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The Importance of Optimism and School Belonging for Children's Well-Being and Academic Achievement

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ABSTRACT: Background: Academic achievement is an important indicator of student development, and its pursuit should be considered alongside students' mental health and overall quality of life. Traditional martial arts, as an educational activity that emphasizes self-discipline, communal values, and positive emotional experiences, may support key psychological factors related to learning, such as optimism, school belonging, and well-being. However, how these factors are connected to academic achievement has not been fully examined. Therefore, this study investigated the associations between these psychological resources and academic achievement among students participating in traditional martial arts training. **Methods:** Data were collected from 331 elementary school students in South Korea who were enrolled in school-based traditional martial arts (taekkyeon) classes. The survey was administered on-site between August and November 2024. Confirmatory factor analysis and structural equation modeling with 5000 bootstrap resamples were performed to evaluate the measurement model and test the hypothesized relationships. **Results:** The measurement model showed acceptable fit, and the structural model supported most of the hypothesized relationships. Optimism showed significant positive associations with school belonging, well-being, and academic achievement; well-being was positively related to academic achievement. However, the direct relationship between school belonging and academic achievement was not statistically significant, suggesting that its influence may operate indirectly through well-being. **Conclusion:** The findings indicate that participation in traditional martial arts training is related to positive psychological processes and academic outcomes. This study underscores the broader contributions of traditional martial arts to students' well-being and academic adjustment, highlighting their relevance for school-based programs.

KEYWORDS: Traditional martial arts; optimism; school belonging; student well-being; academic achievement

1 Introduction

Education plays a decisive role in equipping students with the competencies necessary to participate in society, enabling them to realize their potential and contribute to broader social development [1]. Accordingly, education and psychology research have sought to gain an in-depth understanding of student development and learning processes by exploring various factors. For example, learning motivation, self-efficacy, academic resilience, and self-regulation [2–6]. Academic achievement is the most direct indicator of student development and educational effectiveness [7]. Beyond reflecting current educational outcomes, academic achievement is regarded as a critical predictor of students' long-term learning trajectories and future development [8].

Academic achievement has been found to be associated with learning-related, psychological, relational, and emotional resources [9]. Among these resources, optimism, school belonging, and well-being represent the



core constructs that describe how students adapt to challenges and thrive in academic environments [10,11]. Specifically, optimism enables students to maintain positive expectations even in the face of challenges and is tied to adaptive interpretations of setbacks, which correspond to stronger academic engagement [12]. School belonging fosters a sense of meaning and connectedness through supportive relationships with peers and teachers, and is connected with higher participation and engagement in learning [13,14]. Student well-being has been linked with effective stress regulation, while life satisfaction correlates with sustained learning motivation and higher achievement [15,16].

From this perspective, physical activity has been increasingly recognized as an educational intervention that strengthens students' psychological and emotional resources, thereby facilitating their academic achievement [17,18]. In particular, traditional martial arts, unlike conventional forms of physical activity that primarily emphasize competition, skill development, and physical performance, represent a form of mind-body discipline that highlights self-discipline and character development grounded in philosophical and moral cultivation [19]. Moreover, they are distinguished by their emphasis on cultivating educational virtues, such as courtesy, self-discipline, respect, and a sense of community, making them a particularly meaningful form of physical activity that supports learning and personal growth [20,21]. In South Korea, taekkyeon—designated as an intangible cultural heritage by UNESCO—is a representative example of traditional martial arts characterized by fluid and rhythmic movements, courtesy, respect, and a philosophy of harmony that reflects the Korean cultural values of balance and interconnectedness [22]. The communal training culture and virtue-based discipline in martial arts are connected to relational experiences of acceptance, respect, and validation [23]. Furthermore, positive emotional experiences derived from practice have been associated with greater well-being and optimism [24,25]. These relational and communal processes correspond to a stronger collective identity and an increased sense of belonging. Moreover, it was found that participation in martial arts may exert a direct influence on academic achievement [26].

