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Original Article

Investigating the Correlation between Cognitive and Metacognitive Strategies and Students' Academic Well-being Mediated by Academic Engagement

Akbar Mohammadi[1], PhD Candidate; Shima Parandin[2]*, PhD; Maryam Akbari[1], PhD; Yahya Yarahmadi[1], PhD

[1]Department of Psychology, Sanandaj Branch, Islamic Azad University, Sanandaj, Iran
[2]Department of Psychology, Eslam Abad-e-Gharb Branch, Islamic Azad University, Eslam Abad-e-Gharb, Iran

Corresponding author:* Shima Parandin, PhD; Department of Psychology, Eslam Abad-e-Gharb Branch, Islamic Azad University, Postal code: 83146-67617, Eslam Abad-e-Gharb, Iran. **Tel: +98 87 33288661; **Fax:** +98 87 345323545; **Email:** parandinsh@gmail.com

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Abstract

Background: Puberty is known to be a stressful period for students, and managing its associated crises helps guarantee students' mental health and sense of well-being in adulthood. This study aimed to investigate the mediating role of academic engagement in the correlation between cognitive and metacognitive strategies and academic well-being in high school students.
Methods: The method used in this research was descriptive and correlational. The statistical population included all the female high-school students in Kermanshah, Iran, in 2021, out of whom a sample of 350 students was selected. The Standard School-related Well-being Questionnaire, the Learning Strategies Questionnaire, and the Academic Engagement Scale were utilized herein. The data were analyzed with descriptive and inferential statistics (structural equation modeling).
Results: The results revealed that cognitive (r=0.34, P=0.001) and metacognitive (r=0.36, P=0.001) strategies were significantly and positively correlated with academic well-being. Furthermore, cognitive (r=0.33, P=0.001) and metacognitive (r=0.42, P=0.001) strategies were significantly and positively correlated with academic engagement. These strategies also had an indirect and significant association with academic well-being mediated by academic engagement (P=0.001).
Conclusions: The results demonstrated the desirable fit of the model. It could be therefore recommended that cognitive and metacognitive strategies be instructed to students in order to promote their academic well-being by increasing their academic engagement.

Keywords: Health, Cognitive psychology, Metacognition, Engagement, Students

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1. Introduction

Education pursues two main objectives, being teaching and nurturing students. It highlights students' learning and academic performance, the growth of their talents, and the promotion of their mental health (1). All these increases students' academic engagement as much as possible which, in turn, facilitates their path towards success in life and education. High schools play a key role in meeting teenagers' and youths' needs and solving their problems (2). Puberty is a stressful period, and managing its associated crises helps guarantee students' mental health and sense of well-being in adulthood (3, 4). Mental health is the foundation for the well-being and effective functioning of individuals and society (5).

Well-being refers to striking a balance between physical, social, and mental problems and challenges and their physical, social, and mental resources (6). Given the pivotal role of schools in students' lives and the significance of academic achievement to their socioemotional functioning, their well-being is related to the school setting and educational conditions (7). Students' school-related well-being is determined by four dimensions, namely school value, burnout, academic satisfaction, and engagement with the assignments (8). Their well-being comprises components, such as skills to do the assignments, satisfactory academic performance, and academic enthusiasm (9). In other words, academic well-being is students' attitudes towards education, which is manifested in four dimensions of the general attitude towards academic life, the teacher, peers, and educational organization (10).

Metacognition refers to people's knowledge about cognitive flows and executing, regularizing, and harmonizing them (11). Since the 1920s,

intellectual processes in learning have received a great deal of scientific attention from psychology. The mid-1970s witnessed the development of information processing theories, when the concept of metacognition was further highlighted (12). Metacognition refers to the data people have about their cognitive system. More precisely, metacognition is one's knowledge about how he/she learns. It is a combination of explicit and implicit processes, for which conscious awareness is a necessary condition (13, 14). The way people learn and the speed of learning also depends on their metacognitive differences (15).

The concept of academic engagement has recently been used by different researchers; it refers to the quality of the effort learners put into targeted educational activities in order to directly achieve the desired outcomes (16, 17). In general, academic engagement highlights the role of self-awareness in studying, forming metacognitive notions, and self-regulation (18). According to Rajabalee and colleagues (19), students' engagement in academic assignments means that the assignment attracts and commands their attention. With this level of attention, they prepare their energy to do and complete the assignment and maintain this level of energy proportionate to the requirements of the task until it is completed.

