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The interrelationship between basic psychological needs, intrinsic motivation, classroom engagement, and L2 academic achievement: A large-scale study of self-determination theory

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Abstract

Applications of self-determination theory in second or foreign language (L2) learning have continuously provided crucial implications but remain limited in terms of sample scope and the comprehensiveness of tested models. This is particularly important in a large yet under-researched context such as Saudi Arabia, as it enables a stronger assessment of the external validity of the theory. In this study, data were collected from 815 undergraduate students across 35 universities in the country to examine the relationships among the three basic psychological needs, intrinsic motivation, classroom engagement, and grade point average (GPA) in English as an L2. Results showed that variable levels were moderate. A series of one-way ANOVAs indicated that all study variables were consistent across age, gender, and geographical location. Using set-exploratory structural equation modeling (set-ESEM), we found that the effect of the three

basic psychological needs and intrinsic motivation on GPA was solely indirect through classroom engagement. Moreover, the influence of classroom engagement on GPA was itself indirectly mediated by intrinsic motivation. Implications for both theory and L2 educational practice are discussed.

Keywords: self-determination theory; basic psychological needs; structural equation modeling; classroom engagement

1. Introduction

Self-determination theory (SDT) provides a fundamental framework for comprehending human motivation, emphasizing individuals' innate drive for development and optimal performance (Deci & Ryan, 2000). As exemplified by Ryan and Deci (2020), the three basic psychological needs (BPN) of autonomy, competence, and relatedness are essential to learners' intrinsic motivation and positive functioning. Autonomy pertains to one's sense of volition and self-direction in performing the activity. Competence pertains to the feeling of effectiveness and mastery in executing academic tasks and assignments. Relatedness refers to the human need to feel connected and supported by others, thereby fostering positive relationships. Research has demonstrated the positive outcomes of fulfilling these needs among undergraduate students, including increased engagement (Alamer, Al Sultan, et al., 2025; Ryan & Deci, 2020), language achievement (Alrabai & Alamer, 2024; Noels, 2023), and intrinsic motivation (Noels et al., 2001; Roth et al., 2007).

While research on SDT is substantive and insightful, more comprehensive and representative studies within education are still required. Specifically, large-scale empirical studies on the relevance of SDT have been concentrated in Western countries, neglecting diverse student populations elsewhere. Investigating the theory in non-Western settings is crucial for assessing its external validity across different demographic and cultural contexts. In addition, studies that employ a comprehensive model encompassing key aspects of SDT, along with related variables such as classroom engagement and L2 proficiency, are relatively scarce. Therefore, this study addresses this research gap by examining SDT in the underrepresented context of a large country such as Saudi Arabia. Specifically, the study considers the applicability of SDT to undergraduate students across a large country such as Saudi Arabia, while controlling for variables such as students' age, geographical areas, gender, and grade point average (GPA) as these factors are linked to studies conducted on differences in motivation and engagement (Guérin et al., 2012). This is particularly important because prior research has highlighted that basic psychological needs may differentially predict motivation

types across educational contexts (Bureau et al., 2022). In such collectivist societies, familial expectations, hierarchical educational structures, and pronounced power distance between students and faculty may shape how students experience autonomy and belonging, potentially constraining teachers' capacity to provide autonomy support (Cortina et al., 2017). Therefore, examining how SDT processes unfold in Saudi higher education not only fills a geographical gap but also advances theoretical understanding of how culture and institutional structures influence motivation.

2. Literature review

2.1. The basic psychological needs theory

According to SDT (Ryan & Deci, 2017, 2020), fulfilling certain psychological needs facilitates the achievement of high levels of engagement, motivation, and ultimately well-being. Humans are expected to flourish, experience elevated well-being, and demonstrate enhanced intellectual functioning when their basic psychological needs are met. Needs, as conceptualized by BPN theory, are essential for the growth and well-being of all individuals (Martela & Ryan, 2016).

Numerous studies have emphasized the role of BPN in promoting student motivation across various educational environments. For example, a review conducted by Conesa et al. (2022) summarized findings on how satisfying these three needs can enhance engagement and motivation among school-aged learners. Although their focus was on younger students, the overarching patterns are consistent with SDT principles and underscore the universality of BPN effects across different age groups.

Several studies have concluded that satisfying BPN helps reduce stress and maintain elevated emotional well-being levels (Church et al., 2013; Quested et al., 2011; Reis et al., 2000). Nevertheless, when these needs are frustrated, there is a heightened risk of increased defensiveness in individuals and a subsequent decline in learning outcomes (Alamer et al., 2023; Ryan & Deci, 2000). This relationship was examined even during challenging periods such as the COVID-19 pandemic, and researchers observed congruent results consistent with the theory: Enhanced BPN satisfaction was correlated with improvements in achievement and positive well-being among participants, irrespective of cultural, age, gender, racial, or geographical backgrounds in the samples (Cantarero et al., 2021; Chiu et al., 2022; Rodrigues et al., 2019). The beneficial effects of BPN satisfaction were further explored through a large-scale study involving 48,550 participants across 27 European nations. Martela et al. (2023) found that, universally, the satisfaction of autonomy, competence,

and relatedness was consistently and significantly associated with higher levels of well-being indicators, including happiness, life satisfaction, and meaning, and with lower levels of ill-being indicators, such as depressive symptoms. Although this research primarily focused on need satisfaction, prior investigations have demonstrated that need frustration tends to be more strongly associated with ill-being compared to the relationship between need satisfaction and well-being.

Ryan and Deci (2000) further posited that basic psychological needs, most notably autonomy, serve as equally vital predictors of motivation and well-being for individuals of all genders, irrespective of cultural backgrounds, whether Eastern or across individualistic or collectivistic orientations. As this region remains underrepresented in this area of research, the applicability of this assertion to Middle Eastern countries has not been comprehensively explored. Furthermore, some studies have also identified variations in BPN levels among participants based on age and gender (Tóth-Király et al., 2018). Moreover, certain studies have emphasized only one or two aspects of BPN, such as competence (e.g., Oga-Baldwin & Ryan, 2025). Nonetheless, it is important to stress that satisfying all three basic needs is necessary (Ryan & Deci, 2017, p. 92), as supported by robust empirical studies within SDT (Cheon et al., 2018, 2020; Noels et al., 2019; Reeve, 2012). Together, these issues represent a significant gap in the existing knowledge base; consequently, this study aims to assess the three BPN among Saudi undergraduate students while considering demographic variables.