Although previous studies have addressed these issues, most have examined only specific associations between martial arts and psychological factors, such as optimism, school belonging, and well-being, without exploring how these factors are related to academic achievement [13,24]. In other words, the relationships among these variables cannot be adequately explained by a single factor or direct linear relationship. Instead, it may be better understood as part of a complex psychological process [27]. Therefore, this study examined the relationships between optimism, school belonging, well-being, and academic achievement among students practicing traditional martial arts. By doing so, it aimed to highlight the multidimensional educational value of traditional martial arts and provide an integrated perspective of the relationships between psychological resources and academic outcomes. While previous studies have applied these theories independently to explain motivational or emotional processes, few have integrated them to explain cross-domain psychological transfer from physical to academic contexts. This study extends the theoretical scope by combining relationship motivation theory [28], which explains social motivation through relatedness, with the dynamics of action theory [29] and the spillover theory [30], which together elucidate how motivational energy generated in one domain can carry over to another. By proposing this integrative framework, this study contributes to a deeper understanding of how psychological resources cultivated through traditional martial arts may operate within educational settings.

2 Literature Review

2.1 Optimism

Optimism refers to generalized outcome expectancies, defined as the tendency to believe that good things will happen across life events [31–33]. It can be conceptualized from two complementary perspectives [31,34]. Trait optimism reflects a stable and generalized tendency to expect favorable outcomes

across life domains [31], whereas state optimism represents a dynamic, context-dependent belief in positive outcomes that may fluctuate over time or across situations. Given that martial arts training involves goal striving, feedback, and mastery experiences that vary across contexts, state optimism provides a more sensitive indicator of the short-term psychological changes fostered through such practice. Previous research has identified associations between optimism and multiple psychological indicators, including mental health, well-being, stress, and depression [35–37]. Although empirical evidence is limited, one early study reported that participation in traditional martial arts was associated with greater optimistic attitudes, a finding that has been cited in later reviews [24,38,39].

Optimism functions positively in interpersonal relationships by facilitating bond formation and maintenance, enhancing relationship satisfaction and adjustment, and contributing to social support and the expansion of networks; thus, serving as an important psychological resource [40–42]. Psychological resources can play a crucial role in shaping school belonging. Previous research noted that positive personal attributes, including optimism, self-efficacy, self-esteem, and resilience, are significantly associated with school belonging [13], and these attributes collectively serve as important psychological resources [43–45]. Individuals with an optimistic disposition are more likely to experience higher levels of bonding and relational satisfaction with their peers, which, in turn, are linked to a stronger sense of school belonging.

Optimism is also related to well-being. Oriol and Miranda [46] found that optimism significantly affects both subjective and psychological well-being. In particular, adolescents with higher optimism tended to experience more positive and fewer negative emotions, suggesting possible links to emotion regulation and psychological adaptation. Thus, optimism functions as an important predictor of quality of life across different age groups and has been reported to enhance positive emotional experiences and mental health [47–49]. Duy and Yıldız [50] mentioned that optimism was indirectly associated with subjective well-being through self-esteem as a mediator, indicating optimistic individuals are more likely to form positive self-evaluations, enhancing their overall well-being.

Beyond well-being, optimism is related to academic achievement. El-Anzi [51] noted that students' optimistic attitudes were linked to greater persistence and problem-solving abilities in personal situations, and a hopeful outlook toward the future may serve as a motivation for academic success. Furthermore, Tetzner and Becker [12] examined the relationships between optimism, self-esteem, and academic achievement and found that optimism serves as a significant predictor in academic contexts and that moderate levels of optimism appeared to be most beneficial for academic achievement. Previous studies have demonstrated that optimism is significantly associated with school belonging [13], well-being [46], and academic achievement [51]. Nevertheless, these relationships have rarely been explored within the context of traditional martial arts. To address this gap, this study examined whether the positive role of optimism observed in educational settings also emerges in this context and proposed the following hypotheses:

H1: *Optimism is positively associated with school belonging.*

H2: *Optimism is positively associated with well-being.*

H3: *Optimism is positively associated with academic achievement.*

2.2 School Belonging and Well-Being

School belonging refers to the extent to which students feel psychologically connected to their school community, experience emotional bonds, and have a sense of security [13,52]. This sense of belonging is regarded as being closely related to relatedness, one of the basic psychological needs proposed in self-determination theory, and has been shown to be important for students' emotional stability, self-efficacy, academic motivation, and social adjustment [13,53–55].

