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Longitudinal changes in academic motivation in Japan: Self-determination theory and East Asian cultures

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ABSTRACT

This study examined changes in the academic motivation of Japanese junior high school students through a two-year longitudinal survey, based on self-determination theory. Japanese students ($N = 410$; 215 boys and 195 girls aged 12–13 years at the time of the first survey) completed the Japanese short-version of the Self-Regulation Questionnaire once each year during three consecutive grades (seventh, eighth, and ninth). The results of a latent curve model indicated that intrinsic and identified regulation (i.e., autonomous motivation) decreased and extrinsic and introjected regulation (i.e., controlled motivation) increased during junior high school. The results of ANOVA revealed the specific period during which academic motivation changed. In addition, a growth mixture model detected two characteristic profiles concerning motivational change: some students showed only decreases in autonomous motivation and others showed only increases in controlled motivation. Japanese junior high school students' motivation shifted from autonomous to controlled, but they did not become less motivated overall.

1. Introduction

For more than thirty years, educational psychologists have shown great interest in the processes and outcomes associated with intrinsic motivation and extrinsic motivation in classrooms. In previous research, intrinsic motivation for academic activities has been associated with better grades (Lepper, Corpus, & Iyengar, 2005) and predictive of achievement and adjustment (Gottfried, Marcoulides, Gottfried, & Oliver, 2013). In contrast, extrinsic motivation has been predictive of more negative consequences, and in general is found in students from late elementary to high-school years, becoming more highly correlated with negative educational outcomes over time (Murayama, Pekrun, Lichtenfeld, & vom Hofe, 2013).

During the same period, investigators have also examined changes in students' academic motivation over the period from mid-elementary to high school; however, they have not yet reached a conclusion, particularly concerning changes in extrinsic motivation. In this study, we introduced perspectives from self-determination theory and cultural views on this issue to organize the previous results and investigated motivational changes in Japanese junior high school students. This was the first study regarding this topic in a sample from an East Asian Culture based on self-determination theory and will contribute to providing a comprehensive perspective on motivational changes of school-aged students.

1.1. Motivational changes in academic activities

The consensus among researchers focusing on changes in academic motivation is that intrinsic motivation decreases in the long-term. In a longitudinal study, Gottfried, Fleming, and Gottfried (2001) found a significant downward trend in intrinsic motivation for reading, math, and science between the ages of 9 and 16 years. Gottfried, Marcoulides, Gottfried, Oliver, and Guerin (2007) found that intrinsic motivation for math decreased in students aged 9 to 17 years. In a within-year study for students in third to eighth grade, Corpus, McClintic-Gilbert, and Hayenga (2009) found that intrinsic motivation decreased from fall to spring and that this decline was particularly pronounced in adolescents.

Meanwhile, the findings regarding changes in extrinsic motivation are inconsistent. In a cross-sectional study, Harter (1981) found an increase in extrinsic motivation from third through ninth grade, with a corresponding decrease in extrinsic motivation. However, because of the nature of the scale that she used, with an intrinsic and an extrinsic pole, as students decrease in one they increase in the other. In contrast, Lepper et al. (2005), who used a scale where intrinsic and extrinsic motivation are measured independently, reported that extrinsic motivation did not vary between the fourth and eighth grades. One possible reason why investigators have not reached consensus is because of

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the use of an undifferentiated version of the level of extrinsic motivation, which is defined as performing an activity to obtain some separable consequence. However, as described latter, the concept of extrinsic motivation within self-determination theory has been differentiated by using the idea of self-determinant degree of one's behavior (Deci & Ryan, 1985; Ryan & Deci, 2000).

