Motivational Changes and Their Effects on Achievement: Japanese High School English Learners

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Abstract
This longitudinal study investigates (a) changes in Japanese high school English learners' motivation over the 3 years of high school, and (b) whether their motivational changes over the high school years predict achievement at the end of high school. A questionnaire was developed drawing on the Attitude/Motivation Test Battery (Gardner, 1985) and the self-determination-theory scale (Noels, Pelletier, Clément, & Vallerand, 2000), and administered to 190 students 3 times at yearly intervals. 10 constructs were identified. Concerning (a), in general, Desire to Learn English declined in the early years of high school, whereas Motivational Intensity and Attitudes Toward Learning English increased in the later years of high school. Concerning (b), higher achievement was predicted by the growth of Motivational Intensity, Attitudes Toward Learning English, and Intrinsic Motivation and the decline of Amotivation over the high school years. The results suggested which constructs intervention should be focused on.

Keywords: L2 motivation, the socio-educational model, self-determination theory, latent growth curve modeling, longitudinal study

Introduction

L2 motivation can change over time. For example, Gardner, Masgoret, Tennant, and Mihic (2004) found in their 1-year-longitudinal study about French learners at a Canadian university using the Attitude/Motivation Test Battery (AMTB; Gardner, 1985) that although there was little change for general variables (e.g., interest in foreign languages, attitudes toward French Canadians, instrumental orientation, desire to learn French, and attitudes toward learning French), there was significantly greater change for classroom-related variables (e.g., French class anxiety and motivational intensity). Irie (2005) found comparable results in her combined cross-sectional and 3-year-longitudinal study about Japanese junior high school English learners using her AMTB-based questionnaire.

Concerning Japanese high school English learners, past research has found that generally, their motivation may fall early but rise later in high school (Hayashi, 2005; Miura, 2010; Sawyer, 2006). However, if motivation is not a single construct but consists of various finer-tuned constructs as in Gardner et al. (2004), it is unclear which constructs follow this trend. In addition, little is known about the effect of motivational change over time on achievement. Thus, it is unclear whether the growth of a particular construct of the learner over the high school years predicts achievement. This study is a 3-year longitudinal investigation into the motivational changes of a cohort of Japanese high school students and the effects of the changes on achievement to address these issues.

Literature Review

Theoretical Models

Gardner and associates (e.g., Gardner & Lambert, 1959) started systematic investigation into L2 motivation in Canada, and based on their research Gardner (1985) developed the socio-educational model of L2 acquisition, characterized by integrativeness and instrumentality. The latest version of the model (Figure 1; Gardner, 2010) includes the following constructs. Integrativeness refers to the learner's will to interact with the native speakers of the L2; it is measured by integrative orientation, interest in foreign languages, and attitudes toward native speakers of the L2. Attitudes to the learning situation reflect the learner's attitudes to the teacher and the class. Instrumentality represents the pragmatic value of learning the L2. Motivation refers to the driving force; it comprises motivational intensity (i.e., the strength of the learner's effort expended to learn the L2), desire to learn the L2, and attitudes toward learning the L2. Language anxiety reflects the learner's apprehension. According to Gardner's (2010) hypothesis, motivation, language anxiety, and aptitude can have a direct effect on L2 achievement. On the other hand, integrativeness, attitudes to the learning situation, and instrumentality can exert an indirect effect on L2 achievement via motivation (The broken arrow from instrumentality to motivation indicates the instability of the effect). Gardner (1985) developed the AMTB to measure these constructs.

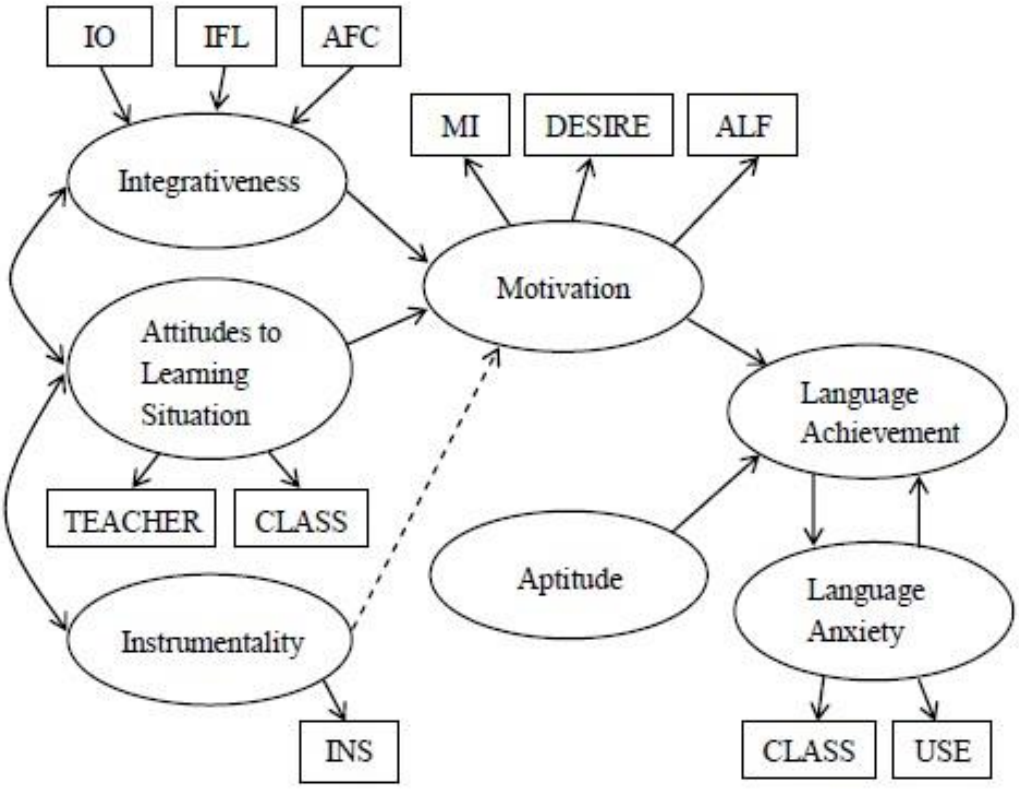

Figure 1. The socio-educational model, re-created from Gardner (2010, p. 88). IO = integrative orientation; IFL = interest in foreign languages; AFC = attitudes toward French Canadians; MI = motivational intensity; DESIRE = desire to learn French; ALF = attitudes toward learning French; INS = instrumental orientation.