2.2. Intrinsic motivation and self-determination theory

SDT, proposed by Deci and Ryan (1985, 2000), identifies two categories of human motivation, autonomous and controlled, and elucidates the processes through which they operate (Ryan & Deci, 2017). Autonomous motivation arises when individuals find activities engaging and pleasurable (intrinsic orientation) or purposeful and meaningful (identified orientation), thereby promoting well-being and mitigating ill-being (Alamer, Saeedy Robat, et al., 2025). Conversely, controlled motivation occurs when individuals act under external pressure, such as societal expectations, familial influence, or authority figures (introjected orientation), or to attain rewards or avert punishment (external orientation). SDT has achieved considerable theoretical and practical significance across various disciplines, including psychology (Barberis et al., 2023), physical education (Cheon et al., 2018; Di Battista et al., 2019; Lonsdale et al., 2019), classroom instruction (Cheon et al., 2020; Reeve et al., 2022; Roth et al., 2007), and second and foreign language (L2) acquisition (Alamer, Saeedy Robat, et al., 2025; Alrabai, 2021; Hwang & Chang, 2025; Liang, 2025; Noels, 2023; Noels et al., 2001; Oga-Baldwin & Nakata, 2017).

Numerous studies conducted within educational contexts have demonstrated that intrinsic motivation is positively correlated with enjoyment (Carreira, 2011), GPA of university students (Jeno et al., 2017; Messerer et al., 2023), academic achievement (Ryan & Deci, 2000, 2020), as well as perceived performance, usefulness, and value of the activity (Kácovský et al., 2023). In one of the very few experimental studies in the field, Alamer, Al Sultan, et al. (2025) conducted an intervention with young language students. In the initial phase, they presented young learners with an engaging language task and motivated them to participate through external rewards. After determining the winners, the second phase commenced. In this phase, the students were informed that no rewards would be provided. Surprisingly, approximately 14% of the participants withdrew from the activity, expressing anxiety, frustration, and boredom. Notably, none of the participants performed as well as they had in the first round of the game. A key finding was that intrinsic motivation for language tasks could be diminished by the presence of external motivators.

A recent multilevel meta-analysis confirmed the argument of SDT (Alamer, Saeedy Robat, et al., 2025). It encompassed twenty-one primary studies from 1999 to 2024 involving 24,470 participants and revealed that the overall correlation between autonomous motivation and language achievement was notably positive (r = .23, p < .01), indicating a moderate effect size. Conversely, controlled motivation was not significantly associated with language achievement (r = -.03, p = .24), reflecting a negligible effect size.

Nonetheless, some authors (e.g., Oga-Baldwin et al., 2025) argue that intrinsic motivation strongly reflects positive emotions, a view that requires careful assessment from an SDT perspective. While the authors correctly highlight the integral role of emotion in intrinsic motivation, their view risks conflating the distinct, albeit related, constructs of motivation and emotion. Oga-Baldwin et al.'s (2025) argument seems to suggest that intrinsic motivation can be largely comprehended by quantifying positive emotions. However, the founders of SDT explained that while enjoyment and interest are affective components of intrinsic motivation, the construct is not fully defined by emotions since “exploration, curiosity, creativity, and spontaneous interest are all characterized by self-determination” (Ryan & Deci, 2017, p. 67). This is also evident from the name of the mini theory, cognitive evaluation theory, which is one of the six mini theories of SDT (Ryan & Deci, 2017). As such, there are certain cognitive components involved. Furthermore, Oga-Baldwin et al. (2025) portray positive affect as the driving force behind intrinsic motivation, a claim that misinterprets the causal direction articulated by SDT. According to the theory, “the emotions of enjoyment and excitement accompanying the experiences of competence and autonomy represent the rewards for intrinsically motivated behavior” (Deci & Ryan,

1985, p. 34). Therefore, as Alamer (2024) emphasizes, maintaining conceptual clarity between substantive constructs, such as motivation and emotion, is methodologically crucial. Separating these constructs, while acknowledging their interconnection, allows for more precise empirical assessment of their nuanced relationship and helps avoid the jangle fallacy, thereby strengthening the validity of research findings.

2.3. Classroom engagement

A primary objective of researching motivation and BPN is to assist educators in enhancing students' learning outcomes by understanding the factors that foster sustained engagement, thereby supporting academic achievement (Locquiao & Gronlund, 2024). Intrinsic motivation drives students to invest effort in learning and functions as a direct antecedent to active engagement (Alamer & Alrabai, 2023; Conesa et al., 2022; Reschly & Christenson, 2012; Ryan & Deci, 2020; Teraoka et al., 2025; Tóth-Király et al., 2018). Although educators can observe learners' engagement through their behaviors, interactions, and participation, motivation itself is less tangible and more difficult to assess directly (Lee & Reeve, 2012; Ryan & Deci, 2000). This distinction emphasizes the importance of examining engagement as a direct outcome of motivation.

Engagement is often recognized as a multidimensional construct that encompasses cognitive (mental effort), behavioral (active participation), and emotional domains (emotional responses) (Deng, 2021; Reeve, 2012; Reschly & Christenson, 2012). The construct of L2 engagement, while still emerging within the L2 learning field, has yielded significant insights but has also generated diverse perspectives (Aoyama et al., 2024). For example, Nakamura (2025) notes that although the multidimensional categorization of engagement (e.g., cognitive, behavioral, and emotional) has provided valuable insights, it also raises methodological and conceptual challenges, such as whether emotional engagement is truly distinct from the emotion of enjoyment. Moreover, several existing engagement instruments have failed to receive support from factor analyses (both exploratory and confirmatory), suggesting that engagement items may be better conceptualized as an emergent variable that should be modeled as a composite (Alamer, 2025; Sparks & Alamer, 2023). These challenges highlight the need for more nuanced understandings that align with recent developments in the field of engagement (Aoyama et al., 2024).

Engagement extends beyond teacher-student interactions to include peer relationships, emotional experiences, motivation, the classroom environment, and the broader community (Feng & Hong, 2022). Research consistently

highlights engagement as a robust predictor of academic success (Alrabai & Alamer, 2024; Fredricks et al., 2004; Reeve, 2012; Reschly & Christenson, 2012), with studies showing that satisfaction of BPN and positive emotions foster classroom engagement, which in turn influences outcomes such as attendance and reading comprehension. In this sense, engagement often functions as a mediator linking motivational processes to performance. However, despite increasing scholarly attention, relatively few studies have examined this mediating role of engagement between intrinsic motivation and academic achievement in higher education. Addressing this gap, the present study investigates the mediating function of engagement within an SDT framework, specifically modeling the relationships among BPN satisfaction, intrinsic motivation, and GPA in the L2.

2.4. Purpose and significance of the study

While SDT has been extensively applied in educational research, much of the literature examines the three basic psychological needs, autonomy, competence, and relatedness, either in isolation or within narrowly defined contexts such as single schools or universities (Teraoka et al., 2025). Although these studies have advanced our understanding of motivational processes, relatively few have employed an integrative structural model grounded in SDT with a culturally diverse sample spanning multiple locations within a large country such as Saudi Arabia. This is particularly significant given that most empirical investigations have been conducted in Western or individualistic contexts, limiting the external validity of SDT's assumptions in culturally distinct environments (Slemp et al., 2024).

