -.16$, $p < .05$; boredom: $\beta = -.25$, $p < .05$), elaboration (hopelessness: $\beta = -.16$, $p < .05$; boredom: $\beta = -.34$, $p < .01$), organization (hopelessness: $\beta = -.15$, $p < .05$; boredom: $\beta = -.36$, $p < .01$), critical thinking (hopelessness: $\beta = -.23$, $p < .01$; boredom: $\beta = -.36$, $p < .01$) and metacognitive self-regulation (hopelessness: $\beta = -.17$, $p < .05$; boredom: $\beta = -.45$, $p < .001$).

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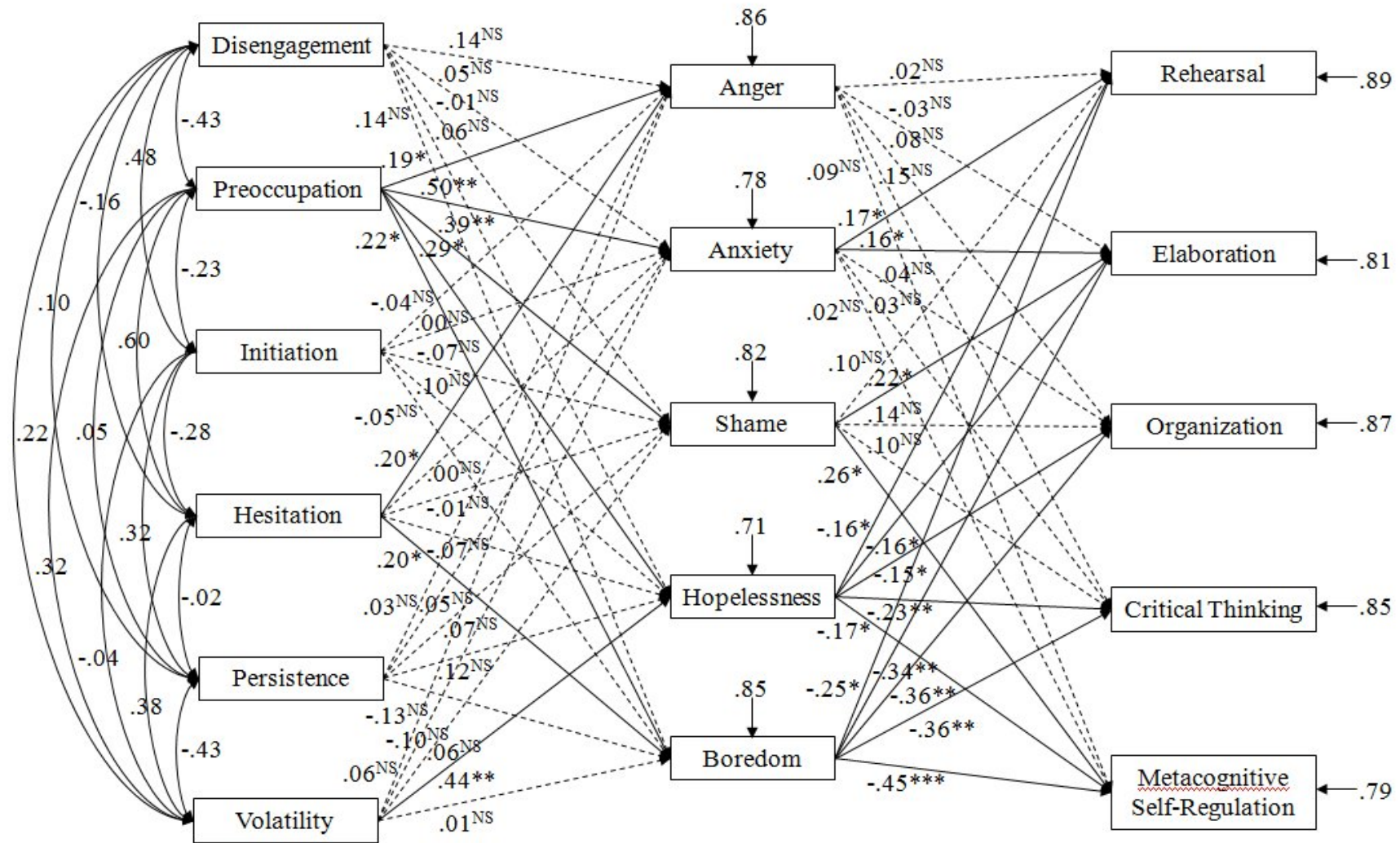Contact Email: mtleung@hksyu.edu, kayin0628@hotmail.com

