

The effects of teacher motivational practice on learner L2 achievement: A self-determination theory perspective using structural equation modeling

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Abstract

A central point that has attracted researchers' attention for several decades is related to establishing the causal relationship between student motivation and second language (L2) achievement. Based on self-determination theory, we investigated the effects of motivational interventions applied by English language teachers on subsequent L2 achievement through the mediating effect of students' basic psychological need for autonomy, intrinsic motivation, and motivational intensity. To obtain precise results, we applied structural equation modeling (SEM) to examine whether the impact of the intervention on L2 achievement was direct and/or indirect. The results of SEM indicated that the effect is both direct and indirect, and the model variables explained approximately 87% of the variance in students' achievement. Moreover, the indirect effects of the intervention on L2 achievement were significant, suggesting the key role that autonomy and intrinsic motivation played in understanding the positive impact of teacher motivational strategies on students' language achievement. The experimental-driven findings represented by the SEM model in the present study denote a strong empirical evidence of the role of teacher motivational practice on student L2 achievement and important implications for the English as a foreign language (EFL) profession in this regard.

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Keywords

basic psychological needs, experiment, motivational intervention, self-determination theory, structural equation modeling

I Introduction

Motivation is considered one of the most significant determinants of success for learning foreign/second languages (L2) (Gao et al., 2024). A large amount of past research (e.g. Alrabai, 2016, 2022a; Ellis, 1994; Gardner, 2010) emphasized that intrinsically motivated individual learners tend to better attain foreign language proficiency. Self-determination theory (SDT; Ryan & Deci, 2000) is a framework that highlights the necessary conditions supposed to influence student motivation necessary to maintain students' subsequent classroom functions (Zhou et al., 2023). In light of this framework, students' basic psychological needs (BPN) of autonomy, competence, and relatedness are prerequisite inherent motivational resources that must be satisfied for deliberate learner motivation to occur (Al-Hoorie et al., 2022; Noels et al., 2019; Ryan & Deci, 2000; Zhou et al., 2023). These motivational assets can be promoted with proper teacher motivational practice that takes into account students' BPN. Such teacher motivational practice has not only been found to be connected to satisfying students' BPN (Alrabai, 2021; Dincer et al., 2019; Reeve, 2016), thus promoting their ultimate motivation (Alrabai, 2016; Alamer, 2022a; Moskovsky et al., 2013) but also to positively influencing their actual academic achievement in L2 (Wang et al., 2021). In this respect, motivation has been identified as a highly significant positive predictor of L2 achievement (Alrabai, 2016; Alamer & Lee, 2019; Dörnyei & Chan, 2013; Mercer et al., 2012).

The positive relationship between teacher motivational practice and different aspects of students' BPN and learning outcomes (i.e. L2 achievement) has been established by the findings of these studies. However, these positive links have been established via non-experimental research designs using old-generation statistical analyses that tend to be an inch deep in establishing the cause-and-effect relationship among these variables. For this reason, the magnitude and patterns of the complex dynamic relationships in the language classroom via experimental research designs and advanced data analyses have yet to be uncovered. For example, studying the indirect effects of teacher motivational practice on student L2 achievement has never, to the knowledge of the authors, been tested via structural equation modeling (SEM) based on experimental data, which the present study tries to fulfill. That said, this study, by deploying advanced and new-generation statistical analyses, is anticipated to offer novel insights into unraveling the complex empirical interactions between the teacher motivational practice in the language classroom and students' motivational experiences and autonomy. This would consequently advance our knowledge of the role that such interactions play in learners' actual L2 achievement, thereby paving the way for better understanding of the steps that can be taken to best capitalize on such interplay between these factors in the L2 domain.

II Literature review

I Teacher motivational practice

Gardner (1985, p. 10) conceptualized L2 motivation as ‘a combination of effort plus desire to achieve the goal of learning the language plus favorable attitudes toward learning the language’. Motivation has been found to be strongly linked to many aspects of language learning. In this respect, it is well acknowledged by past research that individuals motivated to learn an L2 usually exhibit a higher degree of positive attitudes, autonomy, motivational intensity, persistence, resilience, enjoyment, and engagement and a lower degree of anxiety and disengagement than individuals who are less motivated (Alamer & Lee, 2019; Arabai, 2021; Dewaele & Ergün, 2020; Gardner, 2010; Khodadady & Khajavy, 2013; Mercer et al., 2012; Noels et al., 2019; Zhou et al., 2023). Motivation has also been recognized as one of the strongest predictors of success in the course of learning foreign/second languages. This fact has been well established not only by cross-sectional and correlational studies (e.g. Alamer & Lee, 2019; Botes et al., 2020; Dörnyei, 1994; Hashimoto, 2002) but also by longitudinal (Arabai, 2021, 2022a; Oga-Baldwin et al., 2017) and experimental interventions in language classrooms (Arabai, 2016, 2022a, 2022b; Moskovsky et al., 2013).