The present study addresses this gap by testing a comprehensive model linking basic psychological needs, classroom engagement, intrinsic motivation, and L2 academic achievement (i.e., GPA) among a large, diverse cohort of undergraduate students across Saudi Arabia, an environment characterized by unique socio-educational dynamics, including hierarchical teacher-student relationships and high-stakes assessments (Alanazi, 2025; Kim et al., 2019). This approach enables both the theoretical expansion and contextual validation of SDT in a region that is underrepresented in educational research, but of significant educational importance.

Considering that English serves as a second language in Saudi Arabia and recognizing that SDT offers a comprehensive framework for comprehending motivation within L2 learning environments (Alamer, 2024; Noels, 2023), the present study concentrates specifically on learning English. L2 learning is intrinsically driven by motivation and effort, rendering it an optimal domain for the application of SDT principles, especially in contexts that differ culturally, linguistically, and institutionally from those in which the theory has traditionally been examined.

By situating SDT within the unique educational and cultural context of Saudi Arabia, this research aims to clarify how the satisfaction or frustration of basic psychological needs influences learner engagement and academic achievement. The findings have the potential to provide culturally contextualized insights for tailoring SDT to comparable non-Western language learning settings and to offer practical recommendations for enhancing L2 instruction and student motivation.

Drawing upon research in SDT and language learning (e.g., Conesa et al., 2022; Elahi Shirvan & Alamer, 2024; Noels, 2023; Noels et al., 2001; Teraoka et al., 2025; Tóth-Király et al., 2018), we posited a structural model whereby the BPN act as antecedents to both intrinsic motivation and classroom engagement. Moreover, considering that intrinsic motivation can cultivate engagement and effort (e.g., Alrabai & Alamer, 2024; Ryan & Deci, 2017; Tian et al., 2014), we further hypothesized that intrinsic motivation would have a causal influence on engagement. Ultimately, our model suggests that both intrinsic motivation and classroom engagement exert an influence on L2 GPA. The proposed model is illustrated in Figure 1. Accordingly, the present study proposes the following three research questions:

RQ1: What are the levels of autonomy, relatedness, competence, and intrinsic motivation among Saudi undergraduate students?
RQ2: Are there any differences in students' levels of autonomy, relatedness, competence, classroom engagement, and intrinsic motivation that can be attributed to their gender, age, geographical area, or GPA in English courses?
RQ3: What are the structural relations between the three BPN, intrinsic motivation, engagement, and GPA in English courses?

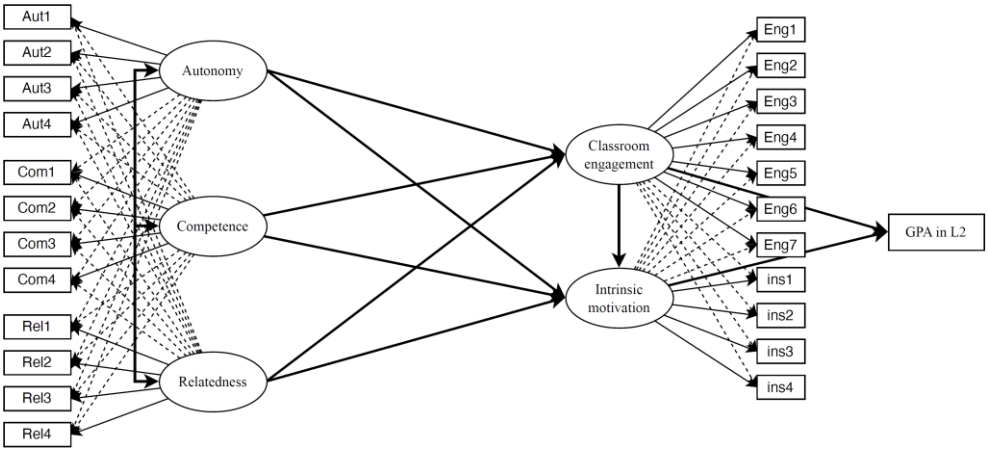

Figure 1 The hypothesized model linking autonomy, competence, and relatedness to classroom engagement, intrinsic motivation, and GPA (GPA = grade point average)

3. Methods

To gather data, our objective was to obtain a sample that was relatively representative of the population within the Saudi Arabian context. This necessitated data collection from both genders, various age groups, majors, and academic backgrounds. Consequently, we sought to establish a convenience sample of the study target population. We recruited students through diverse accessible recruitment methods. Primarily, we approached educators employed at different universities across Saudi Arabia, requesting their assistance in encouraging language students to participate in the questionnaire. All analyses were conducted via Jamovi 2.6 (The jamovi project, 2022).

3.1. Participants

The sample of this study comprised 815 Saudi undergraduate students of whom 57.5% were female (*N* = 469) and 42.5% were male (*N* = 346). All participants were native Arabic speakers enrolled in English departments across 35 public and private universities in Saudi Arabia. Universities were categorized according to the five official administrative regions: Eastern (32%), Central (31.1%), Northern (20.5%), Western (11%), and Southern (5.4%). The sample covered ages ranging from 18 years to 22 years and above. Participants were selected from predefined age categories (18, 19, 20, 21, 22, and older than 22), with 6.3% aged 18, 10.9% aged 19, 13.2% aged 20, 21.2% aged 21, 18.7% aged 22, and 29.7% reporting being older than 22. The mean age was 21.54 years (*SD* = 1.92). All participants were current university students, meaning the age range reflects young adulthood rather than the full spectrum of potential L2 learners; this should be considered when interpreting the results. This age grouping was used in the statistical analyses to account for developmental and academic stage differences. Importantly, the gender distribution in this sample closely aligned with national higher education statistics in Saudi Arabia, where female students represent approximately 54% and male students 46% of the total university population (Colliers International, 2022). This comparability strengthens the representativeness and generalizability of the study findings within the Saudi higher education context.

The sample was obtained through a convenience sampling approach, primarily due to practical constraints related to gaining access to a wide range of institutions and students across the Kingdom. This methodology facilitated the inclusion of participants from 35 universities spanning all five major regions of Saudi Arabia, thereby enhancing the geographic and institutional diversity of the data. Nevertheless, convenience sampling does not guarantee representativeness as respondents who volunteered to participate may differ systematically from those who did not (e.g., in motivation, academic performance, or willingness to engage in research).