School belonging is also closely associated with well-being. Well-being is a key indicator of quality of life, which has become increasingly important in modern society [56,57]. In particular, childhood and adolescence are periods of rapid physical, psychological, and social changes, during which well-being serves as the foundation for healthy development and future life adaptation [58,59]. Tian et al. [60] and Arslan et al. [61] noted that the stronger a student's sense of belonging at school, the higher their life satisfaction and levels of positive emotions, which ultimately leads to improvements in overall well-being. Both school belonging and student well-being have been found to be associated with traditional martial arts participation. Traditional martial arts emphasize etiquette, respect, and a culture of collective practice, thereby promoting students' psychological bonding and social connectedness [21]. Such training methods foster relationships through interpersonal interactions and support community development. Moore et al. [24] reported that traditional martial arts training significantly enhanced well-being and alleviated internalized mental health problems (e.g., anxiety and depression), suggesting its potential as a sports-based psychological intervention. Building on previous studies indicating that traditional martial arts training may strengthen students' sense of school belonging, this study examines the relationships between school belonging and well-being and proposes the following hypothesis:

H4: *School belonging is positively associated with well-being.*

2.3 Academic Achievement

One of the most important developmental tasks during the school years is academic achievement [62], which goes beyond grades, and has been recognized as having a decisive impact on future academic pathways and career choices [63]. School belonging has been identified as a critical predictor of academic achievement. Sakellariou [14] reported that school belonging is a major factor in enhancing learning attitudes and academic engagement and that intrinsic motivation and engagement are closely related to improved academic performance. Slaten et al. [11] also emphasized that school belonging (school engagement) and educational expectations are important predictors of students' academic achievement [64].

Similarly, well-being has been found to be related to academic achievement. Previous research has demonstrated that well-being is closely associated with academic success [16]. For example, Cárdenas et al. [65] found that students' subjective well-being significantly predicted subsequent academic achievement, with lower levels of depression and higher levels of positive emotions corresponding to better performance. Holzer et al. [15] indicated that optimism and perseverance, as subcomponents of well-being in the school context, were significantly related to academic achievement. Specifically, optimism helps students maintain positive expectations about the future during the learning process, whereas perseverance enables them to continue striving toward goals despite difficulties, thereby illustrating the association between well-being and academic success.

The benefits of traditional martial arts training may extend beyond the psychological effects to enhancing academic performance. Pinto-Escalona et al. [26] reported that a school-based intervention using karate, a form of traditional martial art, positively influenced students' academic achievement, reduced behavioral problems, and improved physical fitness. Notably, children who participated in one year of karate classes showed significant improvements in average grades compared to the control group, providing empirical evidence that traditional martial arts experiences are related to academic benefits. Based on these findings, this study proposed the following hypotheses:

H5: *School belonging is positively associated with academic achievement.*

H6: *Well-being is positively associated with academic achievement.*

2.4 Relationship Motivation Theory, Dynamics of Action Theory, and Spillover Theory

Relationship motivation theory, derived from self-determination theory, provides a framework for explaining the formation and strengthening of human motivation in social relationships [28]. The theory emphasizes the three basic psychological needs—autonomy, competence, and relatedness—while focusing on how these needs are satisfied in interpersonal interactions [28,54]. According to Deci and Ryan [28], fulfilling the need for relatedness enhances autonomy and well-being, promoting positive emotions and adaptive behaviors. In the school context, the satisfaction of relatedness is reflected in school belonging, whereby students experience emotional bonds with peers, teachers, and the broader school community [13]. School belonging has also been shown to influence well-being and academic achievement, functioning as a key mediator in these processes [66–68]. Optimism, a psychological resource closely associated with interpersonal functioning [40], may interact with school belonging to support students' well-being. Accordingly, this study hypothesizes that school belonging mediates the relationship between optimism and well-being.