Noels and colleagues (e.g., Noels, Clément, & Pelletier, 1999) initiated using self-determination theory (SDT; Deci & Ryan, 1985) in the L2 motivation field. SDT concerns amotivation (i.e., lack of motivation to act), extrinsic motivation (i.e., motivation to act in order to obtain separable outcome), and intrinsic motivation (i.e., inherent motivation to act) on a hypothesized continuum. Extrinsic motivation is categorized into four regulations based on the extent to which it is externally motivated. First, external regulation, the most externally motivated form, is propelled by a demand or reward from outside the self. Second, introjected regulation, which entails an intake of a regulation but not a complete intake as one's own, refers to behaviors conducted to avoid guilt or anxiety or to uplift one's ego. Third, identified regulation refers to cases where one consciously conducts an activity that agrees with a personally important goal. Fourth, integrated regulation, the least externally motivated form, refers to cases in which the activity agrees with one's other goals, beliefs, and activities, so that conducting the activity expresses the self. SDT claims that external regulation can be internalized over time: It can change into a less externally motivated form of extrinsic motivation (i.e., introjected, identified, or integrated regulation). Noels, Pelletier, Clément, and Vallerand (2000) developed an instrument to assess these components of SDT in L2 learning.

Empirical Research

Some researchers investigated Japanese English learners' motivational change over the school years by having university students look back on their past. Sawyer (2006) asked university students to graphically show their motivational fluctuations from junior high school through university. He found that on average, their motivation declined in the 1st year but rose in the 2nd and the 3rd years in high school. Miura (2010) replicated Sawyer's study and found comparable changes in the high school years and suggested that the motivational increases in the later years of high school were strongly influenced by university entrance examinations.

Other researchers looked into Japanese English learners' motivational change using SDT. Hiromori (2003) administered his SDT-based questionnaire to 1st-, 2nd-, and 3rd-year high school students and analyzed the data cross-sectionally. He found that the number of students motivated by external regulation (e.g., pressure from parents) decreased over the high school years. In the 3rd year, there were only those with low motivation and those motivated by identified regulation (e.g., helpfulness of English learning for one's personal development). It may be that the external regulation observed in the early years either had largely disappeared or had been internalized to be identified regulation in the 3rd year. Hayashi (2005) administered a questionnaire using a retrospective design to university students. The results indicated that the average motivational strength of his participants declined in the 1st year, slightly increased in the 2nd year, and rose in the 3rd year of high school, which parallels Sawyer (2006) and Miura's (2010) findings. In addition, his SDT-based analysis of the written reasons for motivational highs and lows indicated that the students who ended up with strong motivation had displayed high introjected/identified regulation[1] (e.g., pressure from teachers mentioned as a reason for a motivational high), which could be considered to be an internalized form of external regulation, in their high school years. Both Hiromori and Hayashi's findings suggested that Japanese high school English learners can internalize external regulation during the high school years.

Research Questions

Past research on the motivational change of Japanese English learners has suggested a general falling-and-then-rising trend and possible internalization of external regulation during the high school years. However, to intervene precisely and effectively, the following questions should be answered: (a) Which particular constructs in the theoretical models fall and rise? (b) Does the growth of an internalized form of external regulation and of any other construct over the high school years predict achievement? Answers to these questions will help teachers decide which constructs to target. In this study, to address (a), motivation was viewed not as a single construct but as a profile made up of multiple constructs measured using the variables in the AMTB (Gardner, 1985) and the SDT scale (Noels et al., 2000). To address (b), this study investigated, for each construct, whether the learners' individual differences at the beginning of high school and the changes in those differences over the high school years predicted achievement, operationalized by their test scores. The research questions are as follows:

1. Which constructs of Japanese high school English learners, measured using the variables in the AMTB and the SDT scale, fall and rise during the 3 high school years?
2. Do the learners' individual differences on any construct at the beginning of high school predict achievement measured by their test scores at the end of high school?
3. Do the changes in the learners' individual differences on any construct over the high school years predict this achievement?

Method

Participants

The participants were 190 1st-year high school students aged 15-16 at the beginning of this study, from a private boys' school in eastern Japan. Because of absenteeism and natural attrition, 185, 173, and 172 of them answered the questionnaire in the 1st, 2nd, and 3rd years of high school, respectively. They all had six to seven 50-minute English classes focused on reading, writing and grammar, and oral communication each week. The teaching methods were mostly traditional: Emphasis was placed on translation, grammatical analysis, and memorization. The teaching materials included books of words and phrases for university entrance examinations and questions from past university entrance examinations, from the 1st year on. Because the participants had all passed the school's competitive entrance examination and intended to proceed to university, their English proficiency (early intermediate) and their academic ability in general were above the national average.

Instrumentation

The Japanese High School Motivation Battery (JHMB), which included a 35-item AMTB section and an 18-item SDT section, was developed.

The AMTB section was based on Gardner's (1985) AMTB. The items were drawn from his AMTB and, if necessary, reworded in accordance with the Japanese context, while the characteristic quality of the variables was maintained. This section was designed to measure eight variables: integrative orientation (IO; two items; e.g., "Studying English is important for me because it will allow me to meet and converse with more and varied people"), interest in foreign languages (IFL; five items; e.g., "I wish I could speak another language perfectly"), attitudes toward native English speakers (ANES; five items; e.g., "Native English speakers are trustworthy and dependable"), motivational intensity (MI; five items; e.g., "When it comes to English homework, I work very carefully, making sure I understand everything"), desire to learn English (DLE; five items; e.g., "If I knew enough English, I would read English magazines and newspapers as often as I could"), attitudes toward learning English (ALE; six items; e.g., "English is an important part of the school program"), instrumental orientation (INST; three items; e.g., "Studying English is important for me because I think it will someday be useful in getting a good job"), and language class anxiety (ANX; four items; e.g., "I get nervous and confused when I am speaking in my English class"). MI mostly measures self-reported behaviors relevant to high school English classes. DLE represents an idealized feeling about learning English rather than a desire, for example, to learn it to pass university entrance examinations. ALE includes attitudes toward learning English at school. The MI and the DLE items

were three-choice items as in Gardner's AMTB. A 5-point Likert scale (1 = *disagree*, 2 = *slightly disagree*, 3 = *neutral*, 4 = *slightly agree*, and 5 = *agree*) was used for the other items, whereas a 7-point Likert scale was used in his AMTB, to reduce the cognitive burden on the participants.