Regarding actual practice in the classroom, Reeve (2009, 2016) described teacher motivational practice as interpersonal behavior by which the teacher employs habitual and deliberate actions for the purpose of enhancing students’ participation and involvement in academic tasks and activities. In this respect, Zhou et al. (2023) emphasized that teacher motivational practice from an SDT perspective involves autonomy support by the teacher, which entails providing interactive support to students as well as understanding and valuing their perspectives, interests, needs and goals. The authors illustrated that autonomy-supportive instruction is usually associated with desired learning outcomes such as student engagement and motivation (Ahmadi et al., 2022; Zhou et al., 2023) since it satisfies their BPN of autonomy, competence, and relatedness (Aelterman et al., 2019; Reeve, 2016).

Both quasi-experimental studies and longitudinal investigations offer empirical evidence for the effectiveness of teacher motivational practice in promoting different aspects of language learning. Such a positive influence of teacher motivational practice in the language class was not limited to enhanced L2 motivation demonstrated by L2 learners (Bureau et al., 2022; Moskovsky et al., 2013) but also increased levels of academic L2 achievement (Alamer & Arabai, 2023; Arabai, 2016, 2022a; Wang et al., 2024), a higher degree of associated positive emotions (Arabai, 2022a), enhanced sense of autonomy and control over learning (Arabai, 2021; Dincer et al., 2019), autonomy need satisfaction (Carreira, 2012; Chaffee et al., 2014; Reeve et al., 2018; Zhou et al., 2023), and higher L2 proficiency (Arabai, 2022b). While these investigations, including the intervention studies, have shed light on the importance of many elements and components falling within the SDT perspective, they, nonetheless, overlooked other important aspects. One of such largely unexplored aspects is the interconnected and dynamic relationship between the teachers’ motivational classroom practice and learner achievement in the foreign language. In particular, the issue of how such practice causally impacts

students' motivational resources (i.e. their BPN), and how all that is manifested in learner achievement in the foreign language is not yet precisely established via an advanced approach of statistical analyses that uses experimental research designs in the L2 domain; which is an endeavor of the present research.

2 Self-determination theory

Self-determination theory (SDT) is a key framework in L2 motivation research that has been successfully applied for decades (Noels, 2023; Noels et al., 1999). SDT typically revolves around three basic psychological needs that allow humans to flourish and progress: autonomy, competence, and relatedness. Of these three needs, autonomy 'allowing students' to feel in control of their behaviors and actions, taking their input, choice, and perspective into account, providing them with rationales, and helping them set intrinsic goals for learning' remains the central and most critical need that need-supportive intervention should principally target. In this respect, the assumptions made by earlier research (Ahmadi et al., 2022; Alrabai & Algazzaz, 2024; Reeve & Cheon, 2021) have illustrated that autonomy-supportive teaching interventions usually increase satisfaction not only for students' need of autonomy but rather for all three basic psychological needs of students. Based on these assumptions, the intervention in this study was primarily geared towards boosting students' need of autonomy in the first place as a prerequisite step for satisfying the other students' needs and eventually developing their L2 achievement.

A central component of SDT is the importance it attaches to intrinsic motivation (Ryan & Deci, 2017). There are two types of language motivation that are conceived based on the postulations of SDT: autonomous vs. controlled motivation. Autonomous motivation encompasses two types of orientations, namely, intrinsic orientation, which pertains to learning an L2 because the learner perceives it interesting, fun, and enjoyable, and identified orientation, which refers to learning an L2 because the learner considers learning this language as important and meaningful. Controlled motivation, on the other hand, involves two additional orientations: introjected orientation, which represents a desire to learn an L2 in satisfaction with external regulators, such as family members, the language teacher or the community, and external orientation, which refers to certain behaviors, such as obtaining recognition from others or avoiding punishment.

In language learning research, intrinsic motivation is mostly found to be positively associated with engagement (Dincer et al., 2019; Noels et al., 2019; Oga-Baldwin et al., 2017), higher vocabulary knowledge (Alamer, 2022a), continued learning during difficult times such as in Covid-19 (Alamer, 2022b) and language achievement (Alrabai, 2021; Noels et al., 1999, 2019). A main focus in SDT research is that intrinsic motivation to learn an L2 can be largely affected by how the learner conceives the learning environment (Alamer & Alrabai, 2023; Alrabai, 2016; Noels, 2023). In light of the SDT postulations, autonomy-supportive practices have been found to be one of the environmental conditions to critically influence student motivation (Zhou et al., 2023). As a result, positive connections were established in the L2 literature between experiencing autonomy and demonstrating intrinsic motivation for language learning (e.g. Alamer, 2022a, 2022b; Noels et al., 1999; Reeve, 2022). The learner is expected to be intrinsically motivated

when his or her sense of autonomy is fulfilled (Alamer & Lee, 2019). A particular emphasis is placed on the role of the teacher in enhancing students' autonomy and subsequently their intrinsic motivation (Alamer & Alrabai, 2023; Alrabai, 2016; Reeve, 2022). Research shows that when teachers communicate in an autonomous supportive manner, students are more likely to express a higher sense of self-autonomy, and vice versa. For instance, by connecting the classroom material to students' personal experiences, using real-world examples, or teaching about topics that are relevant to the culture and community of the target language, students are more likely to be intrinsically motivated (Dincer et al., 2019; Noels, 2023). In addition, research indicates that intrinsic motivation is a key resource for students to engage in classroom activities (Alamer, 2022a, 2022b) and, more importantly, the actual achievement of L2 (Alamer & Alrabai, 2023). For instance, Noels et al. (2019) show that via the application of cross-lagged panel analysis, intrinsic motivation predicts L2 engagement over time.