The dynamics of action theory, proposed by Atkinson and Birch [29], conceptualizes motivation as dynamic rather than fixed, shifting across activities over time. Although originally developed to explain short-term task switching in laboratory settings, the theory highlights that motivation continuously evolves as individuals engage in different activities, suggesting that motivation and emotions generated in one activity may influence subsequent behaviors over time [69]. Complementing this view, the spillover theory [30] posits that experiences and resources acquired in one life domain can transfer to other psychologically or functionally connected domains. Domains of life are interdependent, and emotions, motivation, and behavioral tendencies cultivated in one domain may shape attitudes and outcomes in another through shared psychological processes [30]. From this perspective, traditional martial arts training can be regarded as a real-world domain for examining motivational and emotional resources, and within the spillover framework, such resources may be conceptually linked to other domains [70]. In particular, optimism, school belonging, and well-being have been conceptually associated with the context of traditional martial arts, and these psychological resources may extend beyond the physical and social domains [21,24,26,38]. Such processes may be related to students' academic achievement, reflecting potential positive spillover effects across life domains. Based on this theoretical background, the following hypotheses were proposed. Fig. 1 illustrates a research model.

H7: *School belonging mediates the relationship between optimism and well-being.*

H8: *School belonging and well-being sequentially mediate the relationship between optimism and academic achievement.*

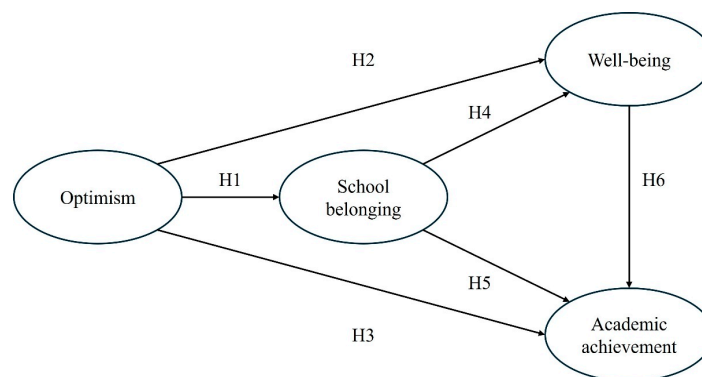


Figure 1: A hypothesized model.

3 Methods

3.1 Participants and Procedures

This study targeted elementary school students enrolled in school-based traditional martial arts (i.e., taekkyeon) classes in Chungju, South Korea. Data were collected from four elementary schools that agreed to participate in this study. Data were gathered on-site in classrooms between August and November 2024 using self-report questionnaires. Students who did not return parental consent forms were excluded, and no additional exclusion criteria were applied. Prior to data collection, written informed consent was obtained from parents, and assent was obtained from all child participants. Students were informed of the study's purpose, procedures, confidentiality safeguards, and voluntary participation. The Institutional Review Board (IRB) of Sungkyunkwan University approved all study procedures (reference no. SKKU-2024-08-018), and no ethical concerns arose during the process. A total of 331 students ultimately participated in the study. The sample comprised 172 boys (52%) and 159 girls (48%), with a mean age of 8.34 years ($SD = 0.58$). The average duration of taekkyeon training was 0.79 years ($SD = 0.46$).

3.2 Measure

3.2.1 Optimism

This study used the state optimism measure developed by Millstein et al. [34] to measure optimism. Given the contextual nature of this study, a state-level measure was employed to better capture participants' situational and short-term motivational experiences that may fluctuate according to factors such as traditional martial arts training and school life. This scale consists of seven items with a single-factor structure and assesses an individual's state-level optimism. For example, "I am feeling optimistic about my future". All items were rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree).

3.2.2 School Belonging

School belonging was measured using the School Belongingness Scale [71]. While the scale originally consisted of two subfactors (school acceptance and school exclusion), only the school acceptance dimension was employed in this study to assess the positive aspect of school belonging. For example, "I see myself as a part of this school". Responses were recorded on a 4-point Likert scale (1 = almost never, 4 = almost always).

3.2.3 Student Well-Being

Well-being was measured using the flourishing scale developed by Diener et al. [72]. This instrument assesses overall well-being and social functioning as a single dimension, and consists of eight items. For example, "I lead a purposeful and meaningful life". All items were rated on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree).