The SDT section was based on the scales used by Noels et al. (2000) and Vandergrift (2005). The items were either adapted from their scales or added anew, whereas the characteristic quality of the variables was preserved. This section was designed to measure four variables: amotivation (AMOT; three items; e.g., "I don't know why I study English"), external regulation (ER; three items; e.g., "[I study English] In order to succeed in university entrance examinations"), introjected/identified regulation (IIR; six items; e.g., "[I study English] Because I think it is important for my personal development"), and intrinsic motivation (IM; six items; e.g., "[I study English] For the pleasure I get in finding out new things"). As in Hayashi (2005), introjected and identified regulations were not distinguished—because students who study English to pursue a personally important goal (identified regulation) may also study it to avoid guilt or anxiety or to uplift their ego (introjected regulation) with their goal as a backdrop—and IIR was viewed as an internalized form of ER. The same 5-point Likert scale as used in the AMTB section was used.

A Japanese version of the JHMB was administered to the participants with the school principal's permission approximately one month after the beginning of the 1st, 2nd, and 3rd years of high school (Time 1, Time 2, and Time 3, respectively) during a homeroom hour.

Achievement

Achievement was measured by the participants' scores on the final high school English achievement test given 5 months before their graduation. The test reflected conventional university entrance examinations in Japan: It included reading comprehension, sentence translation, and grammar/vocabulary questions but did not include listening or speaking components. As the participants entered this private school mainly to prepare for university entrance examinations, their scores on this test were considered to be appropriate measures of their achievement. The 90-minute test consisted of multiple-choice questions (70%) and short questions (30%).

Data Analysis

First, the constructs that the 12 JHMB variables were expected to measure were validated with the Rasch rating scale model (Rasch, 1960), using WINSTEPS 3.68.2 (Linacre & Wright, 2009). A Rasch analysis of item fit and a Rasch PCA of item residuals was performed on each construct. The validation was carried out by ensuring acceptable item fit to the Rasch model and ensuring that each construct was acceptably unidimensional. The criteria were set as follows: (a) Item separation is sufficiently high (above 2.00), (b) no items misfit the Rasch model (infit and outfit mean square statistics are between .50 and 1.50; Linacre, 2009), (c) the variance explained by the Rasch measures is sufficiently high (above 50%), and (d) the unexplained variance explained by first residual contrast is sufficiently low (below 3.0 eigenvalue units; Linacre, 2009). The results indicated that one motivational intensity (MI) item and two introjected/identified regulation (IIR) items did not measure the

constructs these items were expected to measure. These items were deleted from further analysis. As integrative orientation (IO), interest in foreign languages (IFL), and attitudes toward native English speakers (ANES) are hypothesized to measure integrativeness in Gardner's (2010) model (Figure 1), the IO, IFL, and ANES items were analyzed together. The results showed that the IO and IFL items measured one construct (see Tables A1-A3 in Appendix), whereas the ANES items measured another. The participants might have perceived the IO and IFL items as more abstract, whereas they might have found the ANES items easier to relate to because they had been taught by native English-speaking teachers. Hence, IO and IFL were clustered together. External regulation (ER) and instrumental orientation (INST) belong to different theoretical models. However, instrumental reasons originate from outside the self and, therefore, are naturally considered to be external regulations. Indeed, the ER and the INST items are similar: Both include reference to university entrance examinations and good jobs in the future. Thus, the ER and INST items were analyzed together. The results indicated that one item, namely INST1, did not measure the same construct as the other items (see Tables A4-A6 in Appendix). This item was deleted from further analysis, and ER and INST were clustered together. As a result, 10 fundamentally unidimensional constructs were identified across the three waves of data: Integrative Orientation + Interest in Foreign Languages (IO + IFL), Attitudes Toward Native English Speakers (ANES), Motivational Intensity (MI), Desire to Learn English (DLE), Attitudes Toward Learning English (ALE), Language Class Anxiety (ANX), Amotivation (AMOT), External Regulation + Instrumental Orientation (ER + INST), Introjected/Identified Regulation (IIR), and Intrinsic Motivation (IM).

Second, the raw scores from the JHMB were converted into interval Rasch person measures:[2] A person measure was given to each participant for each construct at each measurement time. The descriptive statistics at each time point are shown in Tables 1-3. The Pearson correlation coefficients between the 10 constructs at each measurement are shown in Tables 4-6.

Table 1
Descriptive Statistics at Time 1

	Mean	SD	95% CI	Skew[a]	Kurt[b]
IO + IFL	55.75	6.61	[54.80, 56.71]	.26	1.19
ANES	48.45	8.21	[47.26, 49.64]	-.14	.90
MI	48.85	6.66	[47.88, 49.81]	.16	.22
DLE	54.15	12.15	[52.39, 55.91]	-.30	.20
ALE	51.69	5.88	[50.84, 52.54]	.44	2.72
ANX	49.94	5.52	[49.14, 50.74]	.61	2.03
AMOT	43.09	8.41	[41.87, 44.31]	-.87	2.50
ER + INST	58.19	7.74	[57.07, 59.32]	.31	-.76
IIR	54.65	7.68	[53.53, 55.76]	.27	.81
IM	49.69	7.65	[48.58, 50.80]	.46	1.49

Note. SD = standard deviation; CI = confidence interval; IO + IFL = Integrative Orientation + Interest in Foreign Languages; ANES = Attitudes Toward Native English Speakers; MI = Motivational Intensity; DLE = Desire to Learn English; ALE = Attitudes Toward Learning English; ANX = Language Class Anxiety; AMOT = Amotivation; ER + INST = External Regulation + Instrumental Orientation; IIR = Introjected/Identified Regulation; IM = Intrinsic Motivation.

[a]*SEskew* = .18, [b]*SEkurt* = .36.