Figure 2. The path model of the relationships between action control, negative achievement emotions and learning strategies.
Note: * p < .05 , ** p < .01, *** p < .001, the non-significant pathways are presented with dotted lines (NS p > .05)

SEM with Action Orientation, Positive Achievement Emotions and Learning Strategies

Based on the results of path analysis, Structural Equation Modeling (SEM) is conducted by using Lisrel. The relations between the observed variables and their underlying latent variables including action orientation, positive achievement emotions and learning strategies were shown in Figure 3. A fit structural model could be established, $\chi^2(31) = 95.72$, RMSEA = .095, GFI = .92, CFI = .96.

Action orientation included two observed variables concerning disengagement and initiation. Action orientation was ($p < .01$) significantly related with disengagement ($\beta = .52$) and ($p < .001$) significantly related with initiation ($\beta = .92$).

Positive achievement emotions included three observed variables concerning enjoyment, hope and pride. Positive achievement emotions were ($p < .001$) significantly related with enjoyment ($\beta = .81$), hope ($\beta = .84$) and pride ($\beta = .59$).

Learning strategies included five observed variables concerning rehearsal, elaboration, organization, critical thinking and metacognitive self-regulation. Learning strategies were ($p < .01$) significantly related with rehearsal ($\beta = .45$) and organization ($\beta = .61$), and ($p < .001$) significantly related with elaboration ($\beta = .74$), critical thinking ($\beta = .70$) and metacognitive self-regulation ($\beta = .84$).

For the relationships between latent variables, action orientation was a significant positive predictor of positive achievement emotions ($\beta = .47$, $p < .01$) and positive achievement emotions was a significant positive predictor of learning strategies ($\beta = .73$, $p < .01$). Therefore, the results revealed that positive achievement emotions were significant positive mediators between action orientation and learning strategies.