SDT is considered a comprehensive and powerful conceptual framework that can efficiently link teachers' instructional practice with students' behaviors (Ryan & Deci, 2020; Zhou et al., 2023). This theory posits that SDT-based teacher motivational behaviors usually positively influence student basic psychological needs in that such practices are usually linked to higher degree of learner BPN satisfaction and lower degree of BPN frustration (Aelterman et al., 2019; Reeve, 2016). In addition, past research has established that the positive influence that the teacher practice usually exert on learner BPN usually does in turn positively influence students' motivational experiences (Ahmadi et al., 2022; Bureau et al., 2022; Moskovsky et al., 2013), and consequently their learning outcomes such as engagement (Skinner et al., 2009; Zhou et al., 2023) and L2 achievement (Alamer & Alrabai, 2023; Alrabai, 2016, 2022a). For this reason, the intervention in the present study is set out to investigate the empirical links between teacher motivational practice and student behavior within the lens of SDT.

III Research purpose and questions

The present study is based on self-determination theory and is concerned with evaluating the mediating role of sense of autonomy, intrinsic motivation and motivational intensity on the effect of motivational intervention applied by the teacher on students' L2 achievement. Although a previous study examined the effect of motivational interventions on L2 achievement (i.e. Alrabai, 2016), that study did not consider the indirect effects (i.e. mediation processes) of key variables in accounting for the relationship between the intervention and achievement, such as autonomy, intrinsic motivation and motivational intensity. Without understanding the motivational process, we would lack important details that can inform research and practice in the field. Therefore, the present study examines two research questions:

- Research question 1: Is the effect of the motivational intervention on students' L2 achievement direct or indirect?
- Research question 2: Do sense of autonomy, intrinsic motivation, and motivational intensity mediate the effect of the motivational intervention on L2 achievement?

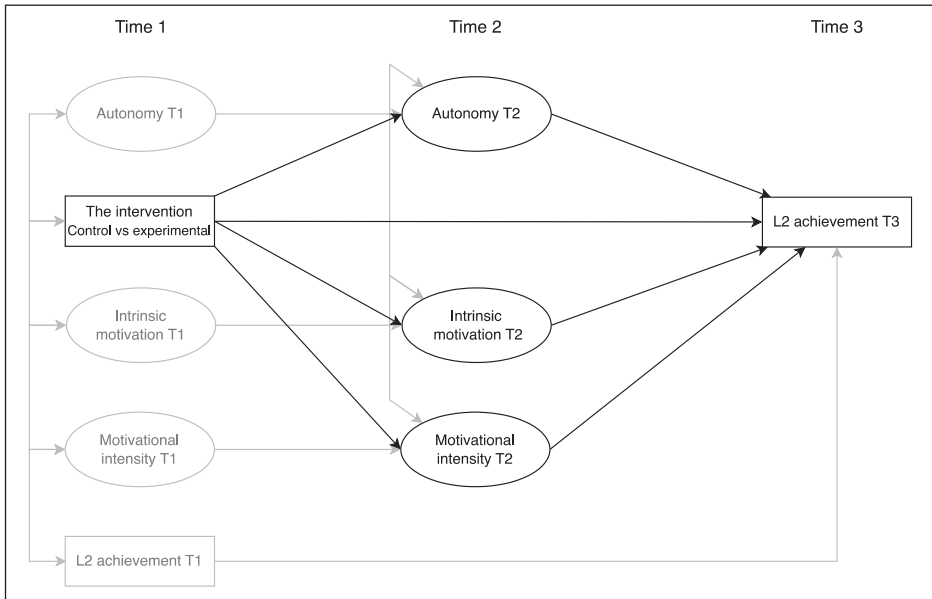


Figure 1. The hypothesized model.

We answer these research questions through the SEM approach which allows us to obtain richer results for the anticipated cause-and-effect of the intervention on L2 achievement and to assess the mediation effect of certain variables in this mediational processes. Drawing on the SDT-focused studies reviewed earlier in this study, we postulate that teachers' teaching motivational practice can have a direct effect on students' sense of autonomy, which, in turn, affects their intrinsic motivation and, further, their engagement (i.e. motivational intensity), and eventually their L2 achievement. The hypothesized model is depicted in Figure 1.

IV Methods

A non-probability convenience method of sampling was adopted since it was convenient in finding available and willing to participate respondents. Fourteen volunteer English as a foreign language (EFL) teachers from 5 institutions participated in this study. These participating teachers encompassed a wide range of qualifications, teaching experiences, and age ranges, as seen in the social demographics shown in Table 1.

A total of 437 English-major students took part in this study. These learners were native speakers of Arabic, and they had similar ages, social and educational backgrounds and L2 proficiency levels (intermediate to relatively high English language proficiency). Demographic information of the participating learners in this study is presented in Table 2.

To satisfy the quasiexperimental research design conditions and to control for the effect of likely pre-existing differences between the study groups, some matching producers were maintained. First, teachers were assigned to a teaching group based on their

Table 1. Social demographic information for the participating teachers of English as a foreign language (EFL) (frequencies with percentages in parentheses).