3.2.4 Academic Achievement

Academic achievement was assessed using a modified version of the goal orientation scale developed by Midgley et al. [73]. The original scale consisted of three dimensions (task, performance-approach, and performance-avoidance), while only the task goal orientation subscale was employed in this study. Although task goal orientation primarily reflects students' motivational tendencies rather than direct academic outcomes, previous studies have demonstrated that mastery- or task-oriented goals are strongly associated with higher levels of academic achievement and performance [74,75]. Accordingly, task goal orientation was used as a proxy indicator of academic achievement, reflecting students' motivation to master

learning tasks that facilitate academic success. The scale includes six items, such as “I like schoolwork that I will learn from even if I make a lot of mistakes”. All items were rated on a 5-point Likert scale (1 = not at all true, 5 = very true).

3.3 Data Analysis

First, we screened the data for violations of the assumptions. Cases with multivariate outliers were identified and excluded using the Mahalanobis distance [76]. Consequently, 27 multivariate outliers were excluded, leaving 304 valid responses for the final analysis. Confirmatory factor analysis (CFA) was performed to evaluate the measurement model. Model fit was assessed using the comparative fit index (CFI), Tucker–Lewis index (TLI), and root mean square error of approximation (RMSEA), with acceptable thresholds set at CFI and TLI values ≥ 0.90 and RMSEA ≤ 0.08 [77]. After confirming an adequate model fit, construct reliability and validity were examined. Reliability was evaluated through factor loadings and composite reliability (CR), with CR values ≥ 0.70 considered acceptable [76]. Convergent validity was assessed using the average variance extracted (AVE), with values ≥ 0.50 regarded as satisfactory [76,78]. Discriminant validity was assessed using the heterotrait–monotrait ratio of correlations (HTMT), with HTMT values < 0.85 indicating sufficient discriminant validity [79]. Subsequently, structural equation modeling (SEM) was conducted to test the hypothesized relationships. Standard errors and confidence intervals were estimated using 5000 bootstrap resamples [80]. All analyses were performed using SPSS 27.0 and AMOS 24.0 (IBM Corp., Armonk, NY, USA).

4 Results

4.1 Measurement Model

The results of the CFA indicated that the measurement model showed an acceptable fit: $\chi^2(293) = 620.41$, CFI = 0.94, TLI = 0.94, RMSEA = 0.06. Next, the internal consistency of the measurement models was assessed. The CR values ranged from 0.845 for school belonging to 0.941 for well-being, indicating satisfactory reliability (CR ≥ 0.70). The AVE was 0.522 for school belonging and 0.665 for well-being, both exceeding the recommended threshold (AVE ≥ 0.50) (Table 1). Descriptive statistics (means and standard deviations) and correlation coefficients among the latent variables were computed, and the results are presented (Table 2). Finally, discriminant validity was supported (HTMT < 0.85) (Table 3).

Table 1: Confirmatory factor analysis results.

Latent Variable	Observed Variable	λ	CR	AVE
Optimism (Opt)	Opt1	0.746	0.906	0.580
	Opt2	0.794		
	Opt3	0.820		
	Opt4	0.705		
	Opt5	0.729		
	Opt6	0.791		
	Opt7	0.740		
School belonging (SB)	SB1	0.722	0.845	0.522
	SB2	0.731		
	SB3	0.723		
	SB4	0.692		
	SB5	0.742		

Table 1: *Cont.*

Latent Variable	Observed Variable	λ	CR	AVE
Well-being (WB)	WB1	0.816	0.941	0.665
	WB2	0.852		
	WB3	0.843		
	WB4	0.817		
	WB5	0.853		
	WB6	0.825		
	WB7	0.773		
	WB8	0.739		
Academic achievement (AA)	AA1	0.827	0.911	0.632
	AA2	0.839		
	AA3	0.740		
	AA4	0.857		
	AA5	0.750		
	AA6	0.748		

Note: λ = standardized factor loading; CR = composite reliability; AVE = average variance extracted.

Table 2: Descriptive statistics and correlations among the constructs.

Constructs	M	SD	1	2	3	4
1. Optimism	4.07	0.83	-			
2. School belonging	4.06	0.88	0.592***	-		
3. Well-being	4.11	0.83	0.837***	0.778***	-	
4. Academic achievement	3.92	0.97	0.734***	0.662***	0.818***	-

Note: M = mean; SD = standard deviation. *** $p < 0.001$.

Table 3: HTMT analysis results.