3.2. Procedures

Students were invited to participate informally via their teachers, who sent the link through the class group on Telegram, stating that completing the questionnaire was voluntary and would not affect their grades. Additionally, online messages were sent to randomly selected Saudi college students with a social media following exceeding 10,000 individuals on any platform. The authors also issued shoutouts via Telegram and various social media platforms, such as Snapchat, Instagram, TikTok, and Facebook. The link to the questionnaire was preceded by a notice indicating that the survey targeted Saudi college students enrolled at a local university. Participants were informed that their participation was voluntary and that they should specify their university to confirm their enrollment in a Saudi institution. They were instructed to click on the link, which directed them to the questionnaire created using Google Forms. Before completing the form, participants viewed a consent form requiring approval; without it, participation was not permitted. Individuals who were not interested in participating were advised to ignore the invitation. Finally, participants were explicitly informed that they could withdraw from the questionnaire at any time without penalty.

3.3. Measures

Following the section containing participants' self-reported general background questions, the questionnaire employed in this study comprised three primary sections: satisfaction of basic psychological needs within the classroom, intrinsic motivation, and classroom engagement. The scales were measured on a 5-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Prior to completing the questionnaire, potential participants were provided with a brief consent form informing them that participation was voluntary and that their information would be kept confidential. In the present study, the questionnaire items were translated from English into Arabic using a back-translation method to ensure the validity and accuracy of the Arabic version for participants whose first language was Arabic. Subsequently, both the original and translated versions were examined by a specialist to verify the clarity and conceptual equivalence of the items.

3.3.1. Background questions

In the preliminary section, we collected general self-reported data regarding participants. The inquiries aimed to gather information concerning gender, academic institution, field of study, age, and GPA.

3.3.2. The Basic Psychological Need Satisfaction in Classroom Scale (BPN-CS)

The BPN-CS was developed and validated by Conesa and Duñabeitia (2021). It consists of 17 items to assess students' satisfaction with autonomy (comprising four items; e.g., "I feel I have been doing what really interests me in class"), relatedness (comprising four items; e.g., "I feel very comfortable with my teachers and classmates"), and competence (comprising four items; e.g., "I feel competent to achieve my goals"). The remaining five items measure the construct of novelty, which was not included in the present study.

3.3.3. Intrinsic motivation

Intrinsic motivation was assessed using four items from the SDT-L2 scale (Alamer & Saeedy Robat, et al., 2025). It began with the question "why are you learning the second language?" Next, four items representing intrinsic reasons were presented, such as "Because I enjoy studying English." One item was omitted to reduce questionnaire length and minimize respondent burden, while the remaining four items sufficiently captured the construct.

3.3.4. Classroom engagement

The engagement items were adapted from Oga-Baldwin and Nakata (2017). Seven items were included in the questionnaire, with one ("I felt good") removed because it was deemed to assess emotion rather than engagement. In addition, minor wording adjustments were made to ensure consistency with classroom engagement rather than the general or emotional domain, so that participants thought about what they actually did in the classroom. For example, the item "I enjoyed today's class" was reworded as "I enjoyed participating in today's class" to provide greater contextual clarity. These adaptations preserved the original meaning of classroom engagement while ensuring substantive and meaningful alignment with recent advancements in L2 engagement (Aoyama et al., 2024; Nakamura, 2025).

3.3.5. GPA in L2 (English) courses

Students' GPA in English (as an L2) courses was obtained by asking participants to indicate their GPA in English courses, scored on a 5-point scale. Consistent with other items in the questionnaire, participants were informed that this item

was optional, in line with ethical guidelines for voluntary disclosure. It is important to note that obtaining official records from students' universities was challenging as no identification information was collected from participants. Therefore, this variable should be interpreted with caution.

3.4. Statistical analysis

3.4.1. Assumptions and checks

Before analyzing the data to address the research questions, we evaluated the assumptions underlying the quantitative data. The normality of the data was assessed by examining skewness and kurtosis, with cut-off values set at -2 and +2, in accordance with the recommendations by Alamer (2025). Furthermore, the adequacy of the sample size was considered. According to the guidelines suggested by Cohen et al. (2011), a sample size of 815 was deemed sufficient to ensure statistical power for detecting effects within our targeted population.

3.4.2. Set-ESEM

Exploratory structural equation modeling (ESEM and thus set-ESEM) represents an advancement in the domain of SEM, incorporating the advantages of both exploratory and confirmatory factor analysis within a unified analytical framework (Alamer et al., 2023). This methodology facilitates the estimation of conceptually significant cross-loadings among factors while preserving the integrity of pure loadings of unrelated factors. Typically, set-ESEM enhances model precision while maintaining theoretical coherence (Marsh & Alamer, 2024). Prior research in the field has demonstrated support for employing ESEM and set-ESEM methods to address constructs within SDT (e.g., Alamer & Al Fraidan, 2025; Marsh et al., 2019). The integration offered by set-ESEM harnesses the strengths of exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), effectively overcoming their respective limitations, namely EFA's lack of certain SEM-derived information and CFA's potential to be excessively restrictive. As recommended by field guidelines, model fit indices, including chi-square ($\chi 2$), comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR), were meticulously examined.

3.4.3. Effect sizes

In SEM, the path coefficients represent effect sizes independently (Alamer, 2025; Cohen et al., 2011). According to the guidelines established by Alamer (2025), path values ranging from 0 to .10, .10 to .30, .30 to .50, and greater than .50 indicate weak, modest, moderate, and strong effect sizes, respectively. Similarly, the coefficient of determination (R^2) signifies the proportion of variance explained by the predictor variables concerning the model outcomes. It is recommended that the values between 0 and .10, .10 and .30, .30 and .50, and exceeding .50 denote weak, modest, moderate, and strong explanatory power, respectively (Alamer, 2025).

4. Results

The results are outlined in three stages. Initially, descriptive statistics, alongside measures of reliability and validity, are reported. Subsequently, the findings are discussed in relation to the three research questions: the levels of autonomy, relatedness, competence, and intrinsic motivation among students (RQ1); group differences based on gender, age, geographical area, and GPA (RQ2); and the structural relationships among the three BPN, intrinsic motivation, engagement, and GPA (RQ3).

4.1. Descriptive, reliability, and validity measures

Initially, descriptive statistics were calculated. Table 1 presents the means, medians, and standard deviations (SDs) of BPN, intrinsic motivation, and engagement. Table 2 presents the normality assessment, including skewness and kurtosis for all variables included in the study. Our analysis indicated that no variable surpassed the established thresholds for normality; consequently, the data were considered normally distributed, and the mean values fell within acceptable ranges.