Condition	Qualifications			Teaching experience in years			Age in years		
	BA	MA	PhD	5–10	10–15	> 15	30–40	40–50	> 50
Experimental	2 (29)	2 (29)	3 (43)	2 (29)	3 (43)	2 (29)	3 (43)	2 (29)	2 (29)
Control	2 (29)	2 (29)	3 (43)	2 (29)	3 (43)	2 (29)	3 (43)	2 (29)	2 (29)
Total	4 (29)	4 (29)	6 (43)	4 (29)	6 (43)	4 (29)	6 (43)	4 (29)	4 (29)

Note. Sample sizes: experimental group $n=7$; control group $n=7$; total $n=14$.

Table 2. Social demographic information for the participating learners of English as a foreign language (EFL) ($n=437$) (frequencies with percentages in parentheses).

Demographic variable	Condition	
	Experimental ($n=220$)	Control ($n=217$)
<i>Age (years):</i>		
12–15	5 (2.27)	4 (1.84)
15–18	69 (31.36)	70 (32.26)
18–22	72 (32.73)	69 (31.8)
22–25	66 (30)	68 (31.34)
> 25	8 (3.64)	6 (2.76)
<i>EFL learning experience (years):</i>		
1–5	5 (2.27)	4 (1.84)
5–10	137 (62.27)	132 (60.83)
10–15	78 (35.46)	81 (37.33)
<i>School level:</i>		
High school	77 (35)	79 (36.41)
University	143 (65)	138 (63.59)
<i>Region of origin:</i>		
Capital city	40 (18.18)	42 (19.35)
Eastern region	46 (20.91)	48 (22.12)
Western region	51 (23.18)	49 (22.58)
Southern region	83 (37.73)	78 (35.95)

own choice to teach either for an experimental or a control group. In addition, each pair of teachers in the treatment and control groups had taught the same course content to learners at similar study levels. Furthermore, while participating students were allocated to an experimental or control group of teachers, they were not informed about the nature of instruction in their group (i.e. whether they were in an experimental or a control group). Moreover, every possible effort was made to prevent the overrepresentation or underrepresentation of learners in the groups. This was performed by evenly distributing them among the groups (220 in the experimental vs. 217 in the control groups).

1 Measures

Two instruments were employed in the present research. The first was a 15-item self-reported measurement (three items for each construct in the model) that was utilized to assess student motivational variables in terms of motivational intensity, intrinsic motivation, autonomy, linguistic self-confidence, and attitudes based on a 5-point Likert scale ranging from very untrue = 1 to very true = 5 (see Appendix A in supplemental material). Items in this instrument were modeled after similar items in previous studies, such as Alrabai (2011, 2016); Dörnyei (1994); Gardner et al., (1997); Guilloteaux (2007) and Guilloteaux and Dörnyei (2008), with slight modifications. The questionnaire was initially constructed in English but was translated and administered to participants in their Arabic mother language due to the limited English competency of some respondents, which might affect their ability to give accurate responses to the survey items. This translation was originally carried out by the researcher(s) and then verified by two area specialists who are fluent in both English and Arabic. The verified translated version of the survey was then back translated into English before the English and Arabic versions of the scale were evaluated and compared by two bilingual experts in the two languages to check for any likely discrepancies. The comparison has returned a high degree of accuracy and consistency amongst the two versions. Finally, any remaining issues such as redundancy and clarity of some items were checked and addressed by the researcher(s).

The second tool utilized in the present study was achievement measurement. Learner achievement was measured by test scores, which enabled us to consider changes in achievement simultaneously with changes in learner motivation by the end of the treatment. The achievement test was the end-of-semester exam, with a maximum possible score of 50 points. Unified English tests were used to measure learner achievement in four skills: listening, speaking, grammar, and writing. Mean scores for English achievement (overall competence) were determined by summing the results obtained in the four skill tests. All tests (apart from the speaking test) were written and completed in groups during a normal class session. The speaking test was administered on an individual basis with only the examiner present and was recorded by the researcher for subsequent evaluation. The listening and grammar tests were marked following objective criteria, whereas the writing and speaking tests were rated following a holistic approach.

2 Procedures

a Pretreatment training. Based on the results of the first stage of the study, an advisory guide was constructed to assist the teachers in the experimental groups in strategy implementation (see Appendix B in supplemental material). The guide comprised a range of specific techniques to translate the preselected motivational strategies in the classroom context. For this operational translation, we drew on leading textbooks on motivation, educational psychology, and motivation in education (e.g. Alrabai, 2016, 2022a, 2022b; Dörnyei, 2001; Horwitz & Young, 1991; Young, 1999) and on the feedback of some participating teachers. Details about these strategies as well as some extracts and examples for the specific techniques that were used to operationalize them are presented in the next section. Prior to the implementation of the experimental treatment, the teachers

were provided with a three-week intensive training conducted by the researcher on how to use the advisory guide. This was a kind of awareness-raising program that facilitated the teachers' motivational thinking and practice.

b Experimental treatment. The experimental treatment was carried out over 10 weeks. During the experimental intervention, teachers in the experimental group implemented the following macro strategies:

1. Establish a positive rapport with students.
2. Build up students' self-confidence.
3. Reduce language anxiety among learners.
4. Arouse students' curiosity for learning English.
5. Promote students' autonomy and control over learning.
6. Connect learning to students' real life and experiences.

