Research article

Relationship of self-determined motivation with time-related academic behavior in Korean primary school students: A person-centered approach

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ABSTRACT

This study aimed to determine the relationship between self-determined motivation and time-related academic behavior (T-AB) of Korean primary school students, using a person-centered approach, and identified differences in the fear of negative evaluation (FNE) and level of achievement to explore the characteristics of each profile. This study is unique, as previous studies on this topic have used a variable-centered approach. To this end, the current study involved a latent profile analysis of 451 fifth and sixth graders (male: 48.3%, female: 51.7%) in three primary schools located in medium- and small-sized cities in the G province of Korea. First, the analysis resulted in four profiles of self-determined motivation: "low motivation" (3.3%), "controlled regulation" (43.5%), "external regulation dependent" (12.4%), and "autonomous" (40.9%). Second, three profiles were derived for T-AB: "low approach" (6.9%), "timely engagement-approach" (55.2%), and "procrastination-approach" (37.9%). Third, this study examined the relationship between the profiles of self-determined motivation and T-AB through a chi-squared test. "Low approach" represented the largest proportion in the "low motivation" profile of self-determined motivation; "procrastination-approach" represented the largest proportion in the "controlled regulation" and "external regulation dependent" profiles; and "timely engagement-approach" represented the largest proportion in the "autonomous" profile. Fourth, analysis of variance was performed (ANOVA) to understand the differences in the FNE and level of achievement of each derived type. Among the self-determined motivation profiles, "low motivation" was associated with the highest level of FNE, and "autonomous" had the highest level of achievement. Furthermore, among profiles of T-AB, "low approach" was associated with the highest level of FNE, and "timely engagement-approach" had the highest level of achievement. However, the interaction effect between self-determined motivation and T-AB profiles showed significant differences only for FNE that were highest in the "low motivation" profile of self-determined motivation and in the "low approach" profile of T-AB, and lowest in the "autonomous" and "timely engagement-approach" profiles. Lastly, the positive types of motivation and academic behavior in primary school students and some important educational implications are presented.

1. Introduction

An ideal student is one who is adaptively motivated and actively participates in academic situations during any given time. However, many Korean students participate in academics with low levels of motivation (Kim, 2008), and with higher grades, the number of less motivated students increases because of factors such as studying due to a sense of duty or guilt and excessive stress and helplessness related to the national college entrance exam (Kim, 2008). For these reasons, they engage in academic procrastination to avoid negative results (Lee et al., 2016). Existing studies that have explored the relationship between motivation and procrastination have been conducted using a variable-centered approach;

particularly, studies on academic procrastination have focused on college students and have not considered students who do not procrastinate—the timely engagement-type students. Further, these studies have not typically considered younger children. Psychological coping abilities for problematic behavior may be lower in primary school students than in students in their adulthood, and learning habits during this period may influence task management abilities later in adulthood (Corno and Xu, 2004). Therefore, this study aimed to explore the relationship between self-determined motivation and time-related academic behavior (T-AB)—which examines procrastination and timely engagement behavior from the perspective of approach and avoidance (Strunk et al., 2013)—in primary school students, using a person-centered approach.

1.1. T-AB

Procrastination, which refers to the unnecessary delaying of tasks while subjectively feeling uncomfortable (Ellis and Knaus, 1977), is considered a negative variable related to low levels of achievement (Kim and Seo, 2015) and affective well-being (Balkis and Duru, 2016; Sirois and Tosti, 2012). Such a negative perception of procrastination was partially shifted by Chu and Choi (2005) as they attempted to diversify the meaning of "procrastination" by classifying its existing idea, resulting in negative consequences into passive procrastination, and defining active procrastination as an adaptive type of procrastination in terms of time management and task performance (Choi and Moran, 2009; Chu and Choi, 2005). Their results were validated in many existing studies using the person-centered approach (Grunschel et al., 2013; Rozental et al., 2015). Furthermore, T-AB, that expanded the concept into timely engagement (the temporal opposite of passive and active procrastination), was subsequently proposed (Strunk et al., 2013). T-AB is a concept that merges time and motivation-related behavior with the existing concept of procrastination. This concept is composed of temporal classifications of procrastination and timely engagement, that are then further classified into approach and avoidance based on the achievement goal orientation. This classifies the existing concept of passive procrastination into procrastination-avoidance and active procrastination into procrastination-approach, in addition to the timely engagement-approach for the successful completion of the task, and timely engagement-avoidance, which refers to participating on time due to fear of being unable to successfully carry out the task (Strunk et al., 2013). Through additional research involving cluster analysis, it has been empirically demonstrated that academic behaviors could be classified by time and motivation, with results yielding types of engagement-approach and engagement-avoidance (Strunk et al., 2018).

1.2. Self-determined motivation

Traditionally, motivation has been classified into intrinsic motivation, where the source of power that induces learning exists internally, and extrinsic motivation, where the source exists externally; emphasis has been placed on the importance of intrinsic motivation. However, by deviating from this dichotomous view of motivation, the self-determination theory was proposed, which identifies motivation on the same tangent of self-determination based on the individual importance of academic participation of the students and their level of internalization (Deci and Ryan, 1985). The self-determination theory explains motivation by classifying extrinsic motivation into external regulation, introjected regulation, and identified regulation, and includes concepts such as amotivation and intrinsic motivation (Ryan and Deci, 2000). External regulation refers to the motive that is performed to satisfy external demands, and introjected regulation refers to the motive to act because of pressure to avoid personal guilt or gain self-esteem (Ryan and Deci, 2020). Identified regulation refers to the motivation to recognize the importance of the behavior and control the behavior, although not fully internalized, and intrinsic motivation means to act based on the satisfaction of the task itself (Ryan and Deci, 2020). Furthermore, in studies related to the self-determination theory, the level of internalization which combines identified regulation and intrinsic motivation was classified as "autonomous motivation" and that which combines external and introjected regulations was classified as "controlled motivation" (Deci and Ryan, 2000, 2008; Vansteenkiste et al., 2009). The distinction between "autonomous motivation" and "controlled motivation" to start and control behavior internally (by oneself) and externally (not by oneself), respectively, can play an important role in evaluating the quality of motivation (Shahar et al., 2003). Based on research indicating that students with high levels of self-determination demonstrate high academic performance (Affuso et al., 2017; Guay et al., 2010; Taylor et al., 2014) and positive emotions such as enjoyment (Burton et al., 2006; Reis et al., 2000; Wang et al., 2019), it is evident that self-determined motivation plays an important role for students in academic situations.