Table 1 Mean, median, and standard deviation of BPN, intrinsic motivation, and engagement

	Mean	Median	*SD*
Autonomy	3.15	3.25	.93
Competence	3.69	3.75	.91
Relatedness	3.40	3.50	.97
Intrinsic motivation	3.87	4.00	1.08
Classroom engagement	3.73	3.71	.77

Table 2 Normality measures

	Skewness	Kurtosis
Autonomy	-.09	-.40
Competence	-.63	.16
Relatedness	-.38	-.12
Intrinsic motivation	-.90	.05
Classroom engagement	-.59	.68
Mardia's test	43.07	63.65

Prior to the analysis of participant responses, reliability assessments were carried out to confirm the consistency and dependability of the results. The variables within the study were evaluated using Cronbach's alpha and McDonald's omega. The reliability statistics for the scales and their items are presented in Table 3.

Table 3 Construct reliability

	Cronbach's α	Composite reliability ω
Autonomy	.81	.81
Competence	.84	.84
Relatedness	.84	.85
Intrinsic motivation	.93	.93
Engagement	.86	.86

To evaluate the quality of the measurement model, a comprehensive set-ESEM analysis was conducted, encompassing all variables included in the structural model. Figure 2 depicts the ESEM model. The results demonstrated an adequate fit to the data ($\chi 2$ = 935.71, *df* = 202, $p < .001$; CFI = .93; TLI = .92; IFI = .93; RMSEA = .07 with a 90% confidence interval of [.06, .07]; SRMR = .04). Convergent validity was evidenced by stronger primary loadings of items on their respective targeted factors compared to untargeted factors (mostly $\beta > .50$; see Appendix A). Discriminant validity was established by the weak cross-loadings of items on untargeted latent variables (mostly $\beta < .30$; see Appendix A). The correlations between the factors were all below .70, providing another layer of support for discriminant validity.

4.2. Levels of autonomy, relatedness, competence, and intrinsic motivation

To address our first research question (the levels of autonomy, relatedness, competence, and intrinsic motivation among Saudi undergraduate students) Table 1 shows that the mean scores for BPN, intrinsic motivation, and classroom engagement can be considered moderate. The values ranged from 3.15 for autonomy to 3.87 for intrinsic motivation. Considering that the scale ranges from 1 to 5, and that the standard deviation values were predominantly below 1, the responses appear to cluster around the midpoint of the scale.

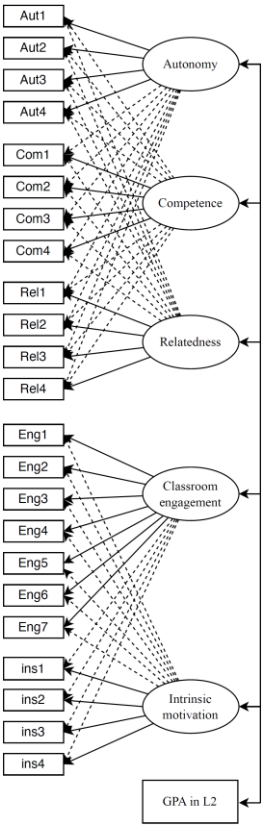

Figure 2 The Set-ESEM measurement model of the present study

4.3. Group differences by age, gender, geographical areas, and GPA

To address the second research question (whether there are differences in students' levels of autonomy, relatedness, competence, classroom engagement, and intrinsic motivation that can be attributed to their gender, age, geographical area, and GPA in English courses), a series of one-way ANOVAs were conducted to examine whether the mean values of the variables remained consistent across various covariates. Table 4 provides a summary of the ANOVA results, evaluating group differences in the primary study variables with respect to participants' age, gender, geographical area, and GPA.

Table 4 shows that there was a statistically significant difference across age groups (18, 19, 20, 21, 22, and older than 22) regarding intrinsic motivation, $F(5, 815) = 3.29$, $p = .01$, eta square (η^2) = .02. Nonetheless, the minimal effect size indicates that the difference was of limited practical significance. Correspondingly, the findings related to classroom engagement also demonstrated significant differences,

$F(5, 815) = 2.26$, $p = .05$, with an eta square (η^2) of .02. However, the small effect size implies that these differences were not practically substantial. Consequently, it can be concluded that no meaningful differences were observed.

Table 4 One-Way ANOVA for age, gender, geographical area, and GPA

	Intrinsic motivation		Autonomy		Competence		Relatedness		Classroom engagement	
	F	*p*	*F*	*p*	*F*	*p*	*F*	*p*	*F*	*p*
Age	3.29	.01	1.3	.26	1.28	.27	.71	.62	2.26	.05
Gender	1.43	.23	2.77	.10	16.28	<.001	6.18	.01	1.64	.20
Geographical area	3.84	.01	.49	.75	.56	.69	.8	.53	.38	.82
GPA	8.43	<.001	0.5	.74	4.67	.01	1.56	.19	2.81	.03

Table 4 shows that there was a statistically significant difference in competence between male and female students, $F(1, 815) = 16.28$, $p < .001$, eta square (η^2) = .02. Although significant, the effect size remained small, suggesting that the observed gender difference in competence is not of substantial practical importance. Additionally, Table 4 indicates a statistically significant difference in relatedness, $F(1, 815) = 6.18$, $p = .01$, $\eta^2 = .01$. However, this effect size was trivial, indicating that while the result reached statistical significance, the actual difference in relatedness between male and female students was negligible and unlikely to have meaningful educational implications.

A statistical difference was found across the regions of Saudi Arabia concerning intrinsic motivation, as shown in Table 4, $F(4, 815) = 3.84$, $p = 0.01$, eta square (η^2) = 0.02. Nevertheless, the eta square effect size indicates that the difference was negligible.

Table 4 shows that a statistically significant difference was found among students with varying GPAs. The findings pertaining to intrinsic motivation revealed notable disparities: $F(4, 815) = 8.43$, $p < .001$, eta square (η^2) = .05; the eta square value for intrinsic motivation indicates a medium effect size. Conversely, the difference related to competence was significant but of lesser magnitude: $F(4, 815) = 4.67$, $p = .01$, eta square (η^2) = .05; similarly, engagement exhibited significance, $F(4, 815) = 2.81$, $p = .03$, eta square (η^2) = .02.

The data presented in Table 5 show that the highest level of intrinsic motivation was observed among students with a GPA of 4.5-5 ($M = 4.04$, $SD = 1.03$), whereas the lowest was among students with a GPA of 2 or below ($M = 2.63$, $SD = 1.27$). Regarding competence, the highest mean score was recorded in the group with a GPA of 4.5 to 5 ($M = 3.81$, $SD = .86$), and the lowest among students with a GPA of 2 or below ($M = 2.63$, $SD = 1.27$). Concerning engagement, students with a GPA of 4.5-5 achieved the highest mean score ($M = 3.82$, $SD = .71$), while those with a GPA of 2 or below scored the lowest ($M = 3.02$, $SD = 1.06$). As

evidenced in Table 5, there was a positive correlation between the three variables and GPA, indicating that higher GPAs were associated with elevated mean scores in intrinsic motivation, competence, and engagement.