The implementation guide designated some specific techniques to operationalize each of these strategies. For instance, the guide suggests that the teacher uses the following techniques to promote students' autonomy:

- A. Promote students' choice ability.
- B. Enhance students' relatedness satisfaction.
- C. Promote students' competence satisfaction.
- D. Promote students' intrinsic motivation.

It is noteworthy that the implementation guide even presents some specific subtechniques to implement the macro strategies. For example, the guide suggested the following techniques to promote students' relatedness satisfaction:

- a. Accept every student the way he/she is.
- b. Be considerate and compassionate.
- c. Show warmth to students.
- d. Allow students to easily express their feelings to you.
- e. Allow students to interact with you and to be open toward you.
- f. Show care and concern about students' progress.
- g. Shows interest in students' thoughts, suggestions, and viewpoints.

Due to space restrictions, the full intervention guide is available in Appendix B in supplemental material.

3 Data collection

The questionnaire was administered twice: once at the start of the treatment (T1) and a second time at the end (T2). One of the researchers administered the questionnaire to all study groups. Participating learners were thoroughly reassured of the confidentiality of their responses. Teachers were not allowed in the classroom during the administration of

the questionnaire to avoid influencing the students' responses. Participants were provided approximately 45 minutes to respond to the entire questionnaire.

4 Statistical analysis

In the present study, we apply SEM to study the impact of the motivational intervention on later L2 achievement. SEM was used in this study because is useful in experimental research in that it allows us to study the direct and indirect effects between variables, and can substantiate the mediating effect appropriately within the structural model. This is a helpful approach because it provides a fuller picture of the pathways of the effect of the intervention on the outcome variable (Collier, 2020).

We first evaluate the measurement model and continue with the structural model. We evaluated the goodness-of-fit of all models using traditional indices such as χ^2 and the degrees of freedom that are reasonably independent of sample size. These indices include the root mean square error of approximation (RMSEA), the confirmatory fit index (CFI), the Tucker–Lewis index (TLI), and the standardized root mean square residual (SRMR). CFI and TLI values in the region of 0.95 indicate a good model fit. However, values of approximately 0.90 can also be acceptable. Both RMSEA and SRMR should be equal to or lower than 0.07 or 0.05, respectively, to indicate acceptable and good model fits (Hu & Bentler, 1999; Marsh et al., 1988). Additionally, average variance extracted (AVE) was used to test the convergent validity of the measure with a value in the region of .50 as indicative of convergent validity (Collier, 2020). We also considered the heterotrait–monotrait ratio (HTMT) to evaluate the discriminant validity of the constructs, with values below .85 showing no concerns about collinearity (Alamer, 2022b). The robust maximum likelihood (MLR) estimation was selected, and the analyses were conducted using Jamovi 2.3 (The Jamovi Project, 2022). To interpret the results of path coefficients in SEM, we adopted the L2 guidelines (Alamer, 2022b) such that path coefficients ranging from 0 to .10, .11 to .30, .30 to .50, and $> .50$ are indicative of weak, modest, moderate, and strong effect sizes, respectively.

V Results

1 Descriptive statistics

Before performing the analyses, a check was performed for normality and outliers. Table 3 presents descriptive statistics, including the means, standard deviations, and a correlation matrix. None of the items provided skewness and kurtosis values above 1. Additionally, Q–Q plots were manually checked, and the points generally appeared to follow the line. These results suggest that the data can be said to be normally distributed.

2 Examining the measurement model

Before discussing the structural model, we examined a CFA to ensure that the empirical data fit the variance–covariance matrix of the model. The CFA model provided an excellent fit to the data (i.e. $\chi^2=79.97$, $df=36$, $p<.01$; CFI=.97; TLI=.95, RMSEA=.05,

Table 3. Correlation matrix, means and standard deviations.

Variables	Condition		Intrinsic motive				Autonomy				Intensity				Achievement			
			Cont	Exp	T1	T2	Cont	Exp	T1	T2	Cont	Exp	T1	T2	Cont	Exp	T1	T2
Condition	-																	
Intrinsic motive	0.18***																	
Autonomy	0.34***	0.30***																
Intensity	0.05	0.39***																
Achievement	0.36***	0.63***																
-			Cont	Exp	T1	T2	Cont	Exp	T1	T2	Cont	Exp	T1	T2	Cont	Exp	T1	T2
Mean			3.65	3.60	3.71	3.85	2.81	2.82	2.89	3.25	3.14	3.07	3.14	3.15	16.19	16.27	16.23	17.30
SD			.71	.75	.66	.60	.55	.55	.59	.66	.63	.72	.74	.73	2.15	2.17	2.35	1.96

Notes. Cont=Control group; Exp=Experimental group; SD=Standard deviation; ***p<0.001.

Table 4. Reliability, convergent and discriminant validity of the variables.