1.2. Motivation in self-determination theory

Self-determination theory posits several subtypes of motivation, and proposes that extrinsic motivation pertains to a wide variety of reasons for behavior. The first type of extrinsic motivation is *external regulation*, which involves the least autonomous form of motivation and includes the classic instance of being motivated to obtain a reward or avoid punishment. Generally, external regulation is in evidence when people's reasons for performing a behavior are to satisfy an external demand or a socially constructed contingency. The second type of extrinsic motivation is *introjected regulation*, in which behaviors are performed to avoid guilt and shame or to achieve ego enhancement and feelings of worth. According to self-determination theory, external and introjected regulation constitute controlled motivation, because they have an external perceived locus of causality and are accompanied by the experience of pressure and obligation (i.e., feelings of being controlled; Ryan & Deci, 2009; Vansteenkiste, Lens, & Deci, 2006). The third type of extrinsic motivation is *identified regulation*, which represents conscious valuation of a behavioral goal and acceptance of the behavior as personally important. Relative to external and introjected regulation, behavior that stems from identified regulation tends to be more self-determined. In addition, *intrinsic regulation* is autonomous, corresponding to intrinsic motivation on the regulation style; therefore, identified and intrinsic regulation constitute autonomous motivation because they have an internal perceived locus of causality and are accompanied by a sense of self-determination (Ryan & Deci, 2009; Vansteenkiste et al., 2006). Previous research has provided evidence for a relationship between autonomous motivation and achievement (d'Ailly, 2003; Hardre & Reeve, 2003), deep levels of learning strategies (Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004), and psychological well-being (Levesque, Zuehlke, Stanek, & Ryan, 2004). From a person-centered perspective, students with motivational profiles involving high autonomous motivation and low controlled motivation have shown low levels of test anxiety, procrastination, and cheating, and high grade point average (Vansteenkiste, Sierens, Soenens, Luyckx, & Lens, 2009).

One longitudinal study examining changes in academic motivation based on self-determination theory was conducted by Otis, Grouzet, and Pelletier (2005) and involved a Canadian sample from the eighth to tenth grade. They reported that all types of motivation decreased over this period, suggesting that students became less motivated as they aged. Because different studies have found different patterns for extrinsic motivation, there is a need for additional investigation; however, before conducting an investigation, we should consider cultural differences (specifically Western vs. East Asian cultures) in motivational aspects that have attracted the attention of cross-cultural psychologists.

1.3. Motivation and culture

Culture influences dominant societal belief systems, educational practices, and desired behaviors (e.g., Greenfield, Keller, Fuligni, & Maynard, 2003; Kim & Park, 2008), and individuals implicitly learn appropriate ways of adapting to social contexts (Hofer & Bond, 2008). Consequently, cultural influences affect several aspects such as motivation (Iyengar & Lepper, 1999) and achievement beliefs (Chen & Stevenson, 1995).

When comparing the results of research conducted in different countries and cultures, the construal of the self in individualist and collectivist paradigms is a useful concept in the interpretation of findings. Markus and Kitayama (1991) suggested independent (individualism) and interdependent (collectivism) self-construals. Independent self-construals emphasize the validation of internal attributes and separation from social contexts. This is assumed to be exemplified in sizable segments of American and many Western European cultures. In contrast, interdependent self-construals focus on connecting with the social setting, engaging in appropriate actions that are desired by others in society, and maintaining harmony within social circumstances. This is assumed to be exemplified in Japanese and other East Asian cultures (Markus & Kitayama, 1991). With respect to motivational factors, individuals with independent self-construals are motivated to express themselves and focus on personal success, while individuals with interdependent self-construals are motivated to promote goals that are shared with others in social contexts (Kitayama, Markus, Matsumoto, & Norasakkunkit, 1997; Markus & Kitayama, 1991). Considerable research has supported differences between Western cultures with individualistic cultural views and East Asian cultures with more collectivist views (e.g., Hagger, Rentzelas, & Chatzisarantis, 2014). In particular, persons with East Asian cultural views were more autonomously motivated when they felt a sense of relatedness and shared their goals in social contexts (e.g., Bao & Lam, 2008; Rudy et al., 2015).

1.4. The objectives of the present study

As a further investigation based on self-determination theory, the present study examined longitudinal changes in academic motivation in Japanese junior high school students (a sample from an East Asian culture). The hypothesis was that Japanese junior high school students' academic motivation would change from autonomous to controlled; and they would not become less motivated because of the high societal pressure in Japan, the shared common goal among students to move on to high school, and the motivational tendency of individuals in East Asian cultures to be motivated by social demands and norms. Hess and Azuma (1991) compared the Japanese and American educational systems and found that Japanese students felt significantly greater pressure to study due to social demands. Additionally, the Organization for Economic Cooperation and Development (OECD, 2011) introduced the concept of Japan as a meritocratic society that attaches importance to entrance examinations for social success, motivating students to learn in difficult classes and demanding substantial effort to obtain high grades. Moreover, because approximately 95% of junior high school students have progressed to high school (Japan Ministry of Education, Culture, Sports, Science and Technology, 2015), most students in Japan share the goal of passing high school examinations. As previously mentioned, in East Asian cultures with more collectivist values, there is greater emphasis on students behaving in accordance with others.