Table 2
Descriptive Statistics at Time 2

	Mean	SD	95% CI	Skew[a]	Kurt[b]
IO + IFL	55.88	7.23	[54.79, 56.96]	.23	.42
ANES	48.07	8.38	[46.81, 49.33]	-.24	.20
MI	49.33	8.53	[48.05, 50.61]	.13	-.12
DLE	52.21	11.73	[50.45, 53.97]	-.20	-.08
ALE	51.04	5.91	[50.16, 51.93]	.07	1.38
ANX	50.02	5.87	[49.14, 50.90]	.29	2.14
AMOT	42.47	8.30	[41.22, 43.71]	.14	-.80
ER + INST	57.72	8.11	[56.51, 58.94]	.40	-.99
IIR	53.69	7.87	[52.51, 54.87]	-.13	.99
IM	49.07	8.40	[47.81, 50.33]	-.04	1.10

Note. SD = standard deviation; CI = confidence interval; IO + IFL = Integrative Orientation + Interest in Foreign Languages; ANES = Attitudes Toward Native English Speakers; MI = Motivational Intensity; DLE = Desire to Learn English; ALE = Attitudes Toward Learning English; ANX = Language Class Anxiety; AMOT = Amotivation; ER + INST = External Regulation + Instrumental Orientation; IIR = Introjected/Identified Regulation; IM = Intrinsic Motivation.
[a]SE_{skew} = .19, [b]SE_{kurt} = .37.

Table 3
Descriptive Statistics at Time 3

	Mean	SD	95% CI	Skew[a]	Kurt[b]
IO + IFL	55.99	8.05	[54.78, 57.20]	.32	-.01
ANES	48.73	8.55	[47.44, 50.02]	-.41	.70
MI	51.63	7.70	[50.47, 52.79]	-.21	.08
DLE	51.32	11.55	[49.59, 53.06]	-.27	-.25
ALE	52.66	6.31	[51.71, 53.61]	.04	2.69
ANX	50.27	5.86	[49.39, 51.16]	.15	1.84
AMOT	42.52	8.32	[41.27, 43.78]	.24	-.39
ER + INST	58.13	8.67	[56.83, 59.44]	.16	-.85
IIR	54.09	8.08	[52.88, 55.31]	-.11	.84
IM	49.80	7.71	[48.64, 50.96]	.15	1.69

Note. SD = standard deviation; CI = confidence interval; IO + IFL = Integrative Orientation + Interest in Foreign Languages; ANES = Attitudes Toward Native English Speakers; MI = Motivational Intensity; DLE = Desire to Learn English; ALE = Attitudes Toward Learning English; ANX = Language Class Anxiety; AMOT = Amotivation; ER + INST = External Regulation + Instrumental Orientation; IIR = Introjected/Identified Regulation; IM = Intrinsic Motivation.
[a]SE_{skew} = .19, [b]SE_{kurt} = .37.

Table 4
Intercorrelations of the Rasch Person Measures for the 10 Constructs at Time 1

	1	2	3	4	5	6	7	8	9	10
1. IO + IFL										
2. ANES	.491**									
3. MI	.450**	.364**								
4. DLE	.749**	.468**	.463**							
5. ALE	.657**	.371**	.396**	.617**						
6. ANX	-.033	.024	-.074	-.007	-.030					
7. AMOT	-.434**	-.152*	-.268**	-.413**	-.527**	.109				
8. ER + INST	.323**	.135	.258**	.243**	.280**	.168*	-.214**			
9. IIR	.785**	.443**	.450**	.682**	.661**	-.065	-.470**	.362**		
10. IM	.734**	.639**	.467**	.606**	.632**	.010	-.376**	.253**	.692**	

Note. IO + IFL = Integrative Orientation + Interest in Foreign Languages; ANES = Attitudes Toward Native English Speakers; MI = Motivational Intensity; DLE = Desire to Learn English; ALE = Attitudes Toward Learning English; ANX = Language Class Anxiety; AMOT = Amotivation; ER + INST = External Regulation + Instrumental Orientation; IIR = Introjected/Identified Regulation; IM = Intrinsic Motivation.
**$p < .01$. *$p < .05$.

Table 5
Intercorrelations of the Rasch Person Measures for the 10 Constructs at Time 2

	1	2	3	4	5	6	7	8	9	10
1. IO + IFL										
2. ANES	.617**									
3. MI	.422**	.307**								
4. DLE	.652**	.523**	.534**							
5. ALE	.607**	.464**	.536**	.586**						
6. ANX	-.131	-.040	-.129	-.188*	-.103					
7. AMOT	-.513**	-.276**	-.401**	-.534**	-.685**	.140				
8. ER + INST	.328**	.093	.038	.089	.306**	.098	-.288**			
9. IIR	.755**	.520**	.375**	.668**	.692**	-.087	-.562**	.407**		
10. IM	.692**	.668**	.403**	.594**	.633**	-.073	-.415**	.208**	.709**	

Note. IO + IFL = Integrative Orientation + Interest in Foreign Languages; ANES = Attitudes Toward Native English Speakers; MI = Motivational Intensity; DLE = Desire to Learn English; ALE = Attitudes Toward Learning English; ANX = Language Class Anxiety; AMOT = Amotivation; ER + INST = External Regulation + Instrumental Orientation; IIR = Introjected/Identified Regulation; IM = Intrinsic Motivation.
**$p < .01$. *$p < .05$.

Table 6
Intercorrelations of the Rasch Person Measures for the 10 Constructs at Time 3

	1	2	3	4	5	6	7	8	9	10
1. IO + IFL										
2. ANES	.462**									
3. MI	.364**	.128								
4. DLE	.593**	.248**	.433**							
5. ALE	.628**	.241**	.443**	.576**						
6. ANX	-.111	.233**	-.183*	-.174*	-.115					
7. AMOT	-.380**	.138	-.314**	-.308**	-.516**	.171*				
8. ER + INST	.431**	.117	.124	.108	.297**	.131	-.335**			
9. IIR	.772**	.387**	.358**	.486**	.657**	-.077	-.439**	.455**		
10. IM	.679**	.575**	.324**	.470**	.576**	-.028	-.104	.255**	.669**	

Note. IO + IFL = Integrative Orientation + Interest in Foreign Languages; ANES = Attitudes Toward Native English Speakers; MI = Motivational Intensity; DLE = Desire to Learn English; ALE = Attitudes Toward Learning English; ANX = Language Class Anxiety; AMOT = Amotivation; ER + INST = External Regulation + Instrumental Orientation; IIR = Introjected/Identified Regulation; IM = Intrinsic Motivation.
**$p < .01$. *$p < .05$.