	Intrinsic motivation	Autonomy	Motivational intensity
Cronbach's alpha (α)	.72	.73	.72
Composite reliability (CR)	.70	.73	.73
Average variance extracted (AVE)	.47	.48	.47
Heterotrait–monotrait ratio (HTMT)*	(.33, .71)	(.33, .34)	(.34, .71)

Note. *Values in parentheses are the HTMT for each pair of variables.

RMSEA 90% CI: [.04,.07]; SRMR = .04). The reliability and validity of the constructs are reported in Table 4. As seen, most of the values were in the region of acceptable levels such that no critical issues are observed in the model.

3 Examining the structural model

After evaluating the validity of the measurement model, we examined the structural model to test the direct and indirect effects of the motivational intervention on L2 achievement. As shown in Figure 2, we controlled for previous measurement of the variables that measured at time one (i.e. autonomy, intrinsic motivation, and motivational intensity, and achievement) to obtain better assessment of the path coefficients (Alamer & Alrabai, 2023; Collier, 2020). The result suggests that the model fit the data at an acceptable level (i.e. $\chi^2=352.68$, $df=141$, $p<.01$; CFI = .94; TLI = .91; RMSEA = .06, RMSEA 90% CI: [.05,.07]; SRMR = .04). Thus, we continue our analysis with this present model.

Figure 2 illustrates the results of the structural model with path coefficients. First, the outcome variable, i.e. L2 achievement, was substantially explained by the predictor variables, with 87% of its variance explained by the latent variables in the model indicating a large variance was explained. Moreover, the strongest predictor of the outcome appeared to be intrinsic motivation ($\beta=.38$, [95% CI: .28, .49], $p<.001$), with medium effect size, followed by motivational intensity ($\beta=.16$, [95% CI: .08, .29], $p<.001$), with small effect size, and autonomy ($\beta=.15$, [95% CI: .10, .21], $p<.001$) which was also small in size. Importantly, we found that the intervention directly and positively predicted the outcome variable ($\beta=.24$, [95% CI: .20, .29], $p<.001$) over and beyond the variance explained by the mediator variables. Having the condition variable (i.e. the intervention) predicted L2 achievement significantly over and beyond the other variables in the model indicates a unique predictive power of the intervention on increased L2 achievement. We turn to report the indirect and total effect results.

The results of the indirect effect show us how the effect of the intervention is mediated by potential variables. Table 5 shows the indirect and total effects from the intervention on L2 achievement. We also report the indirect effects of the intervention on intrinsic motivation and motivational intensity. The indirect effect results indicate that all variables positively mediated the effect of the intervention on L2 achievement. Specifically,

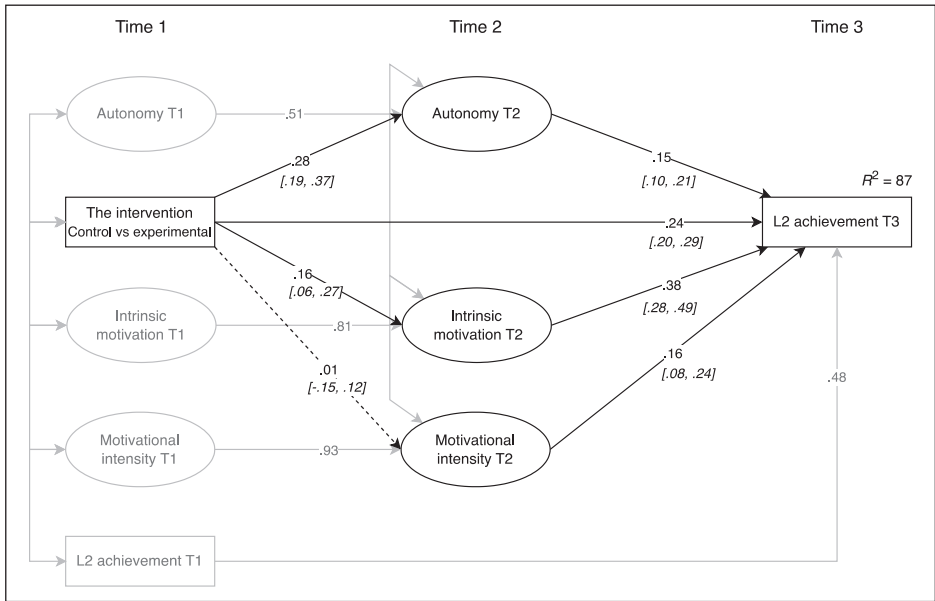


Figure 2. The results from the hypothesized longitudinal causal model linking teacher motivational practice to later second language (L2) achievement. Notes. Model fit indices: $\chi^2=352.68$, $df=141$, $p<.01$; CFI=.94; TLI=.91; RMSEA=.06, RMSEA 90% CI: [.05,.07]; SRMR=.04. Grayed paths are covariates. Italic values between brackets represent the 95% confidence interval. The measurement model is removed from the figure to prevent clutter.

Table 5. Indirect and total effects of the variables on second language (L2) achievement.