This study had two additional objectives. The first was to examine the profile of motivational shifts. Most previous studies have discussed average tendencies toward motivational changes from a statistical basis. However, some characteristic motivational shifts exist within average tendencies when focusing on individual differences in motivational changes (Harter, Whitesell, & Kowalski, 1992). The second additional objective was to examine the temporal stability of motivation. This would provide an overall picture of changes in academic motivation across ages and perspectives of educational interventions.

2. Method

2.1. Participants and procedure

This study was a two-year longitudinal design, conducted between 2007 and 2009, that consisted of three waves. Each questionnaire survey was completed during October and November for three consecutive years. Questionnaires were administered in a classroom under the instruction of the homeroom teacher. In total, 410 junior high school students (212 boys and 198 girls) from five public schools in the Kanto region (Tokyo and surrounding area) participated in the survey. The

members of the class changed in each school every year. Participants' ages ranged from 12 to 13 years at the time of the first survey. The numbers of participants in the first, second, and third waves were 407, 398, and 373, respectively. Three-hundred sixty-five participants (185 boys and 180 girls) completed all three questionnaires. All participants were Japanese. The sample was highly homogeneous with respect to ethnic and cultural background. Participants' predominant socioeconomic status was estimated to be lower to upper-middle class. No incentives were offered to participants.

2.2. Measures

2.2.1. Academic motivation

Participants completed the Japanese short-version of the Self-Regulation Questionnaire (Nishimura, Kawamura, & Sakurai, 2011) that assesses external, introjected, identified, and intrinsic regulation in self-determination theory: each type of regulation was measured via five items. The items were rated using a four-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Nishimura et al. (2011) reported the validities of this scale by correlation analysis with the original Self-Regulation Questionnaire (Ryan & Connell, 1989): 0.86 for intrinsic regulation, 0.75 for identified regulation, 0.73 for introjected regulation, and 0.82 for external regulation. The scale included the self-determination continuum: the relationships between adjoining regulations (e.g., intrinsic and identified regulation) are more positive relative to their relationships with other types of regulation. In this study, Cronbach's alpha coefficients for intrinsic regulation were 0.91 at T1, 0.90 at T2, and 0.88 at T3; for identified regulation, they were 0.87 at T1, 0.84 at T2 and 0.84 at T3; for introjected regulation, they were 0.84 at T1, 0.84 at T2, and 0.81 at T3; and for external regulation, they were 0.80 at T1, 0.77 at T2, and 0.76 at T3.

2.3. Ethical considerations

The front sheet of the questionnaire contained four statements: (a) there is no relationship between this survey and grade evaluations, (b) the privacy of those taking this survey will be protected, (c) participating in this survey is not mandatory, and (d) completion of this questionnaire is considered agreement to participate in the study. In addition, demographic data, such as grade, class, sex, and student number, were required on the final page of the questionnaire to link data from different collection times. We obtained informed consent from students and school principals. This approach and research plan was approved by the IRB at the institution where the first author was affiliated.[2]

2.4. Statistical analysis

To achieve the main objective of the present study, we performed a one-way repeated measures ANOVA and produced a latent curve model to examine changes in academic motivation. The latent curve model (Meredith & Tisak, 1990) is superior in estimating longitudinal intra-individual changes; however, if changes are not supposed to be linear, the accuracy of the model is insufficient. In addition, a latent curve model shows a general trend but does not detect specific periods to indicate motivational changes; in contrast, an ANOVA can be used to detect these specific periods. Therefore, each of these statistical methods compensates for the limitations of the other and provides a comprehensive perspective regarding changes in academic motivation. Moreover, we performed growth mixture model to reveal characteristic motivational shifts. In general, a growth mixture model aims to uncover unobserved heterogeneity within a population and identify substantively meaningful groups that are similar in their growth trajectories (Muthén, 2004). The underlying assumption of a latent curve model is that all individuals are drawn from a single population. On the other hand, a growth mixture model provides differences in distinguished growth patterns across unobserved subpopulations (Bauer & Curran, 2003; Jung & Wickrama, 2008).