Finally, to evaluate the effects of motivational change on achievement, the participants' questionnaire data and their test scores were analyzed with latent growth curve (LGC) modeling involving sequelae of change, using EQS version 6.1 (Bentler & Wu, 2007). In the model, the participants' individual differences at the beginning of high school and the changes in those differences over the high school years were represented by the intercepts (i.e., their person measures at Time 1) and the slopes (i.e., the rises or declines of their person measures between Times 1 and 3), respectively. The LGC modeling was used in this study because it allows the individual's motivational trajectory, represented by the intercept and slope, to be treated as a predictor.

Figure 2 shows the linear-growth LGC model used in this study for each construct. Note that observed variables V1, V2, and V3 (i.e., the participants' person measures for the construct at Times 1, 2, and 3, respectively) are represented by two latent variables, the intercept and the slope, which are estimated. The intercept is a constant for any given individual for any given construct across time; hence, its factor loadings were fixed at 1 for each measurement time. The slope is the rate of change; assuming that the slope is linear, the factor loadings for the slope were set at 0, 1, and 2 for Times 1, 2, and 3, respectively. The achievement (i.e., the participants' *T* scores[3] on the achievement test) was hypothesized to be predicted by the intercept and the slope: The thick arrows from the intercept and the slope to the achievement represent this hypothesis. The asterisks indicate that the parameters, which indicate the strength of the effect, are estimated.[4]

The factor loadings for the slope were set linearly at 0: 1: 2 originally. However, the growth rate that fits the data best might not always be linear. Thus, in addition to the linear-growth model, two non-linear models were made for each construct and tested for comparison. In the first model, the growth rate was set so that it reflected the construct's mean person measures at Times 1-3 (Tables 1-3).[5] In the second model, the growth rate was set so that the *t* value for the slope → achievement parameter was largest.[6] This approach was adopted because a *t* value greater than |1.96| for the parameter indicates that the growth/decline of the construct over the high school years predicts achievement, which will lead to pedagogical implications. As a result, three models (i.e., one linear and two non-linear models) were obtained for each construct, and the best-fitting model was selected for each construct. Goodness of fit was evaluated using the chi-square (χ^2), comparative fit index (CFI), and root mean square error of approximation (RMSEA). The best-fitting models[7] are shown in Table 7.

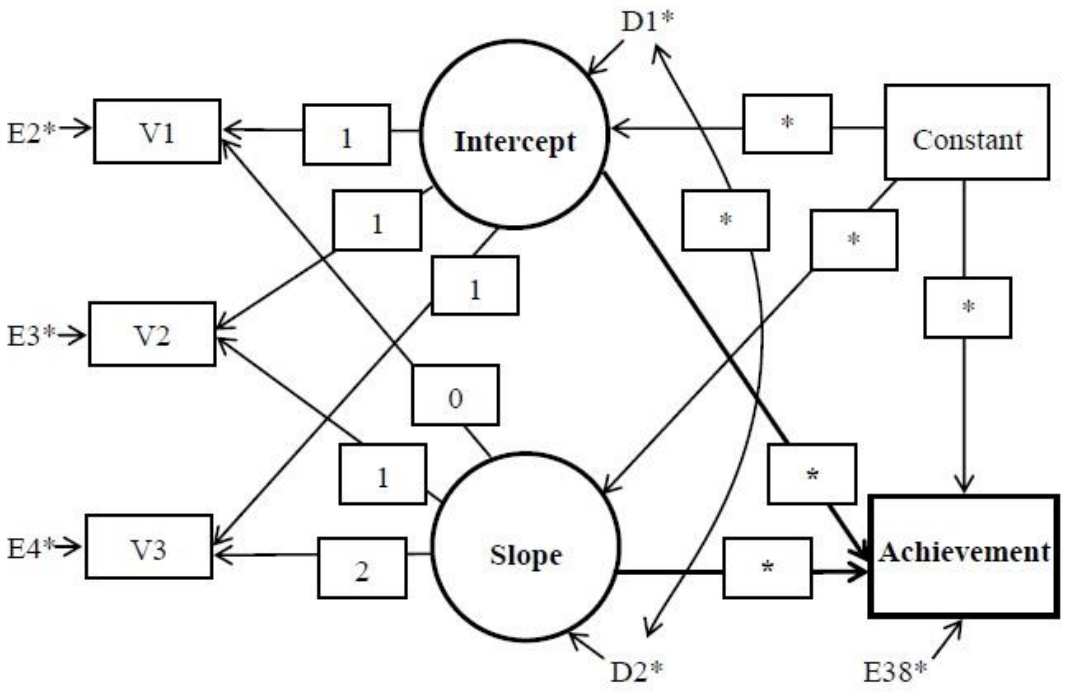

Figure 2. Representation of the linear-growth LGC model used in this study. V's = observed variables; D's = disturbances; E's = errors.

Results

Changes in Average Motivational Profile

Tables 1-3 show the mean person measures for the 10 constructs at each measurement time. A one-way repeated-measures ANOVA was conducted for each construct to assess whether there were significant differences in the means over time, using PASW Statistics 18.0. The results indicated a significant difference for Motivational Intensity (MI), Wilks' $\Lambda = .88$, $F(2, 159) = 10.99$, $p < .05$; Desire to Learn English (DLE), Wilks' $\Lambda = .87$, $F(2, 159) = 11.44$, $p < .05$; and Attitudes Toward Learning English (ALE), Wilks' $\Lambda = .91$, $F(2, 159) = 8.38$, $p < .05$. Following the significant results, paired-samples *t*-tests were conducted for the Time 1-Time 2, Time 1-Time 3, and Time 2-Time 3 pairs for each of these constructs to assess which means differed significantly from each other. The alpha level was set at .017 using the Bonferroni method (.05 / 3 = .017) to control for Type I error. Significant difference was found for MI between Times 1 and 3, $t(166) = -4.56$, $p < .017$, and between Times 2 and 3, $t(165) = -3.40$, $p < .017$; DLE between Times 1 and 2, $t(167) = 3.24$, $p < .017$, and between Times 1 and 3, $t(166) = 4.97$, $p < .017$; and ALE between Times 2 and 3, $t(165) = -4.09$, $p < .017$. Figure 3 represents the changes in these constructs. Note that the decline of DLE was the only significant change between Times 1 and 2, and the increases of MI and ALE were the only significant changes between Times 2 and 3.