Moreover, diverse profile studies based on the person-centered approach and related to self-determined motivation have been conducted (Boiché et al., 2008; Gillet et al., 2017; Hayenga and Corpus, 2010; Ratelle et al., 2007; Vansteenkiste et al., 2009; Wang et al., 2016). Most of these studies exploring self-determined motivation profiles have targeted middle and high school or college students, except for a study that examined the relationship between the two variables in a few physical education contexts (Boiché et al., 2008; Wang et al., 2016). In addition, although differences were noted in the name of the profiles, some similar profiles were derived, such as "good quality, autonomous," a profile with high autonomous motivation; "poor quality, controlled," a profile with high control motivation, and "low quantity, poorly motivated," a profile with low levels of all aspects of motivation (Gillet et al., 2017; González et al., 2012; Hayenga and Corpus, 2010; Vansteenkiste et al., 2009; Wang et al., 2016).

These results indicate that the different types of self-determination regulation coexist within the individual rather than being in conflict with one another (Ratelle et al., 2007), and empirically present the existence of various subtypes. However, prior studies have typically targeted middle and high school students, indicating a general lack of interest in primary school students, who are at an important period of their lives in terms of learning habit formation.

1.3. Relationships between self-determined motivation and T-AB

Procrastination is deemed a motivational problem relating to failures in self-regulation (Steel, 2007); motivation has a significant influence on the formation of T-AB as well (Strunk et al., 2013). From this perspective, several studies have been conducted on self-determined motivation and procrastination-avoidance (Burnam et al., 2014; Cavusoglu and Karatas, 2015; Katz et al., 2014; Seo, 2013), indicating that amotivation and external motivation have a positive influence on procrastination-avoidance, whereas intrinsic motivation has a negative influence. Particularly, Vansteenkiste et al. (2009) examined the relationship with procrastination-avoidance according to the self-determined motivation profile; "good quality motivation," a profile with high autonomous motivation, presented with the lowest level of procrastination-avoidance, while "poor quality motivation," a profile with high control motivation, showed the highest level. However, while existing studies on self-determined motivation and procrastination-avoidance exploring the relationship between motivation and procrastination have identified the positive influence of intrinsic motivation, they have a few limitations. First, despite the fact that self-determined motivation and academic behaviors are multidimensional concepts, these studies have only explored their relationship with intrinsic motivation, external motivation, and procrastination-avoidance, presenting limitations in comprehensively identifying the relationship between self-determined motivation and academic behavior, including procrastination and timely engagement. Second, most existing studies have employed a variable-centered approach, presenting limitations in identifying the relationships between self-determined motivation and each subtype of academic behavior (except the study by Vansteenkiste et al., 2009). Third, previous studies on the relationship between self-determined motivation and procrastination-avoidance (except that by Katz et al., 2014) have examined college students, indicating a research gap in investigating the relationship between motivation and academic behaviors among primary school students, who are at a stage where their academic-related stress begins to increase.

1.4. Outcomes of self-determined motivation and T-AB

According to Zimmerman's (1998) academic learning cycle phases, forethought, such as intrinsic interest, affects performance, and feedback on such performance affects self-evaluation. Moreover, in Korea, social comparisons are frequent in relation to achievement in competitive academic situations (Garcia et al., 2013; Park and Lee, 2019), and comparison with others raises fear of negative evaluation (FNE). However,

students tend to procrastinate as a short-term strategy to reduce their FNE. Thus, there is a possibility that students' FNE and achievement in time-related behaviors, such as motivation and delay, may represent a cyclical causal relationship. Therefore, in this study, we investigate the FNE and achievement to understand the differences in the characteristics of each profile of motivation and T-AB.

In primary school, students become sensitive to other people's evaluations and sometimes experience social anxiety symptoms due to negative evaluations (Halldorsson et al., 2019). Referring to anxiety associated with receiving a negative evaluation from others, FNE (Mesagno et al., 2012) is closely related to academic motivation in students (Abdelrahman, 2020: Kim and Choi, 2020; Kocovski and Endler, 2000; Legault et al., 2007), and is positively related to external, introjected regulation. A study conducted by Weeks et al. (2010) reported that FNE increases when evaluation criteria are relative or when individuals have a strong desire to be recognized by others. Based on these results, lower levels of self-determination may be associated with higher levels of FNE, and this study aims to additionally verify its association with self-determination profiles. As FNE may threaten self-worth, students with a high FNE are likely to postpone their tasks at hand (Ferrari et al., 1995) and avoid situations wherein they are evaluated. Furthermore, Saddler and Buley (1999) argued that students who often procrastinate tend to be afraid of negative evaluations, set lower achievement standards, and do not participate in learning due to the fear of evaluation from others. This can be seen as engaging in procrastination-avoidance to protect their own values; particularly, Korean students who are in an extremely competitive academic environment tend to be sensitive to evaluations, suggesting that there will be differences in evaluation results and the FNEs based on academic behavior profiles.

Achievement is a critical factor of the cognitive domain in academic situations. Considering that achievement has a positive influence on happiness and life satisfaction for Korean primary school students (Lim et al., 2006), it is recognized as a particularly important variable. From this perspective, identifying the profiles of motivation and academic behavior that have positive relationships with achievement can lead to providing educational considerations from an academic perspective. Several studies have been conducted on achievement, along with self-determined motivation. Generally, controlled motivation (external regulation, introjected regulation) is noted to have a negative effect on achievement, and autonomous motivation (identified regulation, intrinsic regulation) has a positive effect (Guay et al., 2010; León et al., 2015; Taylor et al., 2014), with similar results being observed in profile studies (Boiché et al., 2008; Vansteenkiste et al., 2009). However, studies on academic procrastination and achievement have found that while procrastination-avoidance is seen as a factor that negatively influences achievement (Goroshit and Hen, 2019; Kim and Seo, 2015; Steel, 2007), results for procrastination-approach have been mixed (Hensley, 2014; Kim and Seo, 2013; Pinxten et al., 2019).

1.5. Present study

Unlike the variable-centered approach that focuses on generalizing the influence of variables within the existing population, this study utilizes a person-centered approach that can identify how the characteristics of variables within individuals or groups are revealed (Bergman and Magnusson, 1997). Therefore, this study, based on the theory that motivation influences T-AB (Strunk et al., 2013) in a competitive academic atmosphere, aimed to identify the sub profiles of self-determined motivation and T-AB in primary school students and examine the relationship between the two sets of profiles. Furthermore, to identify the characteristics of each profile, this study explores differences in FNE and achievement. This study diverges from prior research that has focused on college students by identifying profiles of T-AB in primary school students, who may face a relatively graver negative psychological influence. It also supplements existing studies on self-determined motivation and procrastination, that have employed variable-centered approaches, to

comprehensively understand the psychological characteristics of each profile and provides implications regarding adaptive motivation and academic behavior in learning situations. The specific research questions were as follows:

1. What types of self-determined motivation profiles exist in a competitive academic atmosphere? Self-determined motivation will consist of subtypes, and the ratio of similar types to the control motive will be high, reflecting the competitive academic culture (H1).
2. What types of T-AB profiles exist in primary school students in Korea? Based on a previous study (Strunk et al., 2018), there will be subtypes in the T-AB of primary school students (H2).
3. What is the relationship between T-AB profile types according to the type of self-determined motivation profile? Based on a previous study (Burnam et al., 2014) that examined the relationship between self-determined motivation and T-AB, such as avoidant procrastination, there will be a significant relationship between each subtype (H3).
4. What is the difference between the FNE and the achievement of each type of self-determined motivation profile and T-AB profile? Based on previous studies, there will be significant differences in FNE and achievement for each subtype (H4).