	<i>b</i> * [CI 95%]	<i>p</i>
<i>Indirect effects on L2 achievement:</i>		
Intervention → Autonomy T2	.04 [.02, .07]	< .01
Intervention → Intrinsic motivation	.06 [.02, .11]	< .01
Intervention → Motivational intensity T2	.001 [-.02, .02]	.94
<i>Total effects of the intervention:</i>	.35 [.44, .26]	< .01

over the direct effect that intervention exerts on L2 achievement, the influence is found to be mediated through autonomy ($\beta=.04$, $p<.01$) and through intrinsic motivation ($\beta=.06$, $p<.01$). However, no indirect effect was observed through motivational intensity ($\beta=.001$, $p=.94$). With regard to the total effect, we observed a moderate total effect size from the intervention on L2 achievement ($\beta=.35$, $p<.01$). Collectively, these findings indicate that the effect of the intervention on increasing language achievement appears to be both direct and indirect through the included mediators. Thus, in answering research question 1, we conclude that the effect of the intervention ('control=0, experimental=1') on L2 achievement is both direct and indirect. Similarly, in answering

research question 2, we found that all variables (i.e. autonomy, intrinsic motivation, and motivational intensity) positively and significantly mediate the effect of the intervention on L2 achievement.

VI Discussion

The current study attempted to assess the influence of a teacher motivation-promotion intervention on language learner achievement via a longitudinal quasiexperimental design on the basis of SDT. A central advantage of this study is the use of SEM methodology in testing the effect of the intervention on L2 achievement. Due to its ability to estimate latent variables, SEM allowed us to obtain higher statistical power, examine the indirect and total effects, and determine which model best fit the data. As such, one key finding from this research is that the teacher's motivational practice was responsible for increased L2 achievement among language students. Since the model explained approximately 87% of students' L2 achievement, this emphasizes the crucial role that teachers play in promoting students' basic psychological needs, motivation and expended effort, as established by past investigations (Alrabai, 2016, 2022a, 2022b; Moskovsky et al., 2013). Specifically, adopting motivational teaching practices by the teacher has been consistently found to be strongly linked to different learning outcomes, including increased effort and actual achievement (Alamer & Al Khateeb, 2023; Ryan & Deci, 2017; Wang et al., 2024), and the findings of the present study concur with these previous investigations.

Another notable conclusion made in this study was that improvements in the behaviors of the language teacher appeared to affect the development of the satisfaction of the basic psychological need of autonomy. In this regard, we noticed that learners' need of autonomy, a core component of SDT, the conceptual framework of this study, was significantly and directly influenced by teachers' motivating practices. This verifies the hypothesis of earlier research that satisfying learners' need for autonomy is remarkably affected by teacher teaching style (Alrabai, 2016, 2021, 2022b; Dincer et al., 2019). It also supports the conclusions made by past SDT-oriented interventions (Ahmadi et al., 2022; Alrabai & Algazzaz, 2024; Reeve & Cheon, 2021) that established the usefulness of autonomy-supportive teaching interventions in satisfying students' need of autonomy as a key component of SDT and that the advantages of fulfilling students' need of autonomy could sequentially contribute in satisfying the needs of competence and relatedness.

In addition to its direct influence on learner BPN, it appears that satisfying learner autonomy results in a positive direct influence on their achievement in the L2. This remarkable finding contributes to validating the many SDT theoretically grounded assumptions made in the language education literature that holding a greater sense of autonomous language learning by satisfying learners' need for autonomy, competence, and relatedness is usually associated with higher language achievement (Alrabai, 2016, 2021, 2022a, 2022b; Noels et al., 2019). While this runs counter to the conclusions of Alamer and Lee (2019), who found that BPN are only indirectly related to L2 achievement by means of other variables (e.g. intrinsic motivation), it seems that the indirect association between BPN and L2 achievement in Alamer and Lee (2019) was complex given the series of motivational processes included in that specific study.

In addition to autonomy, our model demonstrates that learner motivation was also affected by teacher motivational practice. This positive change was represented in two motivational components (i.e. intrinsic motivation and motivational intensity). Our experiment-based model shows that intrinsic motivation, as a core component in SDT, was strongly, yet indirectly, impacted by the teacher motivational intervention. This notable finding emphasizes the fact that any positive changes in teacher motivational practice in the language classroom are likely to yield healthy types of motivation when learners take charge of their own language study (Alrabai, 2016; Moskovsky et al., 2013), especially latent variables such as intrinsic motivation (Guilloteaux & Dörnyei, 2008). We notice in the model of the present study that learners' intrinsic motivation is influenced by teacher motivational behaviors through the mediating effect of learner autonomy. This acknowledges the SDT-grounded assumptions suggested by Noels et al. (2019) and Noels (2023) that the experience of intrinsic motivation is dependent on the satisfaction of the psychological needs of the learner, including the need for autonomy, and that higher perceptions of autonomy in the course of language learning are often associated with more self-determined motivational orientations, including intrinsic motivation (Carreira, 2012; Chaffee et al., 2014; Noels et al., 1999).

In our model, motivational intensity was also influenced by the teacher's motivational approach through the mediation of SDT constructs of autonomy and intrinsic motivation, thus confirming its strong ties with such constructs. In this regard, Noels et al. (2019) maintained that students who endorse self-determined orientations (i.e. intrinsic motivation) are likely to engage more intensely and sustain their motivation across time more than those who endorse orientations based on rewards or pressures from others (i.e. extrinsically motivated). This was the exact case in the final model in this study, where learner motivational intensity was significantly predicted by their intrinsic orientation for L2 learning. Similarly, Alamer (2022a) found that the basic need for autonomy is indirectly linked to expended effort, which collectively leads to higher achievement of L2.