Analyses were performed using R 3.1.0 and M-plus 7.11. Calculation of basic statistics (i.e., mean and standard deviation, and 95% confidence interval) and ANOVA were performed by R 3.1.0. Correlation analysis, the latent curve model and the growth mixture model were performed by M-plus 7.11. Arithmetic means were used as the scale scores for each of the observed variables. Missing data were addressed via the full information maximum likelihood method. In all analyses, we did not set a hierarchy at the classroom level because classmates changed every year in each school. Additionally, we did not set the hierarchy at the school level because only five schools involved in this research, and intraclass correlation coefficients (ICC) of motivation at each measurement point at the school level were quite small: 0.01 to 0.02 for intrinsic regulation, 0.00 to 0.01 for identified regulation, 0.02 to 0.08 for introjected regulation, and 0.01 to 0.06 for external regulation. Moreover, the small number of classes at the hierarchy level was a concern as this could lead to biased estimates (McNeish & Stapleton, 2016).

3. Results

3.1. Preliminary analysis

Table 1 shows the means and standard deviations for the 12 observed variables for the complete data ($n = 365$) and Cronbach's alpha coefficients. Sufficient reliabilities for each subscale were confirmed: 0.88 to 0.91 for intrinsic regulation, 0.84 to 0.87 for identified regulation, 0.81 to 0.84 for introjected regulation, and 0.76 to 0.80 for external regulation. Table 2 shows zero-order correlations between and within the four types of motivation. The correlation coefficients were calculated for the total sample of data ($N = 410$) while dealing with missing data. As Table 2 shows, the hypothesized associations within self-determination theory, that is, simplex patterns, were generally supported for each grade. Intrinsic regulation was positively and strongly correlated with identified regulation (coefficients ranged from 0.55 to 0.64) and moderately correlated with introjected regulation (0.21 to 0.44), and was either nor correlated or slightly negatively correlated with external regulation (−0.15 to 0.04). Identified regulation was positively and moderately correlated with introjected regulation (0.36 to 0.50), and not correlated or slightly negatively correlated with external regulation (−0.07 to 0.11). Introjected regulation was positively and moderately correlated with external regulation (0.41 to 0.45). Moderate or strong positive correlations were observed between the same forms of motivation in intrinsic regulation (0.45 to 0.58), identified regulation (0.47 to 0.53), introjected regulation (0.44 to 0.53), and external regulation (0.32 to 0.51). These results support a degree of temporal stability for each motivation.

3.2. Latent curve model

Using the full dataset ($N = 410$), we examined changes in all four types of motivation. We ran the null model first. The fit indices of this model were χ^2 (66) = 2024.187, $p < 0.001$, RMSEA = 0.269, 90% CI [0.259, 0.279], SRMR = 0.285, BIC = 10,364.100. We then produced a latent curve model for all types of academic motivation. Considering the theoretical hypothesis that the relationships between adjoining motivations are positive, we ran the model and hypothesized covariance between errors of adjoining motivations at each wave. The result showed that fit indices for the latent curve model were χ^2 (25) = 112.672, $p < 0.001$, CFI = 0.955, TLI = 0.882, RMSEA = 0.092, 90% CI [0.076, 0.110], SRMR = 0.044, BIC = 8699.247. As the RMSEA criteria

[2] The IRB at the first author's university waived the requirement to obtain informed consent from each student' parents; however, we announced this project to their parents via a school and have not received any complaints about this project. In this sense, we obtained passive consent from their parents for this research.

Table 1
Means, standard deviations, and Cronbach's coefficient alpha of academic motivation.