Constructs	1	2	3	4
1. Optimism				
2. School belonging	0.598			
3. Well-being	0.845	0.783		
4. Academic achievement	0.744	0.655	0.809	

Note: HTMT = heterotrait–monotrait ratio of correlations; HTMT values below the threshold of 0.85 indicate adequate discriminant validity.

4.2 Structural Model

The results of the SEM indicated that the structural model showed an acceptable fit: $\chi^2(293) = 620.41$, CFI = 0.94, TLI = 0.94, RMSEA = 0.06. Hypothesis testing was evaluated based on path coefficients (β), standard errors (SE), z-statistics, and significance levels (p). First, optimism had a positive effect on school belonging ($\beta = 0.592$, SE = 0.071, $z = 8.298$, $p < 0.001$). Optimism positively influenced well-being ($\beta = 0.580$, SE = 0.061, $z = 10.043$, $p < 0.001$) and had a significant direct effect on academic achievement ($\beta = 0.180$, SE = 0.112, $z = 2.038$, $p < 0.05$). Thus, H1, H2, and H3 were supported. Next, school belonging showed a significant positive effect on well-being ($\beta = 0.435$, SE = 0.058, $z = 7.987$, $p < 0.001$), but no direct effect on academic achievement ($\beta = 0.091$, SE = 0.100, $z = 1.157$, $p > 0.05$). Therefore, H4 was supported, whereas H5 was rejected. Well-being positively affected academic achievement ($\beta = 0.597$, SE = 0.147, $z = 4.837$, $p < 0.001$). Hence, H6 was supported. Additionally, indirect effects were tested using bootstrapping. The results showed that the indirect effect of optimism on well-being through school belonging was significant, as the 95% confidence interval did not include zero. Finally, the sequential mediation effect of optimism

on academic achievement through school belonging and well-being was significant as the 95% confidence interval did not include zero (Table 4). The standardized path coefficients of the final structural model are shown in Fig. 2.

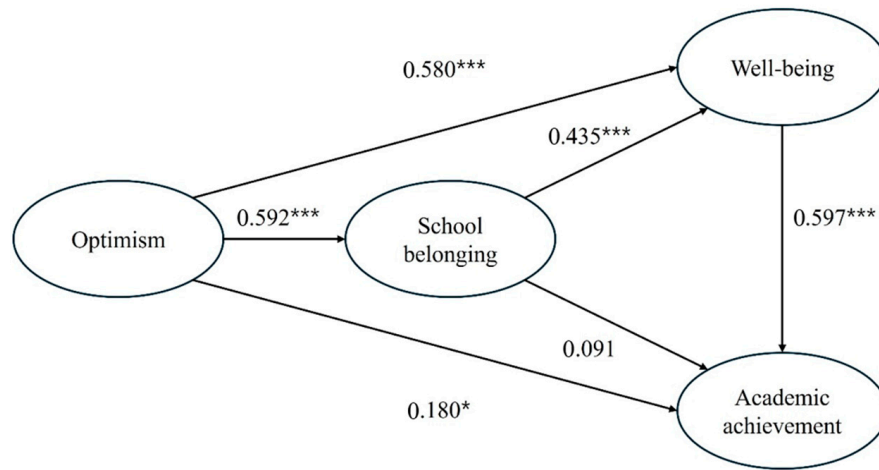


Figure 2: A structural model. Note: * $p < 0.05$, *** $p < 0.001$.

Table 4: Results of structural equation modeling.

Direct Effect	Path	β	SE	z-Value
H1	Optimism \rightarrow School belonging	0.592	0.071	8.298***
H2	Optimism \rightarrow Well-being	0.580	0.061	10.043***
H3	Optimism \rightarrow Academic achievement	0.180	0.112	2.038*
H4	School belonging \rightarrow Well-being	0.435	0.058	7.987***
H5	School belonging \rightarrow Academic achievement	0.091	0.100	1.157
H6	Well-being \rightarrow Academic achievement	0.597	0.147	4.837***
Indirect Effect	Path	β	SE	95% CI
H7	Optimism \rightarrow School belonging \rightarrow Well-being	0.257***	0.077	0.152, 0.458
H8	Optimism \rightarrow School belonging \rightarrow Well-being \rightarrow Academic achievement	0.153***	0.072	0.088, 0.386

Note: * $p < 0.05$, *** $p < 0.001$.