According to Pekrun and colleagues (20) and based on the control-value theory of achievement emotions, cognitive evaluations can affect academic outcomes through academic emotions and personal behaviors. School-related well-being is associated with numerous positive outcomes, such as satisfaction, a sense of efficiency, success, and academic progress; therefore, research into metacognitive factors and engagement that influences it, and awareness of the direct and indirect impacts of these factors, can result in the establishment of academic well-being in schools. One of the most important innovations of the present study is investigation and clarification of academic engagement mediating role in the association between cognitive and metacognitive strategies and academic well-being in female high-school students. Accordingly, this study was conducted in order to investigate the mediating role of academic engagement in the correlation between cognitive and metacognitive strategies and academic well-being in students. Based on the definitions provided and the variables of the current research, Figure 1 illustrates the conceptual model.

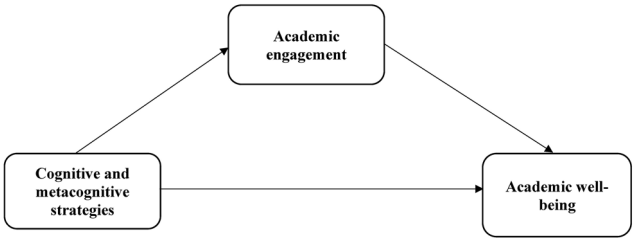

Figure 1: The figure shows the conceptual model of the correlation between cognitive and metacognitive strategies and academic well-being mediated by academic engagement in female high-school students.

2. Methods

This descriptive-correlational study was conducted using structural equation modeling (SEM). The statistical population included all the students in Kermanshah, Iran, in 2021, out of whom a sample of 350 female students was selected via multi-stage cluster random sampling. In order to select the sample in the first stage, one district was randomly selected from the three educational districts of Kermanshah city. In the next stage, two high schools were randomly selected from the girls' high schools of this district, and the research questionnaires were given to the 10^{th}, 11^{th}, and 12^{th} grade students of these high schools. The inclusion criteria were consenting to participation, being ages between 15 and 17, and the absence of mental disorders. The exclusion criteria were failing to answer all the questionnaire items and returning incomplete questionnaires. For ethical considerations in the present study, prior to entering the study, informed consent was obtained from the participants. The students were also assured that their information would remain confidential. This study was approved by the Ethics Committee of the Islamic Azad University of Sanandaj under the following code: IR.IAU.SDJ.REC.1399.050.

2.1. Instruments

The Standard School-related Well-being Questionnaire: Developed by Pietarinen and co-workers (21), this questionnaire comprises 11 items and measures well-being on a five-point Likert scale (from strongly disagree to strongly agree). Higher scores indicate greater academic well-being. Ghadampour and colleagues (22) reported the reliability of this questionnaire based on Cronbach's alpha to be 0.75. The Cronbach's alpha coefficient was 0.78 in the current study. Moreover,

10 experts evaluated the items of the Persian version of the Standard School-related Well-being Questionnaire. The Content Validity Ratio (CVR) and Content Validity Index (CVI) were reported as 0.95 and 0.98, respectively.

The Learning Strategies Questionnaire: The Learning Strategies Questionnaire has 86 items. It initially divides strategies into cognitive and metacognitive strategies. Cognitive strategies are further divided into the sub-categories of repetition or review, semantic expansion, and organization strategies. Additionally, metacognitive strategies are divided into two sub-categories, namely knowledge and self-control (including commitment, attitude, and attention) and knowledge and process control (including planning, control, evaluation, and organization). The items are scored on a 10-point scale ranging from 0 to 9 (23). Erfani (23) reported the reliability of this questionnaire based on Cronbach's alpha of 0.95. The Cronbach's alpha coefficient was 0.86 in the current study. Moreover, herein, the Persian version of the Learning Strategies Questionnaire had good quantitative validity (CVI=0.97, CVR=0.96).

The Academic Engagement Scale: The Academic Engagement Scale was developed by Reeve (24), consisting of 17 items categorized into four components, including behavioral, cognitive, emotional, and agency components. The items are scored based on a seven-point Likert spectrum from completely disagree (1) to completely agree (7). Reeve (24) reported a Cronbach's alpha coefficient of 0.86 for the whole scale. Ramazani and Khamesan (25) reported the reliability of this scale based on Cronbach's alpha to be 0.92. According to Ramazani and Khamesan (25), the Persian version of the Academic Engagement Scale had good quantitative validity (CVI=0.99, and CVR=0.98). The Cronbach's alpha coefficient was 0.87 in the current study.