	7th (T1)				8th (T2)				9th (T3)			
	M	*SD*	95% CI	α	*M*	*SD*	95% CI	α	*M*	*SD*	95% CI	α
Intrinsic regulation	2.38	0.79	[2.30, 2.46]	0.91	2.20	0.70	[2.13, 2.27]	0.90	2.18	0.77	[2.10, 2.26]	0.88
Identified regulation	3.10	0.73	[3.03, 3.17]	0.87	2.98	0.66	[2.91, 3.04]	0.84	2.93	0.72	[2.86, 3.01]	0.84
Introjected regulation	2.38	0.76	[2.30, 2.45]	0.84	2.42	0.71	[2.35, 2.49]	0.84	2.48	0.75	[2.40, 2.55]	0.81
External regulation	2.26	0.67	[2.19, 2.33]	0.80	2.42	0.64	[2.35, 2.48]	0.77	2.54	0.71	[2.47, 2.62]	0.76

Note. $n = 365$. CI = confidence interval.

(<0.05) was not satisfied and correlations between intrinsic and introjected regulation were significant at each wave (see in Table 2), we improved the model by hypothesizing additional covariance between errors of intrinsic and introjected regulation at each wave. The fit indices of the improved latent curve model were χ^2 (22) = 41.950, $p = 0.006$, CFI = 0.990, TLI = 0.969, RMSEA = 0.047, 90% CI [0.025, 0.068], SRMR = 0.025, BIC = 8646.574. We ultimately accepted this model.

Intercepts for intrinsic, identified, introjected, and external regulation in the accepted latent curve model were 2.33 (95% CI = [2.26, 2.41]), 3.06 (95% CI = [2.99, 3.13]), 2.36 (95% CI = [2.29, 2.43]), and 2.27 (95% CI = [2.21, 2.33]), respectively. These values indicate estimated means for the seventh grade for each type of motivation. The slopes of the accepted latent curve model for intrinsic, identified, introjected, and extrinsic regulation were −0.10 ($p < 0.001$), 95% CI = [−0.14, −0.06]; −0.07 ($p < 0.001$), 95% CI = [−0.11, −0.04]; 0.06 ($p = 0.003$), 95% CI = [0.01, 0.09]; and 0.12 ($p < 0.001$), 95% CI = [0.08, 0.16], respectively. The values of slope indicate estimated scores of the average annual change. For example, a significant positive value of slope indicates that student's motivation had increased gradually each year. In contrast, a negative value of slope indicates that student's motivation had decreased each year. Therefore, these results indicated that intrinsic and identified regulation (i.e., autonomous motivation) decreased, and that introjected and external regulation (i.e., controlled motivation) increased during junior high school.

3.3. One-way ANOVA with repeated measures

A one-way ANOVA with repeated measures was performed for the complete data ($n = 365$). When Mauchly's sphericity test criterion was not satisfied, a Greenhouse-Geisser estimate epsilon and regulated statistical degrees of freedom were applied. The results showed main effects for all types of regulation: intrinsic regulation: $F(1.89, 688.44) = 17.74$, $p < 0.001$, $\eta^2 = 0.05$; identified regulation: $F(1.961, 713.90) = 10.98$, $p < 0.001$, $\eta^2 = 0.03$; introjected regulation: $F(2, 728) = 3.37$, $p < 0.05$, $\eta^2 = 0.01$; and external regulation: $F(1.89, 689.71) = 27.79$, $p < 0.001$, $\eta^2 = 0.08$). Differences in the period of each type of regulation were assessed using Scheffé's multiple comparison procedure. The results showed that intrinsic regulation was higher in the seventh grade relative to the eighth, $t(364) = 5.05$, $p < 0.001$, $r = 0.26$, and ninth grades $t(364) = 4.90$, $p < 0.001$, $r = 0.25$; identified regulation was also higher in the seventh grade relative to the eighth, $t(364) = 3.41$, $p < 0.001$, $r = 0.18$, and ninth grades, $t(364) = 4.24$, $p < 0.001$, $r = 0.22$. There were no differences in intrinsic and identified regulation between the eighth and ninth grades. Introjected regulation was lower in the seventh grade relative to the ninth grade, $t(364) = 2.56$, $p = 0.011$, $r = 0.13$. External regulation was lower in the seventh grade relative to the eighth grade, $t(364) = 4.15$, $p < 0.001$, $r = 0.21$, the eighth grade relative to the ninth grade, $t(364) = 3.70$, $p < 0.001$, $r = 0.19$, and the seventh grade relative to the ninth grade, $t(364) = 6.77$, $p < 0.001$, $r = 0.33$. These results indicated that external regulation increased each year. Fig. 1 shows the two-year trajectory of the four types of motivation.