Table 5 Differences in intrinsic motivation, competence, and classroom engagement

	GPA	Mean	*SD*	*SE*
Intrinsic motivation	Below 2	2.63	1.27	.35
	2-2.75	3.47	1.28	.14
	2.75-3.75	3.76	1.1	.08
	3.75-4.5	4.02	.95	.09
	4.5-5	4.04	1.03	.07
Competence	Below 2	3.00	1.03	.27
	2-2.75	3.43	1.04	.11
	2.75-3.75	3.63	.98	.07
	3.75-4.5	3.76	.81	.05
	4.5-5	3.81	.86	.06
Engagement	Below 2	3.02	1.06	.31
	2-2.75	3.58	.8	.09
	2.75-3.75	3.69	.81	.06
	3.75-4.5	3.76	.73	.05
	4.5-5	3.82	.71	.05

4.4. Structural relations among BPN, intrinsic motivation, classroom engagement, and GPA

To address the third research question (examining the structural relationships), and in accordance with the theoretical framework of SDT and recent empirical applications (Alamer, 2024; Alamer & Alrabai, 2023; Reeve et al., 2022), a structural model was specified in which the three BPN, namely, autonomy, competence, and relatedness, were associated with classroom engagement and intrinsic motivation. Engagement was modeled as a mediator between BPN and intrinsic motivation, while intrinsic motivation served as a mediator between engagement and GPA (see Figure 2). The correlation matrix encompassing all variables of the study is provided in Table 6.

Table 6 Correlation matrix of the variables investigated in the study

	1	2	3	4	5	6
Autonomy	-					
Competence	.59**	-				
Relatedness	.59**	.57**	-			
Intrinsic motivation	.33**	.35**	.31**	-		
Engagement	.58**	.59**	.60**	.43**	-	
GPA	.02	.15**	.08*	.21**	.13**	-

Note. * $p < .01$, ** $p < .001$

The model demonstrated a good overall fit (χ^2 = 983.41, *df* = 223, *p* < .001; CFI = .93; TLI = .91; IFI = .93; RMSEA = .06, 90% *CI* [.06, .07]; SRMR = .04). To assess alternative pathways, we compared the original model to two alternatives using AIC and BIC as model selection criteria (Marsh & Alamer, 2024). The first alternative reversed the direction of the effect between intrinsic motivation and engagement, while the second removed the link between the two, with both variables predicting GPA directly. The AIC and BIC values for the original and first alternative models were equivalent (AIC = 48,600.77; BIC = 49,117.30), whereas the second alternative showed poorer fit (AIC = 48,602.77; BIC = 49,124.01). The first alternative suggested a positive path from intrinsic motivation to engagement (β = .20, *p* < .001) but indicated that engagement did not mediate the effect of BPN on GPA, which was theoretically inconsistent with SDT. Accordingly, we retained the original model.

Subsequently, we analyzed the variance explained (R^2) for each endogenous variable. In accordance with the guidelines provided by Hair and Alamer (2022), R^2 values were classified as medium for intrinsic motivation (.20), substantial for engagement (.66), and small for GPA (.05). The direct path coefficients are depicted in Figure 3. Autonomy (β = .02, *p* = .75) and relatedness (β = −.05, *p* = .20) did not significantly predict intrinsic motivation, whereas competence demonstrated a positive but modest predictive effect (β = .15, *p* = .01). Engagement exhibited a significant, moderate positive influence on intrinsic motivation (β = .43, *p* < .001). All three BPN were significantly associated with engagement, with autonomy exerting the strongest effect (β = .39, *p* < .001), followed by relatedness (β = .34, *p* < .001) and competence (β = .29, *p* < .001), all demonstrating moderate effect sizes. Only intrinsic motivation showed a significant association with GPA (β = .21, *p* < .001); engagement did not exhibit a significant relationship (β = .03, *p* = .50).

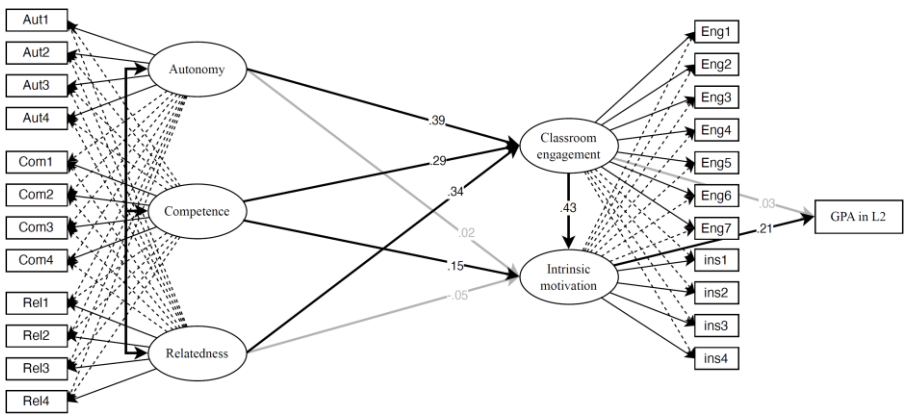

Figure 3 The results of the structural model (grey paths indicate nonsignificant effects; GPA = grade point average)

Considering these findings, we evaluated the indirect effects (see Table 7). All three BPN were indirectly associated with intrinsic motivation through engagement, with autonomy exerting the most significant influence (β = .18, p < .001), followed by relatedness (β = .11, p < .001) and competence (β = .11, p < .001).

Table 7 Indirect effects linking BPN to intrinsic motivation through engagement

Variable	β	Std. Err	p
Autonomy	.18	.04	< .001
Competence	.11	.03	< .001
Relatedness	.11	.03	< .001

The indirect effects on GPA are presented in Table 8. All three BPN were indirectly associated with GPA through engagement and intrinsic motivation (β = .03, p < .001 for each). Additionally, engagement was indirectly related to GPA through intrinsic motivation (β = .09, p < .001).

Table 8 Indirect effects linking BPN to GPA through engagement and intrinsic motivation

Variable	β	Std. Err	p
Autonomy	.03	.01	< .001
Competence	.03	.01	< .001
Relatedness	.03	.01	< .001
Engagement	.09	.04	< .001

5. Discussion

The aim of the current research was to verify the applicability of SDT within the context of L2 education among undergraduate students in a large nation such as Saudi Arabia, while considering various demographic covariates including age, gender, and geographical location. Participants were recruited from 35 public and private universities across all regions of the country. As highlighted by Alamer (2024), empirical research employing SDT in the educational setting of Saudi Arabia remains scarce, a situation that likely persists in similar socio-cultural learning environments (Ryan & Deci, 2017). To attain a comprehensive understanding of the external validity of SDT in a culturally rich socio-cultural setting, an empirical study was undertaken using ANOVA in conjunction with an SEM approach. In our study, we linked basic needs of autonomy, competence, and relatedness to GPA in L2 through mediating variables such as classroom engagement and intrinsic motivation. The principal findings are discussed in the following subsections.