Table 7

Predicting Achievement by the Best-Fitting Models

Construct	Intercept → Achievement		Slope → Achievement		Growth rate		
	Parameter	*t*	Parameter	*t*	T1:	T2:	T3
IO + IFL	.32	3.88*	.19	1.76	0:	1:	2.00
ANES	.31	2.38*	.31	1.62	0:	1:	1.53
MI	.24	2.76*	.41	2.85*	0:	1:	3.45
DLE	.37	3.65*	-.48	-1.40	0:	-1:	-1.46
ALE	.38	4.66*	.26	2.47*	0:	1:	2.00
ANX	-.21	-1.95	-.01	-.05	0:	1:	4.13
AMOT	-.49	-3.57*	-.39	-2.52*	0:	1:	1.17
ER + INST	-.01	-.08	.25	.17	0:	-1:	-.13
IIR	.43	4.62*	.18	1.70	0:	1:	1.58
IM	.42	4.22*	.38	3.04*	0:	1:	1.87

(Table 7 continues)

(Table 7 continued)

Construct	Fit index						
	df	χ^2	*p*	CFI	RMSEA	90% CI of RMSEA	
						LB	UB
IO + IFL	2	1.51	.47	1.00	.05	.00	.23
ANES	2	.77	.68	1.00	.00	.00	.03
MI	2	6.33	.04	.97	.18	.07	.33
DLE	2	.23	.89	1.00	.00	.00	.15
ALE	1	.06	.80	1.00	.00	.00	.13
ANX	2	.34	.84	1.00	.00	.00	.14
AMOT	2	1.06	.59	1.00	.02	.00	.21
ER + INST	1	.50	.48	1.00	.00	.00	.19
IIR	2	2.78	.25	1.00	.00	.00	.17
IM	2	2.58	.28	1.00	.00	.00	.14

Note. The *t* values greater than |1.96| indicate a parameter estimate that is significantly different from zero. Parameters estimated for regressions (→) are presented in standardized form. A free parameter was added to the ALE and the ER + INST models based on the Lagrange Multiplier test. IO + IFL = Integrative Orientation + Interest in Foreign Languages; ANES = Attitudes Toward Native English Speakers; MI = Motivational Intensity; DLE = Desire to Learn English; ALE = Attitudes Toward Learning English; ANX = Language Class Anxiety; AMOT = Amotivation; ER + INST = External Regulation + Instrumental Orientation; IIR = Introjected/Identified Regulation; IM = Intrinsic Motivation; CFI = comparative fit index; RMSEA = root mean square error of approximation; CI = confidence interval.

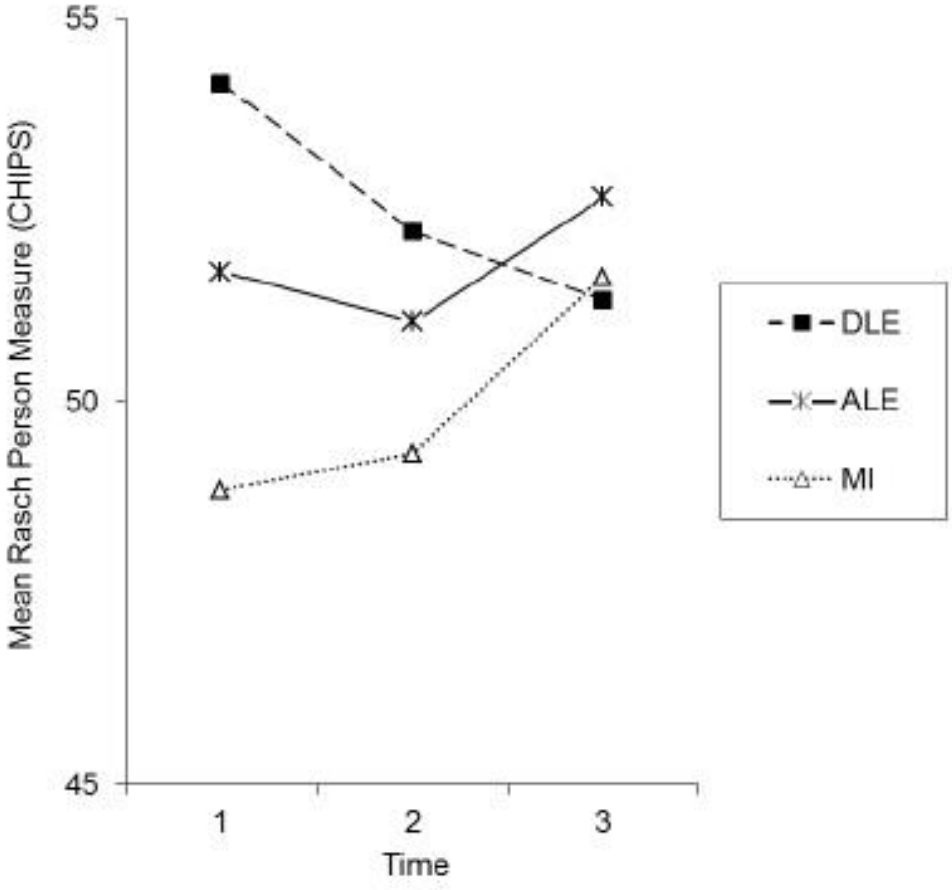

Figure 3. Changes in the mean Rasch person measures for DLE, ALE, and MI. DLE = Desire to Learn English; ALE = Attitudes Toward Learning English; MI = Motivational Intensity.

Predicting Achievement by Initial Individual Differences

Table 7 shows that the intercept → achievement parameter estimates were significant for all constructs except Language Class Anxiety (ANX) and External Regulation + Instrumental Orientation (ER + INST). The results indicate that lower person measures for Amotivation (AMOT) and higher person measures for the remaining seven constructs at the beginning of high school predicted higher achievement (The negative parameter value for AMOT indicates that the lower the initial person measure, the higher the achievement).

Predicting Achievement by Changes in Individual Differences Over Time

Table 7 shows that the slope → achievement parameter estimates were significant for Motivational Intensity (MI), Attitudes Toward Learning English (ALE), Amotivation (AMOT), and Intrinsic Motivation (IM). The results indicate that the growth of MI, ALE, and IM and the decline of AMOT over the high school years predicted higher achievement (The negative parameter value for AMOT indicates that its decline predicted higher achievement).