3.4. Growth mixture model

We performed a growth mixture model for the four types of motivation provided by the results of the latent growth curve model to detect characteristic motivational shifts during the junior high school period. First, to determine the number of classes, we referred to BIC (Bayesian information criterion) and the results of the bootstrap likelihood ratio test (BLRT; Nylund, Asparouhov, & Muthén, 2007) while hypothesizing from one to five classes. BLRT compares neighboring class models by calculating the difference in likelihood ratios between the models. Table 3 shows the results of BLRT and BIC for each class model. As shown, the two-class model provided the best model fit (BIC = 8631.945) and the difference in likelihood ratios between the two and three-class models was not significant (ΔLR (13) = 68.853, $p = 0.160$). According to these criteria, we selected the two-class model.

Table 4 shows the values of the means and slopes for each profile in the two-class model. The number of students belonging to the first and second profiles was 91 (22.2%) and 319 (77.8%), respectively. The first profile involved the group of students with decreasing intrinsic (−0.45, $p < 0.001$, 95% CI = [−0.55, −0.36]) and identified regulation

Table 2
Correlation among four types of regulation at three times (between and within variables).

	2	3	4	5	6	7	8	9	10	11	12
1. Intrinsic regulation (7th)	0.55***	0.21***	−0.15**	0.58***	0.35***	0.20***	−0.07	0.45***	0.33***	0.19***	−0.06
2. Identified regulation (7th)		0.36***	−0.07	0.36***	0.50***	0.28***	−0.01	0.32***	0.47***	0.24***	0.06
3. Introjected regulation (7th)			0.41***	0.11*	0.32***	0.44***	0.30***	0.12*	0.26***	0.50***	0.30***
4. External regulation (7th)				−0.18***	−0.03	0.16**	0.39***	−0.15**	−0.08	0.18***	0.32***
5. Intrinsic regulation (8th)					0.55***	0.44***	−0.05	0.56***	0.38***	0.21***	−0.12**
6. Identified regulation (8th)						0.50***	0.10*	0.37***	0.53***	0.30***	0.04
7. Introjected regulation (8th)							0.41***	0.25***	0.29***	0.53***	0.28***
8. External regulation (8th)								−0.04	0.02	0.22***	0.51***
9. Intrinsic regulation (9th)									0.64***	0.40***	0.04
10. Identified regulation (9th)										0.47***	0.11*
11. Introjected regulation (9th)											0.45***
12. External regulation (9th)											

*** $p < 0.001$.
** $p < 0.01$.
* $p < 0.05$.

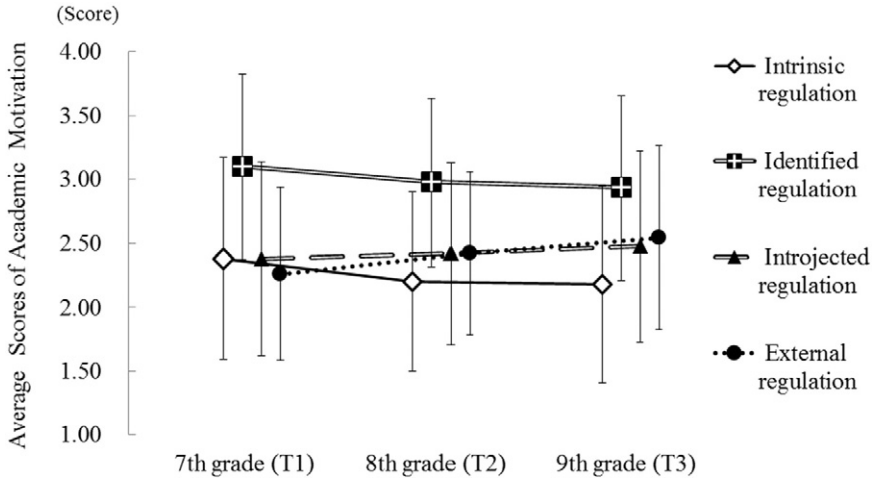

Fig. 1. Two-year trajectories in academic motivation.
Note. Error bar indicates standard deviations.