It is acknowledged in this study that satisfying the language learner's autonomy directly influences their achievement in the foreign language. This is evident in the fact that intrinsic motivation and motivational intensity were positively influenced by the teacher motivation-promotion intervention, and they both significantly and directly predicted learner L2 achievement. When a learner's intrinsic motivation is satisfied due to teacher intervention, this motivation becomes the strongest direct predictor of their L2 achievement in the model. This conclusion coincides with those of many past studies (Alamer & Alrabai, 2023; Noels et al., 2019) that recognized the vital role that intrinsic motivation plays in the attainment of nonprimary languages. Motivational intensity, the other motivation construct, has also been well established as a direct predictor of language learner achievement across many different English as a foreign language (EFL) / English as a second language (ESL) contexts. In our model, this factor exerted a moderate direct influence on learner L2 achievement, thus duplicating what has been established by prior research that the intensity of students' effort in the learning process is a consistent predictor of language achievement (Gardner, 2010; Noels et al., 2019).

The findings of this study confirm that the basic psychological need for autonomy, when satisfied, can play a twofold role in leading to better learning outcomes. This is demonstrated by the direct and indirect paths that autonomy and motivation exerted on

learner achievement in this investigation. We noticed that the teacher motivational intervention in our study accounted for learner achievement not only directly but also indirectly through the individual and collective mediation of learner needs for autonomy and intrinsic motivation. It is indeed interesting to see that the conclusions made based on the experiment-driven data in the current study are in line with those made by past theoretically grounded research illustrated earlier that emphasized the vital role that satisfying learners' basic psychological needs could play in influencing almost all aspects of language learning not only directly but also in mediating the relationship among different variables associated with such a process.

Overall, the results of the present investigation suggest that learner autonomy was the variable most positively influenced by the teacher motivational teaching approach. This showed that these teaching strategies resulted in substantial improve in students' self-sense of choice and volition which subsequently led to increase in achievement. This provides compelling evidence that satisfying the basic psychological needs of language learners is an important prerequisite that enables them to have higher levels of achievement in the L2 (Wang et al., 2021). Therefore, any pedagogical intervention targeting positive improvements in the achievement of L2 learners should be geared toward satisfying their psychological needs as a necessary prerequisite.

VII Pedagogical implications

The findings of the present study offer some insights for the EFL teaching profession. These findings demonstrate the advantages of teacher motivational practice in supporting students' need of autonomy and fostering autonomous language motivation as well (Alamer & Alrabai, 2023; Alrabai, 2016; Noels, 2023). As such, teachers are recommended to provide relevant choices for classroom and homework tasks. As our findings showed, teachers should offer opportunities for L2 student voice in classroom tasks to foster engagement and increase intrinsic motivation. It is expected students who applied the teacher motivational strategies explained in our study can help students become more interested in language learning. In addition, the results derived from this study indicated that a further effect is expected from applying the strategies in enhancing students' language achievement. This once again suggests the need for adopting a teaching approach that fulfills students' basic psychological need for autonomy, competence, and relatedness in the language classroom. This approach is critical in developing students' autonomous motivation, which, in turn, leads to positive language outcomes. Finally, although teacher motivational strategies did not increase students motivational intensity, the results illustrated that motivational intensity is linked with L2 achievement. Accordingly, teachers should take care of how much students work on and put effort in the language tasks.

VIII Conclusions and limitations

Drawing on SDT, this study investigated the influence of teacher motivational intervention on learner EFL achievement mediated by the basic psychological need for autonomy and students' motivation (i.e. intrinsic motivation and motivational intensity). The key contribution of the current study is that it, via a quasiexperimental research design using

an advanced data analytical approach, uncovered the magnitude and patterns of the complex dynamic in-class relationships between teacher motivational practice and student L2 achievement mediated by the role of learner BPN. The SEM approach revealed that the predictor variables explained approximately 87% of the variance in students' achievement, with learner autonomy and intrinsic motivation being the strongest predictors of the learning outcome variable. These findings emphasize the vital role of satisfying learners' need for autonomy and motivation in attaining better language learning outcomes and acknowledge the critical role of language teacher practice in satisfying the autonomy of L2 students, which in turn increases their intrinsic motivation and intensity. Such findings hold considerable practical implications for practitioners and researchers in the field of L2 learning and teaching in the realm of teacher support for learner autonomy and intrinsic motivation as two crucial concepts of self-determined behavior and the subsequent positive impact that satisfying these behaviors might have on students' learning.


One limitation of this study is that it utilized a self-report scale for data gathering, which means that participants' responses could be influenced by the bias of other variables (e.g. self-expectancy, social desirability, etc.). Future studies can deploy a triangulation of measures (e.g. classroom observations in addition to surveys) to capture students' responses to teacher practice in real-time classroom situations. Another limitation is that the participating students had a similar cultural, educational, and social background. Implementing the design of the current research with learners from other EFL/ESL contexts would yield more generalizable results and demonstrate the validity of the teacher intervention utilized in this study.

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Supplemental material

Supplemental material for this article is available online.

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