2. Research methods

2.1. Research participants

In April 2016, using convenience sampling, a survey was conducted among 473 student volunteers (100% Korean) in the fifth and sixth grades from 17 classes of three public primary schools. The primary schools had more than 30 classes, located in medium- and small-sized cities in the G province of Korea, and the average number of students per class was 27.1. For data collection, the same measurement method was applied to each class by explaining the study purpose and data collection method to the class teacher two weeks before the survey, and data collection took place in two weeks. The survey took approximately 40 min, including the time allotted for providing survey-related instructions. In addition, this questionnaire was conducted in each classroom in paper form. It was emphasized that it was not intended to examine the abilities of students, and efforts were made to reduce responses influenced by social desirability.

All procedures performed in this study were in accordance with the ethical standards for research. Participating students were provided with school supplies worth Section 2. Consent was obtained from all participants. Furthermore, considering the fact that a sample size of approximately 500 people in the profile study is suitable for identifying the exact number of latent profiles (Nylund et al., 2007; Tein et al., 2013), 473 people were included in this study. Among them, 451 participants, excluding 22 who did not respond to the entire questionnaire, were included in the final study (male: 48.3%, female: 51.7%). The study was conducted based on the argument (Graham, 2009; Schafer, 1999) that if there is a missing response rate of less than 5%, it is not a problem to use the complete removal method can be used, regardless of the missing mechanism. The ages of the students ranged from 11.1 to 12.3 years. Regarding the sibling relationships of the study participants, 14.5% were single children, 64.5% had one sibling, and 21.1% had two or more siblings. The distribution of the study participants by grade and gender are presented in Table 1. Furthermore, the data collection process was supplemented and the following information was provided in the questionnaire to reduce social desirability bias: "This questionnaire is intended to find out how you feel and learn about your habits in the learning process. Therefore, there is no right answer to this question. You only have to present your honest opinions." In addition, the homeroom teacher of each class conducting the questionnaire mentioned the upper contents to the students twice, so that the students could respond honestly.

Table 1. Distribution of study participants by grade and gender (%).

	Male students	Female students	Total
Sixth grade	131 (47.3)	146 (52.7)	277 (61.4)
Fifth grade	87 (50.0)	87 (50.0)	174 (38.6)
Total	218 (48.3)	233 (51.7)	451 (100)

2.2. Measurement scales

2.2.1. Self-determined motivation

To measure self-determined motivation in primary school students, this study used a 24-question scale composed of items from the Academic Self-regulation Questionnaire developed by Ryan and Connell (1989), and the Korean version of the Academic Self-regulation Questionnaire developed by Kim (2002). Subfactors included external regulation (6 items, e.g., I study because my parents tell me to do so), introjected regulation (6 items, e.g., I study because I'm embarrassed if I have lower grades), identified regulation (6 items, e.g., I study to learn more about the things I don't know), and intrinsic regulation (6 items, e.g., I study to learn the answers to the things I don't know). The responses were recorded on a 4-point Likert scale, with higher scores indicating higher levels of motivation in each factor. The reliability coefficient in this study (Cronbach α) was .81 for external regulation, .82 for introjected regulation, .90 for identified regulation, and .91 for intrinsic regulation, with an overall reliability of .87.

2.2.2. T-AB

To measure the T-AB in primary school students, this study utilized the T-AB scale initially developed by Strunk et al. (2013) and validated for use with Korean primary school students by Park and Sohn (2015). Subfactors included six questions on engagement-approach (e.g., I work on assignments well before the deadline to do them better), four on engagement-avoidance (e.g., I start assignments right away because if I don't start right away, I won't do well), three on procrastination-approach (e.g., I start assignments late to do them better), and three on procrastination-avoidance (e.g., I often delay starting tasks because I am afraid of failure). The responses were recorded on a 5-point Likert scale, with higher scores indicating higher levels of academic behavior in each factor. The reliability of academic behavior (Cronbach's α) was .85 for engagement-approach, .81 for engagement-avoidance, .76 for procrastination-approach, and .81 for procrastination-avoidance.

2.2.3. FNE

To measure FNE, this study employed the scale originally developed by Carleton et al. (2006) and validated by Hong et al. (2011). This scale consists of a single factor composed of 11 questions (e.g., I often worry that I will say or do the wrong thing). The responses were recorded on a 5-point Likert scale, with higher scores indicating higher levels of FNE in each factor. The reliability (Cronbach α) coefficient from Hong et al. (2011) was .95, and in this study, it was .94.

2.2.4. Achievement

A self-reported achievement questionnaire was used to measure the achievement of primary school students (e.g., What was your average score on the final exam for the second semester?). The average scores for Korean, social studies, mathematics, science, and English were classified into five stages, with a score of 90 or higher representing five points, 80–89 representing four points, 70–79 representing three points, 60–69 representing two points, and 59 or below representing one point. The evaluation document used in this study denotes the results of a selection of 20 questions for each school from the questions provided by the G province for each school, and can be seen as an evaluation that has maintained the difficulty and reliability across the schools.

2.3. Data processing

This study derived the profiles of self-determined motivation and T-AB and explored the relationships of the derived profiles. SPSS 18.0 and MPLUS 6.1 (Muthén and Muthén, 2010) were used to verify the differences in FNE and achievement, and the following analyses were performed for each profile. First, latent profile analysis was conducted to derive the profiles. Based on the assertion of Tein et al. (2013) and Schmidt et al. (2021) that the actual number of classes was three to five as a result of analysis of previous studies related to the latent profile, in this study, the number of classes was identified to be from two to five. Moreover, since z-scores allow normative interpretation (Fischer and Milfont, 2010), these were used for latent profile analysis in this study. The number of latent groups was determined by comprehensively considering model fit, quality of classifications, and explanation power, increasing the number of groups from two to five, one at a time, and selecting the model with the best fit by comparing each profile. To understand the model goodness of fit, this study compared various information coefficients as well, such as the Akaike information criterion (AIC; Akaike, 1987), Bayesian information criterion (BIC; Schwarz, 1978) and Sample-size adjust BIC (SSA-BIC; Sclove, 1987). Furthermore, this study also compared the entropy values to understand the quality of classification; this value ranges from zero to one, with values closer to one indicating better goodness of fit. Values of over .80 are considered to be indicators of good classifications (Muthén, 2006). Finally, this study confirmed the differences between the models according to the number of groups using the Lo-Mendell-Rubin likelihood ratio (LMR) (Lo et al., 2001). If the p-value is significant, then the model of group k is considered to have a better fit; however, if it is not significant, the model of group k-1 is considered to have a better fit. Second, this study involved a chi-squared test to understand the relationship between the profiles of self-determined motivation and T-AB. Third, to understand the differences in achievement and FNE according to the interaction effect for profiles of self-determined motivation and T-AB, this study conducted a two-way analysis of variance (ANOVA) and a highly conservative and strict post-hoc test method, the *Scheffe* post hoc test (Shingala and Rajyaguru, 2015).