($-0.21, p < 0.001$, 95% CI = [−0.33, −0.10]), while changes in external and introjected regulation were not significant. In contrast, the second profile involved the group of students with increasing external (0.15, $p < 0.001$, 95% CI = [0.10, 0.20]) and introjected regulation (0.07, $p < 0.001$, 95% CI = [0.02, 0.12]), while changes in intrinsic and identified regulation were not significant. Although the two profiles regarding motivational changes differed, we could conclude that the changes in their motivational states relatively shifted from autonomous to controlled as a common point when we focused on the relative balance between autonomous and controlled in both profiles.

4. Discussion

The main objective of this study was to examine changes in academic motivation during junior high school. We used two statistical methods, the latent curve model and ANOVA, to obtain comprehensive findings. The latent curve model revealed general changes in academic motivation and indicated that intrinsic and identified regulation (i.e., autonomous motivation) decreased and introjected and extrinsic regulation (i.e., controlled motivation) increased during junior high school. Results of the ANOVA identified the specific periods when motivational changes occurred. Decreases in intrinsic and identified regulation occurred between the seventh and eighth grades, and increases in introjected regulation occurred between the seventh and ninth grades. In addition, extrinsic regulation increased annually. These results supported the hypothesis of the present study.

As a possible explanation, the reason this study found that students' motivation shifted from autonomous to controlled and they did not become less motivated, seems to be related to interdependent (collectivism) self-construals and the Japanese educational culture. As mentioned previously, students who live in East Asian cultures with more collectivist values try to live up to social demands and the expectations of their teachers and parents (Markus & Kitayama, 1991). In addition, the OECD (2011) stated that Japanese students spend a considerable amount of time studying for entrance examinations and ensuring their future success while feeling enormous pressure. These conditions, namely "personal tendency" from East Asian cultures with more collectivist values and "social influence" from Japanese educational cultures, were combined and could prevent students from becoming less motivated. Moreover, such motivational shifts might be related to the belief in effort for achievement highlighted in Japanese educational cultures (Heine et al., 2001). The belief that effort leads to success might increase students' motivation in controlled situations and prevent motivational loss. Although some cultural studies have implied that individuals from collectivist cultures are autonomously motivated by social demands and norms (e.g., Hagger et al., 2014; Iyengar & Lepper, 1999), Japanese students might not feel a sense of autonomy after all, due to high social pressure related to academic events, even if they share the goal of passing the high school examination and moving on to prestigious high schools. Thus, students' motivation did not become autonomous over all, but shifted from autonomous to controlled.

Table 3
Result of bootstrap likelihood ratio test and BIC.

	df	BIC	ΔLR	*p*-Value
One-class model	68	8646.574		
Two-class model	81	8631.945	92.839	0.030
Three-class model	94	8641.303	68.853	0.160
Four-class model	107	8661.527	57.986	0.159
Five-class model	120	8765.335	30.653	0.365

Note. ΔLR means difference of likelihood ratio between neighboring class models (i.e., comparing k − 1 and the k class models).

The growth mixture model provided two profiles regarding motivational changes. The first profile involved the group of students for whom only intrinsic and identified regulation (i.e., autonomous motivation) decreased during junior high school. These students might not have experienced autonomy in the Japanese academic environment. In contrast, the second profile involved the group of students for whom only external and introjected regulation (i.e., controlled motivation) increased during junior high school. It is likely that these students were saliently exposed to external factors such as social pressure and norms in the educational setting that controlled them. However, as students' motivational state relatively shifted from autonomous to controlled in both profiles, the direction of the result produced by the growth mixture model is consistent with the overall conclusion provided by the results of the latent growth curve model and ANOVA. Future research is required to specify the factors that distinguish between these profiles. For example, school types (Vedder-Weiss & Fortus, 2012) and personal variables, such as academic achievement (Gottfried et al., 2007) and competence (Harter et al., 1992), are potential candidates for examination in such research.

Temporal stability in all types of motivation was demonstrated (see Table 2); these correlation coefficients had the same degree of value as found in Otis et al. (2005). This result indicated that students with high intrinsic regulation in seventh grade were still high in the eighth and ninth grades, whereas students with low intrinsic regulation in seventh

Table 4
The result of growth mixture model (two-class model).