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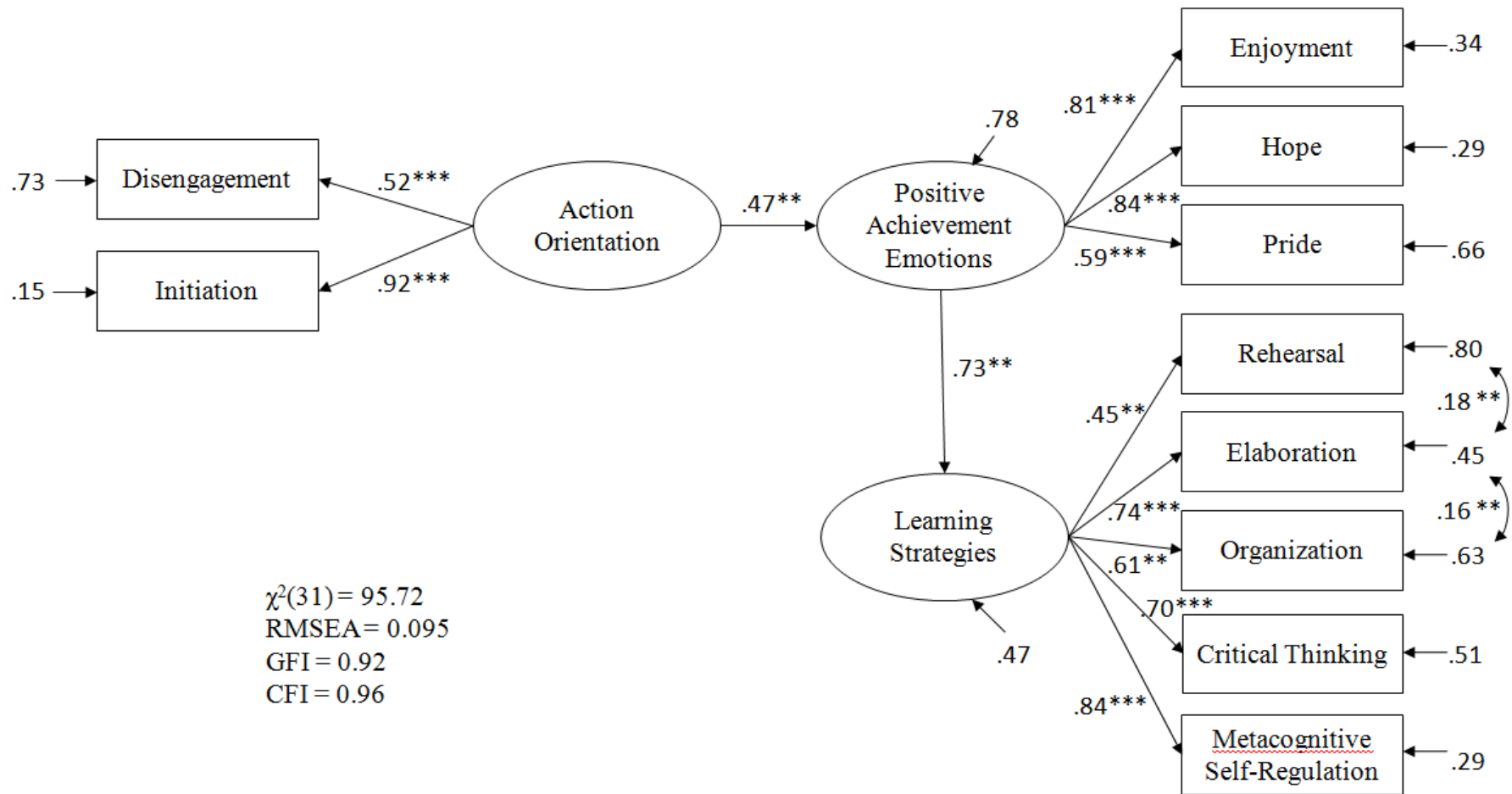Contact Email: mtleung@hksyu.edu, kayin0628@hotmail.com

Figure 3. The structural model of the interrelationships between action orientation, positive achievement emotions and learning strategies.
Note: RMSEA = Root Mean Square Error of Approximation; GFI = Goodness of Fit Index; CFI = Comparative Fit Index.
** $p < .01$, *** $p < .001$.

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SEM with State Orientation, Activating Negative Achievement Emotions, Deactivating Negative Achievement Emotions and Learning Strategies

The relations between the observed variables and their underlying latent variables including state orientation, activating negative achievement emotions, deactivating negative achievement emotions and learning strategies were shown in Figure 4. It was acknowledged that a less favorable model was established, $\chi^2(49) = 178.28$, RMSEA = .094, GFI = .90, CFI = .89.

State orientation included three observed variables concerning preoccupation, hesitation and volatility. State orientation was ($p < .001$) significantly related with disengagement ($\beta = .84$) and initiation ($\beta = .70$), and ($p < .01$) significantly related with persistence ($\beta = .41$).

Activating negative achievement emotions included two observed variables concerning anxiety and shame. Activating negative achievement emotions were ($p < .001$) significantly related with anxiety ($\beta = .72$) and shame ($\beta = .75$).

Deactivating negative achievement emotions included two observed variables concerning hopelessness and boredom. Deactivating negative achievement emotions were ($p < .05$) significantly related with hopelessness ($\beta = .40$) and ($p < .01$) significantly related with boredom ($\beta = .67$).

Learning strategies included five observed variables concerning rehearsal, elaboration, organization, critical thinking and metacognitive self-regulation. Learning strategies were ($p < .001$) significantly related with rehearsal ($\beta = .64$), elaboration ($\beta = .90$), organization ($\beta = .75$), critical thinking ($\beta = .50$) and metacognitive self-regulation ($\beta = .69$).