3. Research results

3.1. Descriptive statistics and correlation analysis of major variables

The results of the descriptive statistics and correlation analysis of self-determined motivation, T-AB, FNE, and achievement are presented in Table 2. Summarizing the correlation results between the subfactors of self-determined motivation and T-AB, most of the correlation results except for some subfactors were significant, and the correlation results excluding some subfactors were also significant in the correlation results between self-determined motivation and T-AB and the outcome variables.

3.2. Self-determined motivation profiles

3.2.1. Derivation of self-determined motivation profiles

This study conducted a latent profile analysis to confirm the self-determined motivation profiles. Table 3 shows the results of analyzing the goodness of fit of each model by increasing the number of latent profiles from two to five.

In terms of the goodness of fit ratios of latent profiles in self-determined motivation, AIC, BIC, and SSA-BIC tended to decrease as the number of latent groups grew from two to five; entropy values were acceptable, as all were higher than .80, whereas pLMR values were not significant in groups 3 and 5, indicating that groups 2 or 4 showed good fit. Considering these statistical results and interpretability, this study

Table 2. Descriptive statistics and correlation coefficients of major variables.

	1	2	3	4	5	6	7	8	9	10
1	1									
2	.534**	1								
3	−.132**	.123**	1							
4	−.095**	.163**	.629**	1						
5	−.022	.120**	.271**	.379**	1					
6	.088	.190**	.162**	.251**	.670**	1				
7	.250**	.254**	−.089	−.049	.078	.069	1			
8	.326**	.240**	−.203**	−.131**	−.030	.095*	.616**	1		
9	.320**	.435**	−.042	.016	.025	.187**	.201**	.293**	1	
10	−.164**	−.021	.160**	.153**	.110*	.021	−.150**	−.219**	−.035	1
Mean (SD)	9.952 (3.399)	11.565 (3.939)	17.126 (4.273)	14.106 (4.822)	17.407 (4.675)	10.764 (3.323)	6.586 (2.336)	6.350 (2.529)	30.857 (10.380)	4.271 (.939)

$*p < .05$, $**p < .01$, 1: external regulation, 2: introjected regulation, 3: identified regulation, 4: intrinsic regulation, 5: engagement-approach, 6: engagement-avoidance, 7: procrastination-approach, 8: procrastination-avoidance, 9: FNE (fear of negative evaluation), 10: achievement.

Table 3. Goodness of fit of the self-determined motivation latent profiles.

Group	AIC	BIC	SSA-BIC	Entropy	pLMR	Ratio of latent group				
						1	2	3	4	5
2	4775.974	4829.423	4788.166	.947	.000	9.8	90.2			
3	4590.091	4664.098	4606.972	.836	.086	11.09	41.69	47.22		
4	**4399.620**	**4494.184**	**4421.190**	**.896**	**.000**	**3.3**	**43.5**	**12.4**	**40.8**	
5	4353.979	4469.100	4380.238	.865	.255	3.3	11.8	38.6	39.0	7.3

AIC: Akaike information criterion, BIC: Bayesian information criterion, SSA-BIC: Sample-size adjusted Bayesian information criterion, pLMR: = Lo-Mendell-Rubin adjusted likelihood ratio test.

concluded that group 4 was the most suitable, thus selecting group 4 as the final model.

3.2.2. Characteristics of self-determined motivation profiles

The characteristics of the four subfactors of the latent profiles relating to self-determined motivation are shown in Table 4 and Figure 1.

Examining the characteristics of the four latent profiles, group 1 had low values for subfactors of self-determined motivation. As such, the group was named "low motivation" and accounted for 3.3% (15 people) of the study participants. Group 2 constituted a profile that had high values for controlled motivation—that is, external regulation and introjected regulation—with average levels of identified regulation and intrinsic regulation. The profile was named "controlled regulation" and this profile was the most abundant, constituting 43.5% (196 people) of the study participants. Group 3 had low levels of introjected regulation, identifying regulation, and intrinsic regulation, with relatively higher levels of external regulation. This profile was named "external regulation dependent" and constituted 12.4% (56 people) of the study participants. The last profile had low levels of external regulation and introjected regulation, and high levels of identified regulation and intrinsic regulation. This profile was named "autonomous" and was the second most abundant profile, constituting 40.8% (191 people) of the study participants.

3.3. T-AB profiles

3.3.1. Derivation of T-AB profiles

This study conducted a latent profile analysis to confirm the T-AB profiles. Table 5 demonstrates the results of analyzing the goodness of fit of each model by increasing the number of latent profiles from two to five. In terms of the goodness of fit, ratios of latent profiles of T-AB, BIC, and SSA-BIC tended to decrease as the number of latent groups grew from 2–5; entropy values were acceptable as all were higher than .80, whereas pLMR values were not significant in groups 4 and 5, indicating that groups 2 or 3 showed good fit. However, in the three profiles, a new profile that was not in the two profiles was derived. Considering these statistical results and interpretability, this study concluded that group 3 was the most suitable, selecting this group as the final model.

3.3.2. Characteristics of T-AB profiles

The characteristics of the three factors of the latent profiles relating to T-AB are shown in Table 6 and Figure 2. In terms of the characteristics of the three latent profiles, group 1 had very low engagement-approach and procrastination-approach and relatively high levels of engagement-avoidance and procrastination-avoidance; this profile was named "low approach" and represented 6.9% of the study population (31 people). The next profile only had high levels of engagement-approach among the
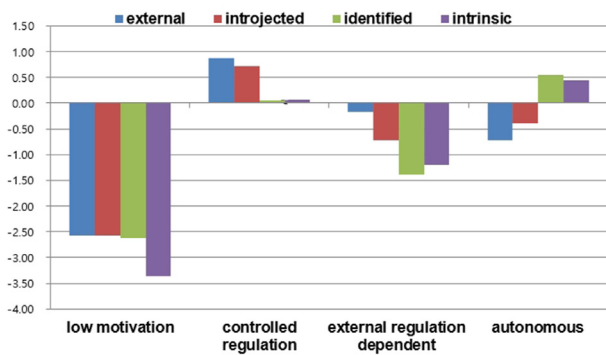
Table 4. Mean (standard deviation) of self-determined motivation by latent profile.