2.2. Statistical Analyses

Descriptive statistics (mean, standard deviation, and correlation matrix) were used for analyzing the data. In addition, structural equation modeling (SEM) was utilized for evaluating the proposed model in AMOS 26.

3. Results

The sample included 350 female students with a mean age of 16.02±0.72 years. Out of this population, 57 (16.2%), 164 (46.9%), and 129 students (36.9%) studied in the 10th, 11th, and 12th grade, respectively. Moreover, 255 students (72.9%) studied experimental sciences, 56 (16%) mathematics, and 39 (11.1%) humanities. Table 1 represents the descriptive statistics, including the mean and standard deviation, and the correlation matrix between the variables. Cognitive (r=0.34, P=0.001) and metacognitive (r=0.33, P=0.001) strategies were significantly and positively correlated with academic well-being. Cognitive (r=0.33, P=0.001) and metacognitive (r=0.42, P=0.001) strategies were also positively correlated with academic engagement.

Table 2 lists the goodness-of-fit indices for the model of academic well-being based on cognitive and metacognitive strategies mediated by academic engagement. The values of goodness-of-fit index (GFI), adjusted goodness of fit index (AGFI), normed fix index (NFI), comparative fix index (CFI), and incremental fix index (IFI) indices were 0.94, 0.90, 0.84, 0.91, and 0.91, respectively. Furthermore, a root mean square error of approximation (RMSEA) of 0.058 confirmed the general fit of the model to the data.

Figure 2 displays the final model of academic well-being based on cognitive and metacognitive strategies, mediated by academic engagement. The results revealed that cognitive and metacognitive strategies are significantly and indirectly related

Table 1: Mean and standard deviation (SD), and the correlation between the variables

Variables	Mean±SD	Min.	Max.	1	2	3	4
1- Academic well-being	40.82±2.42	35	49	1			
2- Academic engagement	92.60±4.71	78	113	r=0.07 P=0.191	1		
3- Cognitive strategies	281.83±12.13	255	320	r=0.34 P=0.001	r=0.33 P=0.001	1	
4- Metacognitive strategies	226.87±8.35	204	260	r=0.33 P=0.001	r=0.42 P=0.001	r=0.46 P=0.001	1

Table 2: Goodness-of-fit indices for the model

Fit indicators	GFI	AGFI	NFI	CFI	IFI	RMSEA	CMIN/DF
Model	0.94	0.90	0.84	0.91	0.91	0.058	2.17
Acceptable range	>0.85	>0.80	>0.80	>0.90	>0.90	<0.08	2-3

GFI: Goodness of Fit Index; AGFI: Adjusted Goodness of Fit Index; NFI: Normed Fit Index; CFI: Comparative Fit Index; IFI: Incremental Fit Index; RMSEA: Root Mean Square Error of Approximation; CMIN/DF: Minimum Discrepancy Function by Degrees of Freedom divided.

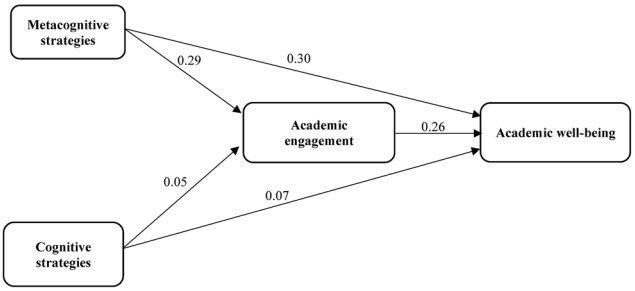

Figure 2: The figure shows the final model of the correlation of cognitive and metacognitive strategies with academic well-being mediated by academic engagement.

to academic well-being mediated by academic engagement (P<0.001) (Table 3).

4. Discussion

Based on the results of the present study, cognitive strategies had a positive and indirect effect on students' academic well-being through academic engagement. Metacognitive strategies also had a significant, positive, and indirect effect on academic well-being through academic engagement. In other words, academic engagement mediated the correlation between metacognitive strategies and academic well-being. Moreover, all the goodness-of-fit indices of the model were desirable; thus, the model had a very good fit to the experimental data. These results are consistent with those reported in previous studies (13, 26). The use of cognitive strategies is associated with positive academic emotions in students, which can in turn effectively contribute to academic engagement, active participation during the semester, academic self-efficacy, and attachment to the educational setting. In line with this finding, Shahzad and co-workers (26) noted that the successful use of cognitive and metacognitive strategies enhances self-efficacy-related beliefs, thereby increasing students' engagement in learning and satisfaction with educational activities. Students' self-regulation also makes them actively engage in and organize learning, as a result of which they enjoy activities and homework (13).