For the relationships between latent variables, state orientation was a significant positive predictor of both activating ($\beta = .68$, p < .001) and deactivating ($\beta = .58$, $p < .01$) negative achievement emotions. Furthermore, activating negative achievement emotions was a significant positive predictor of learning strategies ($\beta = .60$, $p < .01$) while deactivating negative achievement emotions was a significant negative predictor of learning strategies ($\beta = -.75$, $p < .01$). Since it was acknowledged that a less favorable model was established as mentioned above, it should be carefully interpreted that activating negative achievement emotions was a significant positive mediator while deactivating negative achievement emotions was a significant negative mediator between state orientation and learning strategies.
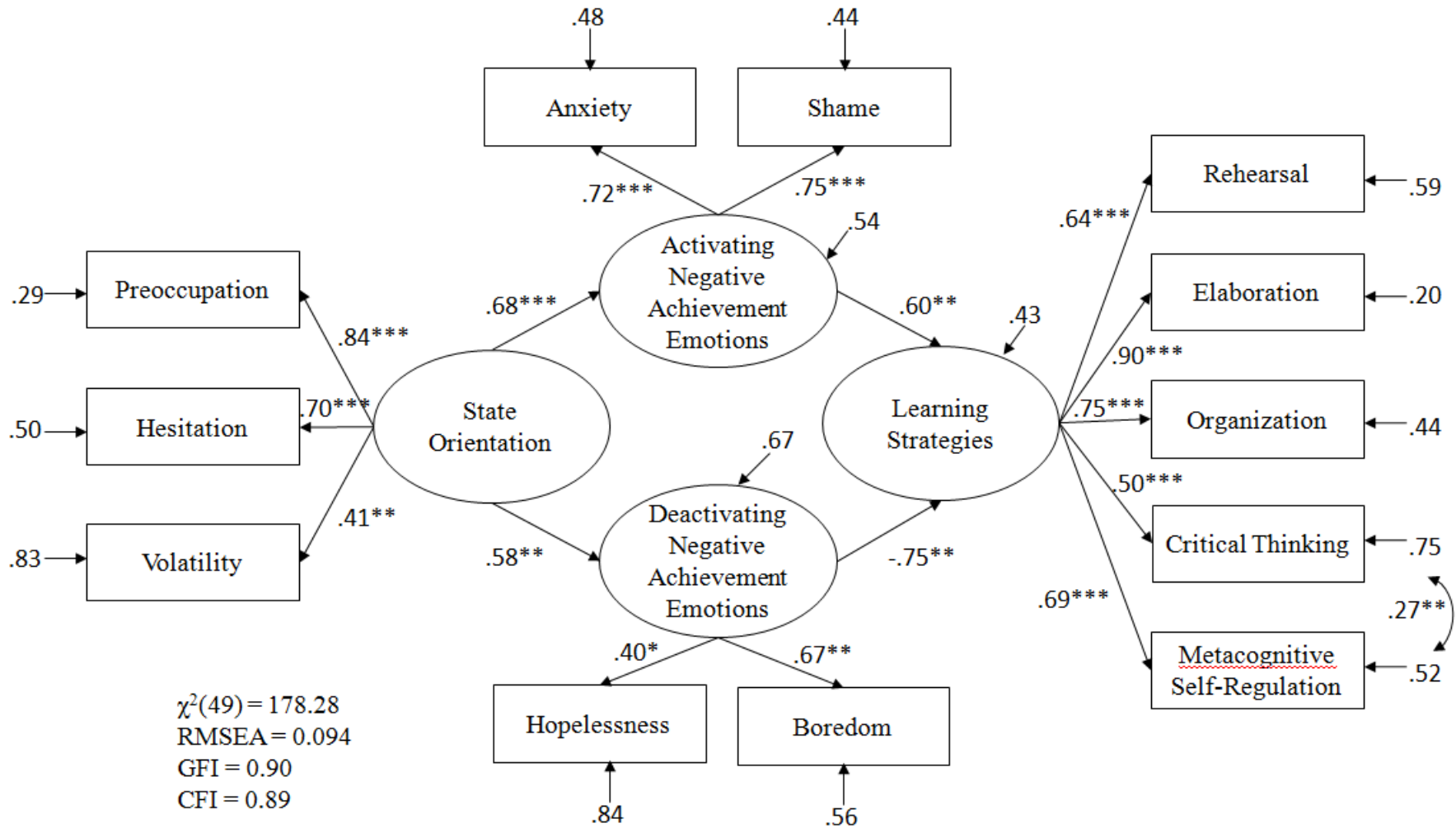
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Figure 4. The structural model of the interrelationships between state orientation, activating negative achievement emotions, deactivating negative achievement emotions and learning strategies.