5.1. Descriptive patterns of basic psychological needs, engagement, and motivation

In response to the first research question, which examined the levels of autonomy, relatedness, competence, and intrinsic motivation among Saudi undergraduate students, the descriptive analysis demonstrated moderate mean scores across all constructs. These results align with prior research (Cantarero et al., 2021; Chiu et al., 2022; Martela et al., 2023; Quested et al., 2011), indicating a consistent trend toward need satisfaction, intrinsic motivation, and classroom engagement within various socio-educational environments. The alignment of our findings with such a diverse body of research corroborates the cross-cultural applicability of self-determination theory (Ryan & Deci, 2017, 2020), even within educational frameworks influenced by distinct sociocultural norms, such as those present in Saudi Arabia.

5.2. Gender, age, geographical areas, and GPA differences in BPN, intrinsic motivation, and classroom engagement

In response to the second research question, which asked whether students' levels of autonomy, competence, relatedness, and intrinsic motivation differed by gender, age, geographical area, or GPA in L2, our analyses revealed no significant gender differences across these constructs. This pattern aligns with the findings from Tian et al. (2014) and Rodrigues et al. (2019), suggesting that gender may not be a significant factor in understanding variation in BPN within educational settings. Some previous studies reported partial differences, especially in competence and relatedness (Tóth-Király et al., 2018). These discrepancies are likely due to the broader age ranges and diverse socio-occupational backgrounds of those samples. The sample in the current study (ages 18-24) was more constrained, and the lack of gender differences points toward a form of motivational equality within the shared academic and cultural environment of Saudi universities.

Similarly, our data showed no significant variation in BPN, engagement, or motivation across different geographic regions. This finding supports the theoretical premise that basic psychological needs are universally pertinent and exhibit relative consistency across diverse contexts (Deci & Ryan, 2000; Martela et al., 2023). This outcome affirms the assertion of the self-determination theory of universality and underscores the importance of future research focused on underrepresented or marginalized populations to delineate the contextual boundaries of these findings.

Ultimately, the research identified a noteworthy correlation between intrinsic motivation and GPA. Students exhibiting higher GPA scores reported elevated levels of intrinsic motivation, corroborating the findings of Erten (2014) and endorsing the premise of SDT that autonomous motivation encourages deeper

learning, perseverance, and academic achievement (Ryan & Deci, 2017, 2020). Although the cross-sectional methodology employed restricts causal conclusions, the correlation appears to suggest a reciprocal or cyclical effect, as posited by Alamer and Alrabai (2023). Specifically, students driven by intrinsic motivation tend to attain superior academic performance, which, in turn may bolster their motivation. This bidirectional reinforcement signifies a potential virtuous cycle between motivation and academic success, carrying significant implications for instructional strategies and student support mechanisms.

5.3. Structural pathways among BPN, motivation, engagement, and GPA

In response to the third research question, which examined the structural relationships between the three basic psychological needs, intrinsic motivation, classroom engagement, and GPA in L2, the SEM analysis yielded detailed insights into the mechanisms by which need satisfaction influences academic motivation and achievement. Consistent with SDT, all three needs of autonomy, competence, and relatedness demonstrated positive correlations with classroom engagement. Notably, autonomy stood out as the most significant predictor, suggesting that students who perceive themselves to be in autonomous learning environments are more likely to exhibit behavioral and emotional involvement in classroom activities. These results substantiate the findings of Cheon et al. (2018), Gillison et al. (2019), and Lee and Reeve (2012), each of whom emphasized the critical importance of need support in promoting active engagement.

With regard to intrinsic motivation, only competence was explicitly associated with it, whereas autonomy and relatedness were indirectly linked to motivation through engagement. This pattern aligns theoretically with SDT, which identifies competence as the most immediate antecedent of intrinsic motivation in performance-based tasks (Oga-Baldwin & Ryan, 2025; Ryan & Deci, 2017). The indirect pathways from autonomy and relatedness to intrinsic motivation through classroom engagement highlight the critical role of engagement in explaining how students' perceptions of autonomy and relatedness connect to their enjoyment and volition in language learning. Furthermore, while engagement did not directly predict GPA, its indirect effect through intrinsic motivation was statistically significant. This finding aligns with prior models (Alamer, Saeedy Robat, et al., 2025; Conesa et al., 2022; Vansteenkiste et al., 2020), suggesting that engagement alone is not sufficient for academic success unless it translates into higher-quality motivation. These results also confirm Cheon et al.'s (2018) argument that the motivational impact of engagement operates most effectively when it is grounded in intrinsic value, rather than external compliance.

The application of set-ESEM analysis (Marsh & Alamer, 2024) provided a more precise estimation of latent constructs and minimized measurement error, thereby establishing a more robust statistical foundation for our investigation.

5.4. Educational implications for students, teachers, and policymakers

This study offers a basis for several pedagogical implications for classroom instruction and higher education policies, particularly within culturally homogeneous educational systems such as Saudi Arabia. Autonomy was identified as the most significant predictor of classroom engagement, underscoring the importance of cultivating autonomy-supportive teaching practices in undergraduate language education. Teachers are encouraged to facilitate this by enabling students to make meaningful choices, providing rationales for activities, and encouraging student voice and self-regulated learning. As illustrated in a recent experimental study conducted in Saudi Arabia with young language learners (Alamer, Al Sultan, et al., 2025), students' intrinsic motivation is sensitive to teachers' instructional style, such that when rewards are used, the sense of autonomy and intrinsic motivation are likely to be frustrated.

Furthermore, the study demonstrated that classroom engagement mediated the relationship between basic psychological needs and intrinsic motivation, highlighting its integral role not only as an outcome but also as a fundamental component in the development of intrinsic motivation. Therefore, teachers should endeavor to design learning environments that stimulate collaborative projects, discussions, and pertinent problem-solving tasks. The inclusion of authentic communicative tasks and learner-centered language use can further enhance engagement within L2 classrooms.

An additional significant implication is the positive correlation between intrinsic motivation and academic achievement, suggesting that students driven by personal interest and internal objectives are more inclined to achieve higher academic performance. This relationship underscores the importance of teachers in fostering environments that enhance students' intrinsic motivation (Cheon et al., 2020; Reeve, 2012), primarily by fulfilling their psychological needs and designing learning experiences that emphasize personal relevance and intellectual curiosity. Approaches such as prioritizing mastery goals and cultivating a growth-oriented classroom climate are particularly effective in maintaining this motivational trajectory toward enhanced academic performance.