	First profile (n = 91)					Second profile (n = 319)				
	Mean	95% CI	Slope	95% CI	p-Value	Mean	95% CI	Slope	95% CI	p-Value
Intrinsic regulation	2.26	[2.05, 2.47]	−0.45	[−0.55, −0.36]	<0.001	2.36	[2.26, 2.45]	0.02	[−0.05, 0.08]	0.625
Identified regulation	2.88	[2.67, 3.09]	−0.21	[−0.33, −0.10]	<0.001	3.12	[3.02, 3.20]	−0.03	[−0.07, 0.02]	0.233
Introjected regulation	2.16	[1.96, 2.37]	−0.01	[−0.12, 0.09]	0.875	2.42	[2.33, 2.51]	0.07	[0.02, 0.12]	0.009
External regulation	2.38	[2.20, 2.57]	0.02	[−0.11, 0.16]	0.751	2.24	[2.16, 2.32]	0.15	[0.10, 0.20]	<0.001

Note. CI = confidence interval.

grade were still low in the eighth and ninth grades. Moreover, the growth mixture model showed that scores for intrinsic and identified regulation decreased in students with relatively low scores initially (i.e., first profile, see Table 4). Considering the moderate and high temporal stability and general changes in academic motivation shown in this study, we could argue that changes in academic motivation occurred while maintaining the motivational gap among students and the gap became wider in junior high school. Therefore, teachers and parents should intervene at an early stage when students demonstrate low autonomous motivation.

Considering these findings, we propose differentiated educational practices for each profile as follows: for the first profile characterized by decreases in students' autonomous motivation, classes that stimulate students' interest would be useful. Additionally, offering a persuasive explanation for why academic activities are important (Reeve, Jang, Hardre, & Omura, 2002), providing a choice of what students will study, and guaranteeing self-determined opportunities are practical for facilitating students' sense of autonomy. Meanwhile, teachers and parents should be mindful of the fact that academic performance and social comparison are prominent in junior high school (Blyth, Simmons, & Carlton-Ford, 1983; Midgley, Feldlaufer, & Eccles, 1989), which potentially causes anxiety and a scholastic sense of being controlled (Harter et al., 1992). For the second profile characterized by an increase in students' controlled motivation, providing autonomy support would also be practical (Chirkov & Ryan, 2001; Reeve, Jang, Carrell, Jeon, & Barch, 2004); additionally, teachers and parents should avoid putting too much pressure on students and over-controlling their academic activities.

This study makes a significant contribution not only for the educational practice of parents and teachers but also educational policy in Japan. Students learn appropriate ways to succeed in an educational culture; at the same time, educational culture has taken root in their own country and could not be easily changed. Therefore, while comprehending the characteristics of Japanese educational culture, educators in Japan should pay more attention to students' autonomy. One of the educational policies in Japan for students in future generation should be to respect and facilitate students' autonomous motivation in academic activities.

4.1. Limitations

This study has several limitations that require consideration. One of these limitations involves generalization of the results. The sample was recruited from five public schools within a specific area of Japan. To revalidate current findings in subsequent stages of this research, participants should be recruited from a wider area. We should also be mindful of the fact that the results of the ANOVA showed that intrinsic and identified regulation decreased between the seventh and eighth grades. This finding indicates that changes in academic motivation are not completely linear. Accordingly, future research should presume a quadratic or cubic curve as well as linear changes in academic motivation and collect data from more than four measurement points. As a precedent, Jaakkola, Wang, Yli-Piipari, and Liukkonen (2015) investigated changes in motivation for physical education while hypothesizing quadratic and cubic curves.

4.2. Conclusion

The results showed general changes in Japanese junior high school students' academic motivation; that is, students' motivation shifted from autonomous to controlled and they did not become less motivated. The significance of this study lies in the explanation of changes in academic motivation based on the theoretical framework provided by self-determination theory and the cultural perspective of a Japanese sample, and the demonstration of the limitations of applying knowledge obtained from a Canadian sample to samples from other countries in a sample from an East Asian culture, particularly Japan.

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Conflicts of interest

The authors have no conflicts of interest to declare.

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