5 Discussion

The primary purpose of this study was to analyze the relationships among optimism, school belonging, well-being, and academic achievement in students who practiced traditional martial arts at school, based on relationship motivation theory [28], the dynamics of action theory [29,69], and the spillover theory [30]. Overall, seven of the eight hypotheses (H1, H2, H3, H4, H6, H7, and H8) were supported, indicating that belonging is associated with positive behaviors and well-being, and that motivation generated in one activity may transfer to another, ultimately relating to overall achievement. The findings advance theoretical understanding by integrating these three motivational frameworks into a unified explanatory model. Specifically, the results suggest that relatedness-based motivation and dynamic motivational shifts may jointly explain how psychological resources derived from traditional martial arts can spill over into academic contexts. This integrative approach extends the application of these theories beyond their traditional domains, highlighting the cross-domain dynamics of psychological and emotional processes in educational psychology.

Specifically, this study found that optimism was positively associated with school belonging among students who participated in traditional martial arts classes (H1). Optimism is known to facilitate positive emotions and social interactions, as well as support relationship maintenance [40,41]. These characteristics may have contributed to strengthening interpersonal bonds and enhancing belonging in the school context. The results also showed that optimism was positively associated with student well-being (H2). Previous research has reported that adolescents with optimistic dispositions experience higher life satisfaction and better psychological well-being, with fewer psychosocial problems [81]. For instance, Ho et al. [48] demonstrated that optimism was related to the positive aspects of well-being and reduced the negative aspects of the relationship between meaning in life and well-being among adolescents. These findings suggest that positive future expectations, happiness, and life satisfaction may contribute to the maintenance of mental health during adolescence. Furthermore, optimism was positively associated with academic achievement (H3). This result indicates that optimistic students tend to perceive academic tasks positively, show less discouragement in the face of failure, and sustain their motivation to learn [12]. These results are consistent with prior findings that optimism is linked to persistence and self-regulation in stressful academic contexts, thereby relating to achievement-related behaviors [51].

This study also explored the relationship between school belonging and student well-being. Consistent with the findings reported by Arslan et al. [61], the results of this study showed that school belonging was positively associated with student well-being. Moreover, school belonging appeared to function as a positive predictor of well-being (H4). Arslan [82] noted that school belonging enhanced well-being by reducing loneliness among students. Together, these results highlight that school belonging alleviates emotional isolation, thereby improving students' overall quality of life.

In contrast, school belonging did not significantly predict academic achievement (H5). This outcome may be due to the inclusion of well-being in the model, as we found a strong positive association between well-being and academic achievement (H6). The pronounced link between well-being and academic achievement may have attenuated the apparent effect of school belonging. This result aligns with previous research demonstrating that well-being is a key psychological resource associated with academic [83–85]. Therefore, well-being appears to be an important psychological resource associated with academic achievement.

School belonging also significantly mediated the relationship between optimism and well-being (H7). This extends the original framework of relationship motivation theory, suggesting that optimistic individuals form positive interpersonal relationships at school and experience a greater sense of belonging, ultimately enhancing their overall well-being [13,28]. Previous studies have shown that optimism is associated with warm and proactive interpersonal styles that facilitate positive social interactions and support [86]. In the school context, school belonging (an indicator of positive social relationships) has been shown to mediate the link between well-being-related factors and well-being outcomes [66–68,87]. Thus, the findings empirically support the idea that optimism is related to well-being not only directly, but also indirectly through school belonging.

Finally, the sequential link from optimism to academic achievement through school belonging and well-being was supported (H8). This result aligns with the dynamics of action theory, which emphasizes the transfer of motivation across activities, showing that psychological resources and relational factors developed in one domain (traditional martial arts) can extend to another domain (academics) [29]. The spillover theory [30] suggests that emotions and motivation generated in one life domain can transfer to another that is psychologically or functionally connected. Likewise, Verfuert et al. [88] highlighted that such cross-domain transfer depends on the integration of these experiences into one's sense of self. In this regard, the findings resonate with those of Cho and Chiu [89], who reported that positive psychological resources developed during leisure activities can be transferred to academic motivation. Taken together,

these results suggest that optimism, school belonging, and well-being are psychological factors that are each associated with academic development among elementary students with experience in traditional martial arts.