Based on the findings, one can claim with some degree of caution that the main problem is the method of teaching and interaction with the teacher in the classroom. Traditional learning rarely sparks students' interest in materials or leads to efficient and full learning. Students do not actively engage with the subject matter, do not learn the material effectively, and their competence needs are not met with this kind of learning. This might be the reason why cognitive strategies influenced academic well-being through academic engagement. Furthermore, the positive effect of metacognitive awareness on improving self-efficacy perception leads to academic engagement and improves school-related well-being. Students who enjoy metacognitive ability can strike a balance between their internal and external actions, thus having better mental health and well-being (15). It seems as if self-knowledge and knowledge of the environment and resources available in it, which is a basic characteristic of metacognitive knowledge, creates a sense of mastery and competence in students; these feelings make students attracted to academic activities, result in a sense of self-efficacy, and helps them choose constructive academic behaviors.

Table 3: Path coefficients of the direct and indirect association between the research variables

Path	β	SE	t
Academic engagement to academic well-being	0.26	0.020	3.44
Metacognitive strategies to academic engagement	0.29	0.021	3.50
Cognitive strategies to academic engagement	0.05	0.019	2.23
Metacognitive strategies to academic well-being	0.30	0.019	3.52
Cognitive strategies to academic well-being	0.07	0.020	2.45
Metacognitive strategies to academic well-being mediated by academic engagement	0.24	0.018	3.40
Cognitive strategies to academic well-being mediated by academic engagement	0.36	0.021	3.64

SE: Standard Error

Overall, the results showed that cognitive and metacognitive strategies significantly affected academic well-being through academic engagement. These findings are consistent with the theoretical foundations of academic well-being. Self-regulation interventions targeting students generally enhance learning and reduce dropout by controlling the conditions (27). Motivated students pay full attention to the lesson, show interest in learning, are hardworking and self-regulated learners, and engage in academic affairs. Cognition and motivation are interrelated. This model considers learning strategies as a cognitive and motivational component. Strategies thus determine the level of students' motivation to achieve success and affect their tendencies, actions, and responses in academic contexts.

Learners who are cognitively and metacognitively engaged in learning spend more time and effort on studying, properly cope with their educational needs, and overcome the problems in their studies. This sense of engagement and efficacy concerning academic needs is associated with the level of well-being experienced. When students find the subjects enjoyable and useful for their lives, their intrinsic motivation to learn will increase and they will have further academic engagement with learning (5). A healthy setting and healthy relationships at school lead to self-directed learning and ensure students' mental health. Shernoff (28) stated that over the past few decades, considerable attention has been paid to student engagement as a framework for understanding educational concerns, like academic under-achievement, since engagement is a flexible construct strongly influenced by learning environments.

Based on the results, successful use of cognitive and metacognitive strategies leads to students' academic engagement in learning and their satisfaction with educational activities; this way, they enjoy the activities and homework, and this enjoyment improves their academic well-being. School managers and staff should emphasize the expansion of learning, academic engagement, and academic motivation by taking into account all students' tastes, abilities, and individual differences. Teachers should also be allowed more freedom and authority in order to be able to manage their classes as they see fit. According to the results of the present research, with the appropriate design of assignments and the use of novel educational methods, the educational system and teachers should encourage students to use cognitive and metacognitive strategies. Teaching these strategies can promote students' academic engagement, academic well-being and, subsequently, self-directed learning.

4.1. Limitations

The statistical population of the current study comprised female high-school students in Kermanshah, Iran. Therefore, the results should be cautiously generalized to other student populations.

5. Conclusions

The proposed model had a good fit with the data. Cognitive and metacognitive strategies can influence students' academic well-being directly and mediated by academic engagement. The findings about cognitive and metacognitive strategies and their role in enhancing learning engagement and academic well-being merit attention from educators. Educators should identify and pay attention to the factors contributing to students' acceptance of these strategies. These skills should be instructed at school to help students' wide-ranging development in the educational setting.

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Ethical Approval

The Ethics Review Board of the Islamic Azad University-Sanandaj Branch approved the present study with the code of IR.IAU.SDJ.REC.1399.050. Also, written informed consent was obtained from the participants.

Conflict of Interest: None declared.

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