Discussion

Changes in Average Motivational Profile

Tables 1-3 as a whole do not show the falling-and-then-rising trend of Japanese high school English learners' motivation suggested by the literature (Hayashi, 2005; Miura, 2010; Sawyer, 2006). However, considering that motivation was conceptualized as a single construct in the past studies but as a profile composed of 10 constructs in this study, the form of motivation applied in the past studies might correspond to a few of the constructs in this study. In this study, the decline of Desire to Learn English (DLE) was the only significant change between Times 1 and 2, and the increases of Motivational Intensity (MI) and Attitudes Toward Learning English (ALE) were the only significant changes between Times 2 and 3 (Figure 3). Note that these constructs are the components of motivation in Gardner's (2010) model (Figure 1). Thus, using his conceptualization of motivation, the results of this study indicate that motivation declined between Times 1 and 2 and rose between Times 2 and 3, which is comparable with the trend suggested by the literature. The results of this study also indicate which components of motivation changed.

It may be that the class's increasing focus on the preparation for university entrance examinations[8] undermined some students' Desire to Learn English (DLE), which represents students' feelings about learning English unrelated to university entrance examinations, in the early years of high school. DLE continued to decline (Figure 3) probably because as the students got deeper and deeper into the preparation for university entrance examinations, the issues described by the DLE items, including talking to English-speaking neighbors and seeing an English play, became less and less relevant. On the other hand, most students, hoping to enter a prestigious university, began to study English seriously in the later years of high school. This may have been reflected in the rise of Motivational Intensity (MI) and Attitudes Toward Learning English (ALE), which represent students' behaviors and attitudes, respectively, relevant to learning English at school.

Predicting Achievement

Table 7 shows that achievement was predicted by the slopes (i.e., the rises or declines of the participants' person measures between Times 1 and 3) for Motivational Intensity (MI), Attitudes Toward Learning English (ALE), Amotivation (AMOT), and Intrinsic Motivation (IM) (Group 1). On the other hand, achievement was predicted not by the slopes but by the intercepts (i.e., the participants' person measures at Time 1) for Integrative Orientation + Interest in Foreign Languages (IO + IFL), Attitudes Toward Native English Speakers (ANES), Desire to Learn English (DLE), and Introjected/Identified Regulation (IIR) (Group 2). These results can be interpreted as follows: The Group 2 constructs take more time to affect achievement than the Group 1 constructs. How does this interpretation fit in with the theoretical models?

Regarding Group 1, according to Gardner's (2010) model (Figure 1), Motivational Intensity (MI) and Attitudes Toward Learning English (ALE) are components of motivation, which can affect achievement directly. Intrinsic Motivation (IM) and Amotivation (AMOT) are not included in his model. However, IM fits into

motivation because it concerns positive affect toward learning English. AMOT is the antithesis of motivation; therefore, it also fits into motivation although in the opposite way from its other components. As the constructs in Group 1 are all components of motivation and affect achievement directly, Group 1 taking less time to affect achievement is in agreement with Gardner's model.

Regarding Group 2, according to Gardner's (2010) model, Integrative Orientation + Interest in Foreign Languages (IO + IFL) and Attitudes Toward Native English Speakers (ANES) are components of integrativeness, which can affect achievement indirectly via motivation. Introjected/Identified Regulation (IIR) is not included in his model. However, as IIR can be considered to be a somewhat-internalized form of External Regulation + Instrumental Orientation (ER + INST), which belongs to instrumentality in his model, IIR fits between instrumentality and motivation[9] and affects achievement indirectly via motivation. As they all exert indirect effects via motivation, IO + IFL, ANES, and IIR taking more time to affect achievement is compatible with Gardener's model. As Desire to Learn English (DLE) is a component of motivation in Gardner's model, it does not seem to fit into Group 2. Because achievement was measured using a test similar to university entrance examinations, which DLE does not concern, DLE might not have the same effect in this study as hypothesized in Gardener's model.

Conclusion

This study investigated Japanese high school English learners' motivational changes and their effects on achievement. Major findings and implications are as follows.

Concerning the changes in the average motivational profile, Desire to Learn English (DLE) declined in the early years of high school, whereas Motivational Intensity (MI) and Attitudes Toward Learning English (ALE) increased in the later years of high school. These changes may explain the falling-and-then-rising trend found in the literature (Hayashi, 2005; Miura, 2010; Sawyer, 2006). DLE (i.e., idealized feelings about learning English) declined possibly because the students began to concentrate on the preparation for university entrance examinations. However, as high school students' ultimate goal of learning English should be beyond passing university entrance examinations (e.g., Ministry of Education, Culture, Sports, Science and Technology, 2011), their DLE ought to be raised. To develop students' DLE, teachers should be encouraged not to focus on university entrance examinations strongly in the early years of high school but to expose them frequently to real-life English in the media, on the Internet, and by English-speaking people schools may invite.

Concerning the effects of motivational change, higher achievement was predicted by the growth of Motivational Intensity (MI), Attitudes Toward Learning English (ALE), and Intrinsic Motivation (IM) and the decline of Amotivation (AMOT) over the high school years. High school teachers might want to target these constructs. To develop students' IM (i.e., inherent motivation to learn English) and prevent their AMOT (i.e., lack of motivation to learn English), teachers ought to engage them in more activities in which they acquire knowledge, accomplish challenging work, and get stimulated through their use of English, such as projects and services to foreigners. On the other hand, as the results suggested, MI and ALE (i.e., behaviors and attitudes, respectively,

pertinent to learning English at school) can be expected to increase in the later years of high school as university entrance examinations draw near.

In addition, concerning the theoretical models, the results suggested that all constructs identifiable with Gardner's (2010) motivation but Desire to Learn English (DLE) take less time to influence achievement than other constructs.

The limitations of this study include what follows. First, the participants were all private school students intending to proceed to university; thus, they do not represent the entire high school student population in Japan. In addition, the sample size was too small to conduct factor analysis. Second, achievement was measured using a test similar to conventional university entrance examinations in Japan. Had it been measured differently, the results on its prediction might not have been the same. Therefore, due caution is necessary before generalizing the results of this study.