Category (n)	Profile Name (%)	external regulation	Introjected regulation	Identified regulation	Intrinsic regulation
Group 1 (n = 15)	Low motivation (3.3)	−2.567 (.097)	−2.625 (.058)	−3.358 (.065)	−2.592 (.057)
Group 2 (n = 196)	Controlled regulation (43.5)	.879 (.063)	.719 (.058)	.057 (.048)	.059 (.062)
Group 3 (n = 56)	External regulation dependent (12.4)	−.172 (.116)	−.713 (.083)	−1.386 (.165)	−1.199 (.063)
Group 4 (n = 184)	Autonomous (40.8)	−.713 (.034)	−.400 (.089)	.546 (.054)	.448 (.082)

The scores for self-determined motivation are z-scores.

Figure 1. Self-determined motivation profiles.

TAP: timely engagement-approach, TAV: timely engagement-avoidance,
PAP: procrastination-approach, PAV: procrastination-avoidance

Figure 2. T-AB profiles.

subfactors of T-AB; this profile was named "timely engagement-approach," accounting for 55.2% of the study population (249 people) and constituting the largest group. The last profile only had high levels of procrastination-approach among the subfactors of T-AB. This profile was named "procrastination-approach," representing 37.9% of the study population (171 people) and constituting the second-largest group.

3.4. Relationship between self-determined motivation profiles and T-AB profiles

Table 7 shows the results of a cross-tabulation analysis conducted to understand the relationships between self-determined motivation profiles and T-AB profiles. The proportions of T-AB profiles for each of the self-determined motivation profiles are presented in Figure 3. The results showed a significant difference in the distribution of the T-AB profiles according to the self-determined motivation profile ($\chi^2 = 119.891$, $df = 6$, $p < .001$). Specifically, the "low approach" profile (60.0%) was the highest in students with "low motivation" self-determined motivation, and "procrastination-approach" (52.6%) and "timely engagement-approach" (45.4%) were the most common profiles in students with "controlled regulation" self-determined motivation. The "procrastination-approach" (50.0%) and "timely engagement-approach" (37.5%) profiles were the most common for students with "external regulation dependent" self-determined motivation profile; "timely engagement-approach" (74.5%) was the most common in students with "autonomous" self-determined motivation profile, and "low approach" (6.0%) had the smallest distribution.

3.5. Differences in FNE and achievement depending on profiles of self-determined motivation and T-AB

A two-way ANOVA was conducted to understand the differences in FNE and achievement depending on the profiles of self-determined motivation and T-AB, and the results are presented in Table 8. The results indicated that the effects of self-determined motivation and T-AB on FNE and achievement were significant. This study employed the *Scheffe* post-hoc test to understand the differences in FNE and achievement for each profile, and the results are listed in Table 9 and Figure 4. The "low motivation" and "controlled regulation" profiles had significantly higher FNE compared to other profiles, but there was no significant difference between the two. The "autonomous" profile had significantly higher levels of achievement, the "low motivation" profile had significantly lowest levels of achievement, and there were no significant differences between the "controlled regulation" and "external regulation dependent" profiles. Therefore, among the self-determined motivation profiles, "autonomous" self-motivation showed the most adaptive tendencies, and the "indifferent" self-motivation profile had high FNE and low achievement.

Furthermore, differences in FNE and achievement depending on the T-AB profiles are shown in Table 10 and Figure 5. FNE was significantly high in the "low approach" profile ($p < .001$); however, there were no significant differences between the "timely engagement-approach" and "procrastination-approach" profiles. Levels of achievement were significantly high in the "timely engagement-approach" profile ($p < .001$), and

Table 5. Goodness of fit of the T-AB latent profiles.

Group	AIC	BIC	SSA-BIC	Entropy	pLMR	Ratio of latent group				
						1	2	3	4	5
2	96.148	42.699	83.956	.945	.000	8.4	91.6			
3	**−247.843**	**−173.837**	**−230.962**	**.813**	**.000**	**6.9**	**56.7**	**36.4**		
4	−419.220	−324.656	−397.650	.800	.131	5.8	30.2	17.5	46.5	
5	−482.118	−366.997	−455.859	.812	.482	41.2	13.5	7.1	36.1	2.0

AIC: Akaike information criterion, BIC: Bayesian information criterion, SSA-BIC: Sample-size adjusted Bayesian information criterion, pLMR: = Lo-Mendell-Rubin adjusted likelihood ratio test.

Table 6. Mean (standard deviation) of T-AB by latent profile.

Category (n)	Profile Name (%)	TAP	TAV	PAP	PAV
Group 1 (n = 31)	Low approach (6.9)	−2.065 (.229)	−.100 (.015)	−1.632 (.170)	−.124 (.008)
Group 2 (n = 256)	Timely Engagement-Approach (55.2)	.249 (.078)	−.034 (.006)	−.309 (.069)	−.074 (.003)
Group 3 (n = 164)	Procrastination Approach (37.9)	.064 (.056)	−.035 (.005)	.784 (.075)	.008 (.006)

T-AB figures are z-scores. PAV: procrastination-avoidance, PAP: procrastination-approach, TAP: timely engagement-approach, TAV: timely engagement-avoidance.

Table 7. Relationship between self-determined motivation profiles and T-AB profiles.

Category			Self-determined motivation				Total	χ^2 (*df*)
			A	B	C	D		
T-AB	E	N (%)	9 (60.0)	4 (2.0)	7 (12.5)	11 (6.0)	31 (6.9)	119.891*** (6)
	F		3 (20.0)	88 (45.4)	21 (37.5)	137 (74.5)	249 (55.2)	
	G		3 (20.0)	104 (52.6)	28 (50.0)	36 (19.5)	171 (37.9)	
Total			15 (100)	196 (100)	56 (100)	184 (100)	451 (100)	

***$p < .001$, A: low motivation, B: controlled regulation, C: external regulation dependent, D: autonomous, E: low approach, F: timely engagement-approach, G: procrastination-approach, *df*: degree of freedom.
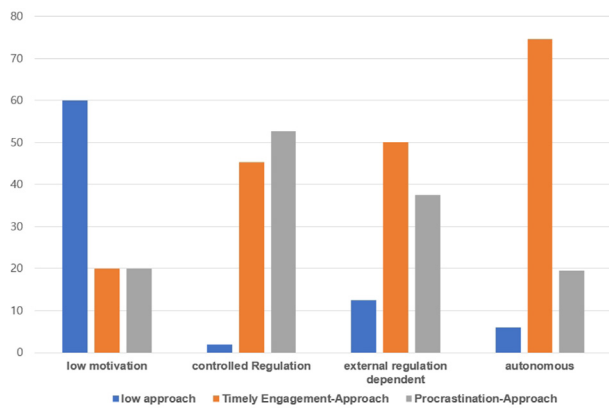
Figure 3. Distribution of T-AB profiles by self-determined motivation profile (%).

there were no significant differences between the "low approach" and "procrastination-approach" profiles. Therefore, this indicated that the "timely engagement-approach" profile had the most adaptive tendencies among the T-AB profiles.