5.1 Theoretical and Practical Implications

Previous studies have examined the relationships between traditional martial arts training and students' psychological variables [24] as well as academic achievement [26]. However, few studies have investigated the relationships among these variables. This study provided empirical evidence supporting the educational value of traditional martial arts training for students. In particular, the findings suggest that positive expectations for the future formed through martial arts experiences are related to higher levels of school belonging and well-being, which, in turn, are linked with better academic achievement. These findings contribute to a more comprehensive understanding of the psychological and social implications of traditional martial arts and the processes through which these effects may occur in educational settings.

Most previous studies have emphasized academic activities and environmental factors as predictors of academic achievement [90,91]. In contrast, this study identified that traditional martial arts experiences may be related to academic achievement, thereby providing new implications for theoretical discussion. Furthermore, this study focused on relatedness among basic psychological needs (autonomy, competence, and relatedness). The results revealed a pattern of associations in which optimism was related to well-being through the fulfillment of relatedness needs, and well-being was, in turn, associated with academic achievement. Importantly, this research extended the application of both relationship motivation theory [28], the dynamics of action theory [29], and the spillover theory [30], offering an integrated explanation of the relationships among the constructs and contributing to theoretical advancement in sports pedagogy and psychology.

This study also suggests that traditional martial arts practice may function as a meaningful pedagogical approach associated with both students' well-being and academic achievement. Accordingly, schools should consider expanding the inclusion of traditional martial arts programs in physical education classes and extracurricular activities. In the long term, martial arts could be incorporated into the formal curriculum. Educators should design martial arts classes not merely as physical skill training, but as a platform that foster mutual respect, cooperation, and peer support. For instance, teachers may organize team-based tasks that encourage students to exchange feedback and build connectedness, which can, in turn, enhance their psychological security and motivation to learn [92]. Beyond these educational applications, the findings further indicate that the practice of traditional martial arts contributes to students' mental health and overall quality of life, supporting the motivational transfer of positive resources to academic contexts. This study's integrated theoretical framework provides a novel perspective that connects physical, emotional, and academic dimensions of student development, thereby clarifying the theoretical contribution of traditional martial arts research to the broader field of motivation and educational psychology.

5.2 Limitations and Future Research Directions

Although this study provided new insights, several limitations should be acknowledged. First, as a cross-sectional study, causal relationships between the variables cannot be demonstrated. In addition, potentially influential background factors, such as socioeconomic status, parental education level, initial motivation, and previous athletic experience, were not controlled, and students' experiences in other extracurricular activities were not considered. Second, the participants were limited to South Korean elementary school students practicing taekkyeon, and variations in the duration and intensity of martial arts training were not examined due to the lack of standardized measures across programs, which may affect

the generalizability and magnitude of the observed effects. Finally, academic achievement was assessed through self-reported measures; future studies should incorporate objective indicators such as grades, standardized test scores, or attendance records. To address these limitations, future research should employ longitudinal designs, include more diverse samples, and consider different types of physical activities and cultural contexts to more accurately examine the effects of traditional martial arts training.

6 Conclusions

This study examines how optimism, school belonging, and well-being are related to the academic achievement of elementary school students participating in traditional martial arts training, highlighting the broader developmental value of such participation. The findings suggest that these programs may cultivate affective resources that enhance students' engagement and functioning within the school environment, thereby linking psychological states to academic-relevant orientations. By integrating key psychological constructs within a sport-based educational context, the study advances understanding of how culturally embedded physical activity contributes to students' holistic development. Collectively, the results underscore the potential of traditional martial arts as a structured school activity that strengthens students' sense of connection and capacity to pursue academic goals, providing an empirically grounded foundation for future research on how culturally meaningful physical education programs can promote both well-being and learning outcomes.

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Availability of Data and Materials: The datasets generated and during the current study are available from the corresponding author, Dr. Heetae Cho, upon reasonable request.

Ethics Approval: This study was approved by the Institutional Review Board (IRB) of Sungkyunkwan University (reference no. SKKU-2024-08-018).

Informed Consent: Written informed consent was obtained from parents, and assent was obtained from all child participants.

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