Notes

[1]Hayashi (2005) did not distinguish the two regulations.
[2]The logit scale was transformed into a CHIPS scale (item mean = 50.0).
[3]$T = 10z + 50$. The *T* score is known as *hensachi* in Japan.
[4]The parameters were estimated using the maximum likelihood procedure.
[5]For example, for IO + IFL, the growth rate was set at 0: 1: 1.85 because the difference between the means at Time 1 and Time 3 was 1.85 times as large as the difference between the means at Time 1 and Time 2: (55.99 – 55.75) / (55.88 – 55.75) ≒ 1.85.
[6]The first two loadings of the original 0: 1: 2 loadings were retained and the third loading was changed until the *t* value for the slope → achievement parameter was at its largest value. For instance, the maximum *t* value for the slope → achievement parameter for IO + IFL occurred when the third loading was 1.28; hence, the growth rate for IO + IFL was set at 0: 1: 1.28.
[7]The best-fitting models for IO + IFL and ALE were linear-growth models; those for DLE, ANX, and ER + INST were mean-based models; and those for ANES, MI, AMOT, IIR, and IM were *t* value-based models.
[8]For example, the oral communication class taught by a native English-speaking teacher was not given in the last 2 years of high school.
[9]IIR should not be identified with motivation because it is still extrinsic and concerns separable outcome.

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Appendix

Rasch Tables

Table A1

Rasch PCA of Item Residuals for the IO and IFL Items at Time 1

Item	Residual loading	Measure	*SE*	Infit		Outfit	
				MNSQ	ZSTD	MNSQ	ZSTD
07 IFL5	.65	51.8	.4	.72	-2.9	.70	-2.8
05 IFL3	.46	50.1	.4	1.27	2.2	1.17	1.3
02 IO2	.16	53.4	.4	.95	-.4	1.11	1.0
06 IFL4	.10	53.5	.4	1.12	1.1	1.09	.8
03 IFL1	-.59	47.1	.5	1.26	1.9	1.20	1.3
04 IFL2	-.58	44.5	.6	1.33	2.2	1.13	.7
01 IO1	-.40	49.6	.4	.74	-2.5	.73	-2.3

Note. The logit scale was transformed into a CHIPS scale (item mean = 50.0). IO = Integrative Orientation; IFL = Interest in Foreign Languages.

Table A2

Rasch PCA of Item Residuals for the IO and IFL Items at Time 2

Item	Residual loading	Measure	*SE*	Infit		Outfit	
				MNSQ	ZSTD	MNSQ	ZSTD
02 IO2	.64	52.6	.4	1.15	1.4	1.19	1.5
01 IO1	.52	50.0	.4	.70	-2.8	.73	-2.2
07 IFL5	.29	52.3	.4	.82	-1.7	.84	-1.3
04 IFL2	-.62	44.4	.6	1.10	.7	.81	-.9
03 IFL1	-.46	47.4	.5	1.11	.9	1.21	1.3
06 IFL4	-.26	53.8	.4	1.08	.8	1.16	1.3
05 IFL3	-.22	49.4	.4	1.24	1.9	1.17	1.2

Note. The logit scale was transformed into a CHIPS scale (item mean = 50.0). IO = Integrative Orientation; IFL = Interest in Foreign Languages.

Table A3

Rasch PCA of Item Residuals for the IO and IFL Items at Time 3

Item	Residual loading	Measure	*SE*	Infit		Outfit	
				MNSQ	ZSTD	MNSQ	ZSTD
04 IFL2	.82	46.0	.5	1.03	.3	1.17	1.0
03 IFL1	.74	48.2	.5	1.09	.7	1.11	.8
05 IFL3	.00	48.6	.5	.94	-.4	.86	-1.0
07 IFL5	-.56	52.1	.4	.92	-.7	.92	-.7
02 IO2	-.33	52.8	.4	.95	-.4	1.00	.0
06 IFL4	-.32	52.6	.4	1.24	2.0	1.23	1.8
01 IO1	-.10	49.6	.5	.91	-.7	.92	-.5

Note. The logit scale was transformed into a CHIPS scale (item mean = 50.0). IO = Integrative Orientation; IFL = Interest in Foreign Languages.

Table A4

Rasch PCA of Item Residuals for the ER and INST Items at Time 1

Item	Residual loading	Measure	*SE*	Infit		Outfit	
				MNSQ	ZSTD	MNSQ	ZSTD
13 INST1	.74	54.6	.4	1.41	3.6	1.64	5.1
14 INST2	.56	50.8	.4	.94	-.5	.87	-1.1
38 ER1	-.68	46.6	.5	.93	-.6	.81	-1.3
40 ER3	-.49	51.7	.4	.90	-.9	.91	-.8
15 INST3	-.41	46.2	.5	1.10	.8	.94	-.4
39 ER2	-.21	50.0	.4	.85	-1.3	.80	-1.7

Note. The logit scale was transformed into a CHIPS scale (item mean = 50.0). ER = External Regulation; INST = Instrumental Orientation.

Table A5

Rasch PCA of Item Residuals for the ER and INST Items at Time 2

Item	Residual loading	Measure	*SE*	Infit		Outfit	
				MNSQ	ZSTD	MNSQ	ZSTD
13 INST1	.81	53.5	.4	1.50	4.1	1.69	5.1
14 INST2	.58	49.9	.4	1.11	1.0	1.14	1.1
38 ER1	-.69	47.0	.5	.90	-.7	.74	-1.8
15 INST3	-.59	47.1	.5	1.24	1.7	1.07	.5
39 ER2	-.48	50.9	.4	.74	-2.5	.73	-2.3
40 ER3	-.32	51.7	.4	.81	-1.8	.80	-1.8

Note. The logit scale was transformed into a CHIPS scale (item mean = 50.0). ER = External Regulation; INST = Instrumental Orientation.

Table A6

Rasch PCA of Item Residuals for the ER and INST Items at Time 3

Item	Residual loading	Measure	*SE*	Infit		Outfit	
				MNSQ	ZSTD	MNSQ	ZSTD
38 ER1	.80	46.2	.5	1.40	2.6	1.17	1.1
15 INST3	.74	46.1	.5	1.08	.6	.82	-1.1
39 ER2	.10	51.3	.4	.65	-3.3	.65	-3.2
13 INST1	-.70	53.2	.4	1.60	4.6	1.86	5.7
14 INST2	-.42	50.9	.4	.70	-2.8	.69	-2.8
40 ER3	-.02	52.2	.4	.87	-1.1	.89	-.9

Note. The logit scale was transformed into a CHIPS scale (item mean = 50.0). ER = External Regulation; INST = Instrumental Orientation.