Significant interaction effects were found only between the self-determined motivation profiles and T-AB profiles in terms of FNE (medium size effect, F = 4.669, $p < .001$, $\eta^2 = .06$), as shown in Figure 6. FNE was highest when the self-determined motivation profile was "low motivation," and the T-AB profile was "low approach." It was the lowest when the self-determined motivation profile was "autonomous" and the T-AB profile was "timely engagement-approach," with no significant

differences between the "controlled regulation" and "external regulation dependent" profiles.

4. Discussion

4.1. Profiles of self-determined motivation: difference in FNE and achievement

Multiple types of self-determined motivation may exist within the same individual (Ratelle et al., 2007), just as various sub profiles may exist for learning behavior (Strunk et al., 2018), which may be a motivationally induced issue (Steel, 2007). From this perspective, the current study derived the profiles of self-determined motivation and T-AB of Korean primary school students and identified the relationship between the two sets of profiles. Furthermore, this study examined differences in FNE and the level of achievement to explore the characteristics of the two sets of profiles. The results of this study can be summarized and discussed as follows.

First, a total of four self-determined motivation profiles, namely, "low motivation," "controlled regulation," "external regulation dependent," and "autonomous," were identified in Korean primary school students in this study (H1). Among the derived profiles, the profiles with the highest distribution were "controlled regulation" (43.5%) and "autonomous" (40.8%), and when including "external regulation dependent" (12.4%), the proportion of controlled regulation-type profiles is more than 55%. These results are derived from previous studies of middle school to college students' controlled motivation (González et al., 2012; Hayenga and Corpus, 2010), non-self-determined motivation (Boiché et al., 2008), low autonomous-controlled motivation (Ratelle et al., 2007), and poor quality motivation (Wormington et al., 2012; Vansteenkiste et al., 2009),

Table 8. Differences in FNE and achievement depending on profiles of self-determined motivation and T-AB.

Independent Variable	Dependent Variable	M(SD)	Sum of Squares	Degrees of Freedom	Mean Squared	F	η^2
Self-Determined Motivation	FNE	.000 (1.000)	33.112	3	11.224	13.542***	.085
	Achievement	.000 (1.000)	16.571	3	5.524	6.387***	.043
T-AB	FNE	.000 (1.000)	7.660	2	3.636	4.669*	.021
	Achievement	.000 (1.000)	2.892	2	1.446	1.672	.008
Self-Determined Motivation* T-AB	FNE	.000 (1.000)	22.832	6	3.669	4.669***	.060
	Achievement	.000 (1.000)	8.440	6	1.407	1.626	.022

*$p < .05$, ***$p < .001$, the mean and standard deviation of dependent variables are z-scores. SD: standard deviation, T-AB: time-related academic behavior, FNE: fear of negative evaluation.

Table 9. Differences in FNE and achievement depending on the self-determined motivation profiles.

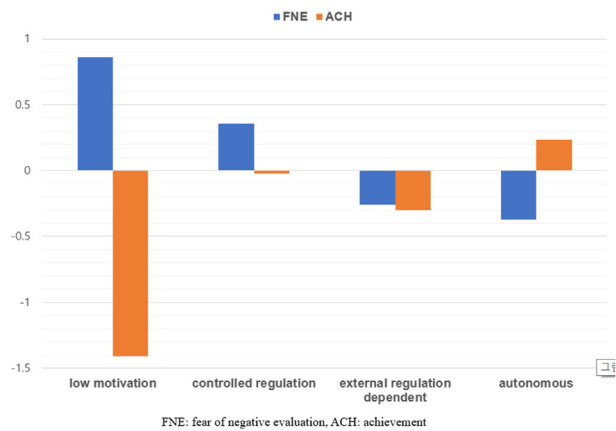| Sub-factor	Self-determined motivation				Post-hoc Verification
	Low motivation (SD)	Controlled Regulation (SD)	External regulation dependent (SD)	Autonomous (SD)	
FNE	.861 (.984)	.357 (.766)	−.260 (1.029)	−.371 (1.040)	1,2 > 3,4
Achievement	−1.412 (1.095)	−.024 (1.004)	−.298 (1.070)	.237 (.831)	4 > 2,3 > 1

SD: standard deviation, FNE: fear of negative evaluation.

Figure 4. Differences in FNE and achievement: Self-determined motivation profiles.

Figure 5. Differences in FNE and achievement: T-AB profiles.

and primary school to college students' (Wang et al., 2016) moderate controlled and strong controlled motivation, which is a type similar to a profile such as controlled motivation. The ratio is 19–48%, and, evidently, the profile ratio of the external control type is quite high.

Since Korean primary school students experience declining levels of self-determined motivation as they advance in grade (Yim and Ryu, 2007), and noting that Kim and Hwang (2018) found similar proportions of controlled motivation and autonomous motivation in sixth-grade primary school students, the higher grades of primary school for Korean students may be a decisive period in terms of self-determined motivation. The greatest cause of stress in Korean primary school students is reported to be academic problems (National Youth Policy Institute, 2015), and they are marked with an increase in social comparisons made by their parents (Park and Lee, 2019). Thus, students experience an increase in external pressure, rather than an environment where they can grow to enjoy learning and participate autonomously. It is possible that the "controlled regulation" profile may have been the most frequent profile given such a social atmosphere. Nevertheless, this study found that the "controlled regulation" profile had higher FNE and lower levels of achievement compared to the "autonomous" profile (H4). These results support the findings of various studies, such as those conducted by Affuso et al. (2017), Taylor et al. (2014), and Burton et al. (2006), that indicate that autonomous motivation leads to more positive results than controlled motivation. As the learning motivation of students can change through the internalization process (Ryan and Deci, 2000), teachers need to support the autonomy of the students to raise their level of self-determination (Ryan and Deci, 2020), apply methods such as cooperative-learning as their class methodology to create a growth-focused classroom environment (Fernández-Espínola et al., 2020), and opt to use criterion- and growth-referenced assessment methods rather than norm-referenced assessment that focus on relative comparisons. Particularly, when students make mistakes in physical education, the level of motivation of students can be raised through a guidance method that actively encourages and provides technical guidance, rather than through punishment (Song and Huh, 2013).