Note: RMSEA = Root Mean Square Error of Approximation; GFI = Goodness of Fit Index; CFI = Comparative Fit Index.

$* p < .05$, $** p < .01$, $*** p < .001$.

Discussion

The present research is to develop path diagrams and structural models for investigating the interrelationships among student's action control, achievement emotions and learning strategies.

Mediating Effects of Positive Achievement Emotions

Referred to hypothesis 1, the path models and structural models showed that positive achievement emotions was a significant positive mediator between action orientation of action control and learning strategies. It is indicated that action-oriented students have more positive achievement emotions which enhance their ability to use learning strategies. To further discuss the relationships, it is divided into the following two parts.

The first part is about the relationships between action orientation (disengagement, initiation, persistence) and positive achievement emotions (enjoyment, hope, pride). Initiation was the best predictor of all positive achievement emotions in learning. Besides, disengagement was also a positive predictor of enjoyment and pride in learning when facing failures. However, persistence was less important for maintaining positive achievement emotions in learning.

The results of these relationships were supported by the action control theory (Kuhl, 1994) and personality systems interactions (PSI) theory (Kuhl, 2000; Kuhl & Koole, 2004) which suggest that action control influences achievement emotions due to intuitive affect regulation. Specifically, initiation refers to generate positive states and motivated learning behaviors (Kazen et al., 2008; Koole & Jostmann, 2004). Hence, it positively predicted all positive achievement emotions in learning. Besides, disengagement refers to relief from negative states and physiological stress when facing failures (Jaramillo & Spector, 2004). Hence, disengagement positively predicted enjoyment and pride, which are related to pleasurable feeling and self-confidence.

The second part is about the relationships between positive achievement emotions (enjoyment, hope, pride) and learning strategies (rehearsal, elaboration, organization, critical thinking, metacognitive self-regulation). Enjoyment was the best predictor of the use of all learning strategies. Comparatively, pride predicted more use of learning strategies with higher cognitive level than hope and enjoyment, including organization, critical thinking and metacognitive self-regulation. Both hope and pride were not related to the use of rehearsal strategy, which is a comparatively rigid strategy.

The results of these relationships were supported by the control-value theory (Pekrun, 2000, 2006) and cognitive-motivational model (Pekrun, 1992) which suggest that achievement emotions influence the use of learning strategies according to cognitive appraisals and motivational mechanisms (Pekrun et al., 2002; Pekrun, Frenzel, Goetz, Perry, 2007). Specifically, enjoyment refers to the interest in learning. Hope refers to the optimistic attitudes towards learning and academic competence. Pride refers to the positive self-perception on academic ability and confidence in learning. Students with more enjoyment, hope and pride are related to their cognitive appraisals on interest and ability to master the learning materials (Pekrun et al., 2002). Therefore, they are able to direct more cognitive resources and motivation to the flexible use of different learning strategies (Pekrun, Elliot, & Maier, 2006; Rachel, Plass, Hayward, & Homer, 2012).

Mediating Effects of Negative Achievement Emotions

Referred to hypothesis 2, the path models and structural models showed that activating negative achievement emotions was a significant positive mediator while deactivating negative achievement emotions was a significant negative mediator between state orientation of action control and learning strategies. It is indicated that state-oriented students have more activating and deactivating negative achievement emotions which influence their ability to use learning strategies differently. To further discuss the relationships, it is divided into the following two parts.

The first part is about the relationships between state orientation (preoccupation, hesitation, volatility), and activating (anger, anxiety, shame) and deactivating (hopelessness, boredom) negative achievement emotions. Preoccupation was the best predictor of all activating and deactivating negative emotions

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when facing failures. Besides, hesitation was a positive predictor of anger and boredom while volatility was a positive predictor of hopelessness in learning.