The "low motivation" profile was also derived, albeit with the lowest level of distribution among the self-determined motivation profiles
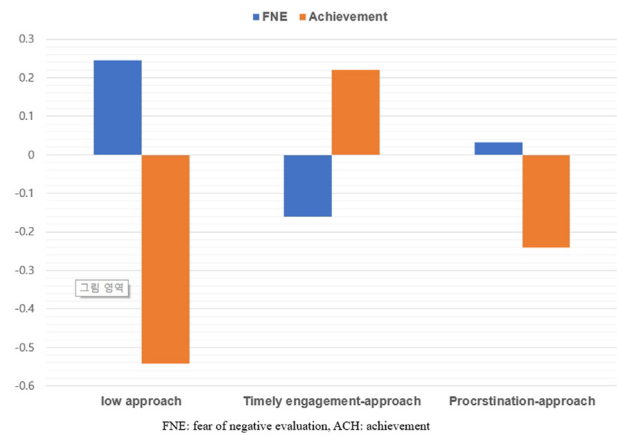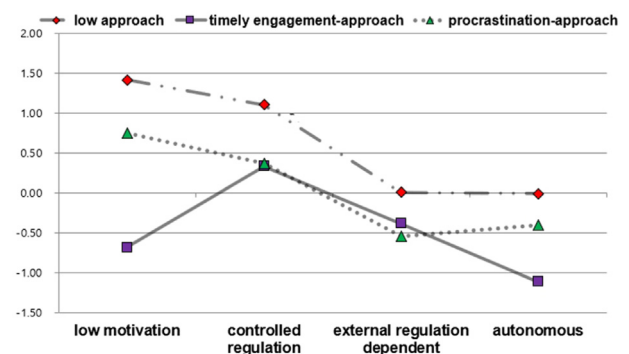

Figure 6. Differences in FNE depending on profiles of self-determined motivation and T-AB.

(3.3%); this is related to high FNE and low levels of achievement (H4). This is similar to the "poorly motivated profile," representing 8.1% of the total sample in the study on French students conducted by Gillet et al. (2017); they demonstrated low levels of positive emotions and interest in the task at hand, with a high level of boredom. Legault et al. (2006) argued that these students tend to perceive the value of learning, their own abilities, and efforts to perform to be low. Considering the derivation of the "low motivation" profile in this study, as well as in a study that explored the development of indifference from second grade middle school to second grade high school in Korea (Lee, 2015) that indicated increasing indifference in almost 80% of the students, it is possible to consider that such a profile exists from primary school, and that this proportion increases as one advances through higher levels. Therefore, it is necessary to provide the experience of success and enjoyment in learning to advance self-determination (Hidi and Harackiewicz, 2000). A supportive learning environment, beginning from primary school, must be provided as well, where teachers and peers provide encouragement and support (Ryan and Deci, 2020), as well as help students to develop an interest in learning, internalize values, and obtain adaptive motivation in the future.

Table 10. Differences in FNE and achievement depending on the T-AB profiles.

Sub-factor	T-AB			Post-hoc Verification
	Low approach (SD)	Timely Engagement-Approach (SD)	Procrastination-Approach (SD)	
FNE	.245 (.905)	−.161 (.984)	.033 (1.322)	1 > 3,2
Achievement	−.541 (1.199)	.221 (.850)	−.241 (1.081)	2 > 3,1

T-AB: time-related academic behavior, SD: standard deviation, FNE: fear of negative evaluation.

4.2. Profiles of T-AB: difference in FNE and achievement

Second, results revealed a total of three T-AB profiles of Korean primary school students: "low approach," "timely engagement-approach," and "procrastination-approach"; the most frequently occurring profile was "timely engagement-approach" (56.7%) (H2). These results indicated that it is possible that multiple sub-level profiles can exist in T-AB, which can be seen as a concept that expands beyond profiles as derived in learning behavior studies conducted with college students (Grunschel et al., 2013; Rozental et al., 2015). Furthermore, the presence of a large proportion of students willing to positively participate within a given time is encouraging. The "timely engagement-approach" profile has low levels of FNE and a high level of achievement (H4); this profile has been identified as the most adaptive profile in learning situations, aligning with the results of Strunk et al. (2018). Some of the important predictors of the engagement-approach include high self-efficacy, mastery approach goal, and self-regulation (Strunk et al., 2018), and it is possible that the primary school students with the "timely engagement-approach" profile, identified in this study, may have these characteristics.

The second most frequent profile was the "procrastination-approach" (36.4%); the FNE was higher than the "timely engagement-approach" profile and achievement was at a low level (H4). While active procrastination is thought to be an adaptive behavior, as it is associated with high levels of self-regulation, engagement, and achievement, unlike passive procrastination (Choi and Moran, 2009; Kim et al., 2017; Kim and Seo, 2013; Wang et al., 2015), these results indicated that it may not be an adaptive behavior for primary school students. Choi and Moran (2009) found that active procrastination had a positive relationship with polychronicity, indicating the tendency to process multiple tasks simultaneously. However, an explanation for these results is that although primary school students believe that they will be able to complete the tasks even if they procrastinate, they face relative difficulties in handling multiple tasks at once, while finding themselves increasingly more sensitive to evaluations from others (Park and Lee, 2019). Furthermore, it was questioned whether active procrastination is indeed a positive behavior; some argue that active procrastination is not a form of procrastination, but rather a purposeful delay (Chowdhury and Pychyl, 2018; Pinxten et al., 2019), a self-deceptive strategy associated with not engaging in behavioral delay (Wessel et al., 2019), or a form of self-handicapping (Cao, 2012). Therefore, primary school students with the "procrastination-approach" profile should be provided with short-term objectives that help them complete tasks at a given time, to ensure that they are actively participating in learning on time.

Furthermore, the T-AB profile with the least distribution was "low approach" (6.9%), demonstrating average levels of procrastination-avoidance and engagement-avoidance; this profile was marked with high FNE and low achievement compared to the "timely engagement-approach" profile. In avoidance motivation, behavior is associated with a negative incident or the possibility thereof (Elliot, 1999); this appears to be similar to the "avoidance orientation" profile in the study conducted by Tuominen-Soini et al. (2011), that examined profiles of achievement goal orientation, and were similar to the "low approach" profile in terms of levels of FNE or achievement. Previous studies showed that this type increased with higher grades and school levels (Tuominen-Soini et al., 2011; Yang and Oh, 2006). Considering that T-AB can change, and is related to self-regulation, self-efficacy, and mastery approach goals (Strunk et al., 2018), it is necessary to engage in efforts to help the students with the "low approach" profile to raise their self-regulation ability and self-efficacy, and strive to create a mastery-oriented learning environment for them.

4.3. Relationship between self-determined motivation profiles and T-AB profiles

Finally, examining the relationship between T-AB profiles according to the self-determined motivation profiles, the "low approach" profile was the most connected to "low motivation" (H3). These results are similar to those of studies that have claimed that passive procrastination is a form of indifference (Klassen and Kuzucu, 2009) and that indifference has a positive influence on passive procrastination (Cavusoglu and Karatas, 2015). Particularly, students with the "low motivation" self-determined motivation profile and the "low approach" T-AB profile had a high degree of FNE (H4); while they are few in number, they appear to be students with significant difficulties in learning. Therefore, to steer them away from learned helplessness, it is important to provide the students with achievable goals beginning in primary school, dividing the tasks into stages to provide them with the experience of achievement, presenting them with positive feedback and reviewing their understanding of the feedback, and guiding them to develop an interest in learning (Brookhart, 2017), thereby decreasing maladjusted academic behavior in the future. Furthermore, the "procrastination-approach" T-AB profile was the most connected to the "controlled regulation" and "external regulation dependent" profiles of self-determined motivation. As previously mentioned, these results can be partially interpreted with the characteristics of active procrastination. Along with claims that active procrastination may be a form of self-handicapping (Cao, 2012), and based on research by Lee and Jang (2014), who indicate that self-handicapping has a positive relationship with introjected regulation and a negative relationship with identified regulation, it is likely that students with this profile respond using methods such as self-handicapping to protect their self-esteem from psychological pressures such as guilt and shame. The "controlled regulation" and "external regulation dependent" profiles are relatively more adaptive regarding FNE and achievement when compared to the "low motivation" profile; as such, they may be more adaptive compared to "low motivation"-"low approach," but these profiles are certainly not recommended. Having high levels of autonomous motivation despite having high controlled motivation may counteract the negative effects of controlled motivation (Deci and Ryan, 2000). Therefore, students with this profile should be guided to feel positive learning emotions; considering the claim that mastery goals can reduce self-handicapping strategies (Midgley and Urdan, 2001), it is necessary to shift from performance-oriented classroom goal structures to ones that focus on individual mastery.

4.4. Adaptive profile

The proportion of "timely engagement-approach" profile was high in the "autonomous" profile, which was the most adaptive in terms of FNE and achievement (H4). Particularly, the "autonomous"-"timely engagement-approach" profile was marked with the lowest levels of FNE and the highest levels of achievement, indicating that this profile can be viewed as an adaptive type by actively participating in a task at the right time with the appropriate motivation, in the academic context.

These results are in line with claims that autonomous motivation is related to high academic achievements and positive emotions (Affuso et al., 2017; Burton et al., 2006; Guay et al., 2010) and that engagement-approach constitutes the most adaptive behavior among the T-AB (Strunk et al., 2018). Students with this profile are the most ideal for learning situations and may participate in learning based on internal standards rather than based on comparisons with others; participate well in tasks in the given time; and have high self-regulation ability, self-efficacy, and mastery approach goals (Strunk et al., 2018). Just as good learners require feedback and support from their teachers (Brookhart, 2017), teachers need to provide these students with attention to ensure that they continue maintaining their current motivation and behavior relating to academics.

4.5. Limitations and future directions

The limitations of this study and suggestions for future research are as follows. First, the significance of this study is its utilization of a person-centered approach to examine the relationship between self-

determined motivation and T-AB, an extended concept of academic behavior. As the few existing studies on T-AB, such as by Strunk et al. (2013) and Yamada et al. (2016), have considered college students, it is necessary to conduct additional research with students from other school levels to identify the characteristics of T-ABs at various school levels and clarify their relationship with self-determined motivation. In addition, it is possible that the "procrastination-approach" profile showed relatively low adaptability, as this study has examined primary school students. Therefore, it is necessary to confirm the relationship between self-determined motivation profiles and the "procrastination-approach" profile of the T-AB profiles with students at higher school levels, likely possessing better coping abilities compared to primary school students. Second, this study was conducted with students from three public schools with more than 30 classes, located in small- to medium-sized cities in Korea as a subset of the Korean primary school student population. While Korea is a country that places emphasis on education, there may be different levels of emphasis between metropolitan areas and rural regions; additional research should be conducted with a diverse range of students to supplement the findings of this study. Third, confirming the stability of the psychological constructs (Nesselroade, 1991) is an important factor for suggesting educational methods to drive positive results from the specific psychological constructs of the students. From this perspective, T-AB is a changeable—rather than stable—factor influenced by context (Strunk et al., 2018); therefore, it is necessary to confirm the stability of T-AB through a longitudinal study that reflects the passage of time and changes to the environment. Fourth, as the motivational process may vary depending on age or gender (Bureau et al., 2021) and specific domain, it is necessary to supplement this study's results by incorporating these factors in future studies. Fifth, when analyzing the interaction effect by identifying the difference between the simple main effects in the two-way ANOVA, there is a disadvantage that the logical basis for the probability of judgment error may be insufficient; thus, caution is needed when interpreting the results (Betz and Gabriel, 1978). Sixth, this study used a self-report questionnaire through convenience sampling; hence, there may have been differences between the actual level and the response level, and generalizability is limited. In addition, although self-determined motivation includes integrated regulation, this study did not measure integrated regulation based on the argument that the distinction between integrated regulation and confirmed regulation is unclear (Kim, 2002).

5. Practical implications

This study is meaningful in that each type of self-determination motive and T-AB was identified by a person-centered approach. The practical implications that can be drawn are as follows. First, to reduce the FNE and increase achievement, it is necessary for teachers to pay attention to the types of T-AB of students. In addition, regardless of whether it applies to only a few students, it is necessary to solve the cognitive and emotional problems that they face in learning situations by providing success experiences in academics and providing individualized feedback by reducing the FNE experienced by the "low approach" profile.

Second, Korean primary school teachers need to change their teaching and evaluation methods to increase the level of self-determination of students, because the ratio of control and external control types exceeds 55%. Third, it would be beneficial to prepare a mastery-oriented learning environment for the "low approach" type among the types of T-AB. Finally, the most adaptive type was noted to be that of "timely engagement-approach" within "autonomous," and teachers' attention is required for these adaptive types of students as well.

6. Conclusions

The results of this study yielded a total of four self-determined motivation profiles, namely, "low motivation," "controlled regulation," "external regulation dependent," and "autonomous," and a total of three

T-AB profiles, namely, "low approach," "timely engagement-approach," and "procrastination-approach." The profiles with the highest distribution were "controlled regulation" and "timely engagement-approach." In the analysis of the relationships between the profiles of the two factors, the highest distributions were as follows: the "low approach" profile with the "low motivation" profile; the "procrastination-approach" profile of T-AB with the "controlled regulation" and "external regulation dependent" profiles, and the "timely engagement-approach" profile with the "autonomous" profile. The "indifference-low approach" profile demonstrated the most maladaptive characteristics in terms of FNE and achievement, whereas the "autonomous"-"timely engagement-approach" profile presented with the most adaptive characteristics.

Declarations

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