The results of these relationships were supported by the action control theory (Kuhl, 1994) and personality systems interactions (PSI) theory (Kuhl, 2000; Kuhl & Koole, 2004) as mentioned above. Specifically, preoccupation refers to emotional exhaustion when facing failures, such as dysfunctional thinking and self-blame (Jaramillo & Spector, 2004). Hence, it predicted all negative achievement emotions in learning. Besides, hesitation refers to low abilities in initiating learning goals and behaviors which cause motiveless and even annoying attitudes towards learning (Kazen et al., 2008). Hence, it predicted anger and boredom in learning. Furthermore, volatility refers to low abilities in maintaining attention and motivation in learning and often results in off-task behaviors (Koole & Jostmann, 2004). Hence, it predicted hopelessness towards learning.

The second part is about the relationships between activating (anger, anxiety, shame) and deactivating negative achievement emotions (hopelessness, boredom), and learning strategies (rehearsal, elaboration, organization, critical thinking, metacognitive self-regulation). It is surprisingly found that anger was not related to any types of learning strategies. Besides, anxiety and shame were seen as activating negative achievement emotions since they facilitate the use of rehearsal, elaboration and metacognitive self-regulation respectively. Alternatively, hopelessness and boredom were seen as deactivating negative achievement emotions since they reduce the use of all learning strategies.

The results of these relationships were supported by the control-value theory (Pekrun 2000, 2006) and cognitive-motivational model (Pekrun, 1992) as mentioned above. For activating negative achievement emotions expect anger, the result supported some past evidences that they can strengthen academic motivation to avoid failures by investing more efforts in using some learning strategies. Specifically, anxiety refers to high physiological arousal of tension and cognitive appraisals on worry about academic failures (Pekrun et al., 2002; Pekrun et al., 2009). Hence, it causes more rehearsal and elaboration for information processing in learning. Besides, shame acts as a warning signal for students to evaluate their current learning behaviors for goal attainment (Turner & Schallert, 2001; Turner, Husman & Schallert, 2002). Hence, it predicted more elaboration and metacognitive self-regulation for information processing and better monitor of learning behaviors.

In contrast, deactivating negative achievement emotions reduce the use of all learning strategies. Specifically, hopelessness consists of cognitive appraisals on low self-control and pessimistic thinking in learning (Daniels, Stupnisky, Pekrun, Haynes, Perry, & Newall, 2009). Boredom consists of cognitive appraisals on unpleasant feelings and lack of interest in learning (Pekrun, Goetz, Daniels, Stupnisky, & Perry, 2010). Especially following academic failures, students with hopelessness and boredom are found to result in poor attention, passive attitudes and disruptive learning behaviors (Pekrun et al., 2009; Rachel et al., 2012). Therefore, they are not able to direct cognitive resource and motivation which causes fewer use of all learning strategies.

Conclusion

The present study contributes to prove the relationships among action control, achievement emotions and learning strategies. From theoretical perspective, the present study formulated and validated two structural equation models. It revealed that positive and negative achievement emotions were important mediators between action control and learning strategies. It also provides new directions for researchers to study further.

From an applied perspective, people can also be aware of the influence of action control and achievement emotions on learning strategies. Action-oriented students are more advantaged than state-oriented students in learning. Enjoyment, hope, pride, anxiety and shame were beneficial in learning, whereas hopelessness and boredom acted as barriers in learning. There is a need to help state-oriented students to regulate and cope with the detrimental emotions for better use of learning strategies. Therefore, it is implicated that educators can implement corresponding strategies in improving conducive learning environments and promote more successful learning experiences to cater for the psychological needs of state-oriented students. For example, instructors can pay more attention to the

design of academic settings, provide sufficient instructions and time, and form effective study groups for them.

There are some limitations in the present research. SEM showed that a less favorable model was established for the relationships between state orientation, activating and deactivating achievement emotions and learning strategies. In the future studies, a larger sample size may increase the fitness of model. Also, it may involve other similar psychological constructs that are related to the variables in this study, such as personality, achievement goals and motivation.

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