Ultimately, the findings have significant policy implications. Because the results highlight the central role of relatedness and competence in sustaining motivation, higher education policymakers should prioritize course-planning

frameworks that allow greater flexibility and reduce student-to-teacher ratios in core language courses, thereby creating conditions more conducive to need satisfaction. Building on this, institutions can further strengthen instructional quality by implementing professional development programs that equip educators with SDT-informed pedagogical practices, ensuring that classroom strategies are aligned with motivational theory. In addition, the successful use of advanced modeling in this study demonstrates how rigorous quantitative methods can inform evidence-based policy and practice, underscoring the value of combining theoretical insight with methodological innovation in applied educational research.

6. Limitations and future research

Notwithstanding its valuable contributions, the present study is subject to certain limitations. Although the substantial sample size strengthens its statistical power, the reliance on a cross-sectional design constrains the capacity to establish causal relationships. While SEM, particularly set-ESEM, provided a robust framework for examining direct and indirect associations among constructs, only longitudinal or experimental methodologies can substantiate the directionality of these relationships. Experimental investigations, for instance, would allow researchers to manipulate instructional conditions, such as autonomy-supportive environments, to causally examine their effects on motivational outcomes (e.g., Alamer, Al Sultan, et al., 2025). Future researchers are therefore advised to replicate and extend the current model through longitudinal data or intervention-based designs to assess the temporal evolution of basic psychological needs, classroom engagement, and academic motivation. Furthermore, the study relied on self-reported GPA as the principal measure of academic achievement. While GPA is a widely used metric within educational psychology, it may not adequately reflect domain-specific learning gains or capture short-term academic fluctuations. Additionally, self-reported GPA may be susceptible to recall biases or social desirability effects. To enhance generalizability and applicability, future research should incorporate objective indicators of academic performance, such as standardized language assessments. Finally, although gender, region, and GPA were considered as covariates, additional sociocultural moderators, such as institutional policy, classroom climate, or teaching practices, may exert significant influence on the observed associations and warrant investigation in future research.

Looking ahead, future studies should investigate how classroom engagement operates across various learning environments and subject areas, potentially employing mixed-methods approaches to gain a deeper understanding of students' lived experiences. Longitudinal designs would be particularly useful

for tracing how engagement and motivation develop over time, while experimental studies could test the causal impact of specific interventions on students' psychological needs and engagement. Researchers may also examine how psychological needs are shaped by institutional or cultural norms in collectivist societies, offering a more nuanced understanding of the cross-cultural applicability of SDT.

7. Conclusion

The present study provides empirical support for the application of SDT in the Saudi higher education context and enhances its external validity across a whole country. By linking BPN to intrinsic motivation and L2 academic performance through classroom engagement, the findings underscore the mediational role of student engagement and affirm the relevance of SDT-informed models in L2 education. These insights have direct implications for instructors, curriculum designers, and policymakers seeking to enhance learner motivation, engagement, and academic outcomes in culturally diverse and rapidly evolving educational systems. Collectively, the study not only affirms the relevance of SDT in L2 educational contexts but also offers actionable insights for enhancing learner motivation and institutional effectiveness.

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References

Alamer, A. (2024). Motivation and language learning. In *The international encyclopedia of language and linguistics*. Elsevier. https://doi.org/10.1016/B978-0-323-95504-1.00223-4

Alamer, A. (2025). Structural equation modeling (SEM) in L2 writing research: Simple tutorial and useful recommendations. *Research Methods in Applied Linguistics, 4*(2), 100202. https://doi.org/10.1016/j.rmal.2025.100202

Alamer, A., & Al Fraidan, A. (2025). How can language teachers help their students avoid withdrawing from the language course? A self-determination theory perspective. *International Journal of TESOL Studies,7*(3), 153-166. https://doi.org/10.58304/ijts.250801

Alamer, A., Al Sultan, H., & Alharfi, A. (2025). The negative effects of external rewards on young language students' performance, withdrawing, and psychological factors: An experimental study. *Learning and Motivation*, *91*, 102156. https://doi.org/10.1016/j.lmot.2025.102156

Alamer, A., & Alrabai, F. (2023). The causal relationship between learner motivation and language achievement: New dynamic perspective. *Applied Linguistics, 44*, 148-168. https://doi.org/10.1093/applin/amac035

Alamer, A., Morin, J. S. A., Alrabai, F., & Alharfi, A. (2023). Introducing the Basic Psychological Needs Frustration in Second Language Scale (BPNF-L2): Examining its factor structure and effect on L2 motivation and achievement. *Acta Psychologica, 240*, 104021. https://doi.org/10.1016/j.actpsy.2023.104021

Alamer, A., Saeedy Robat, E., Elahi Shirvan, M., & Ryan, R. (2025). Self-determination theory and language achievement: A multilevel meta-analysis. *Educational Psychology Review*. https://doi.org/10.1007/s10648-025-10038-y

Alanazi, T. (2025). Addressing the challenges and complexities of teaching English in Saudi higher education: Insights through a sociocultural lens. *Education Quarterly Reviews, 8*(2), 95-106.

Alrabai, F. (2021). The influence of autonomy-supportive teaching on EFL students' classroom autonomy: An experimental intervention. *Frontiers in Psychology, 12*, 728657. https://doi.org/10.3389/fpsyg.2021.728657

Alrabai, F., & Alamer, A. (2024). The effects of teacher motivational practice on learner L2 achievement: A self-determination theory perspective using structural equation modeling. *Language Teaching Research*. https://doi.org/10.1177/13621688241278625

Aoyama, T., Yamazaki, J. S., Nakamura, S., Vuogan, A., An, H., Kim, C. J., & Al-Hoorie, A. H. (2024). Conceptualization and operationalization in L2 task engagement research: Taking stock and moving forward. *Language Teaching*, *57*(4), 597-601. https://doi.org/10.1017/S026144482400020X

Bureau, J. S., Howard, J., Chong, J., & Guay, F. (2022). Pathways to student motivation: A meta-analysis of antecedents of autonomous and controlled motivations. *Review of Educational Research, 92*, 46-72. https://doi.org/10.3102/00346543211042420

Cantarero, K., van Tilburg, W. A. P., & Smoktunowicz, E. (2021). Affirming basic psychological needs promotes mental well-being during the COVID-19 outbreak. *Social Psychological and Personality Science, 12*(5), 821-828. https://doi.org/10.1177/1948550620942708

Carreira, J. (2011). Relationship between motivation for learning EFL and intrinsic motivation for learning in general among Japanese elementary school students. *System, 39*, 90-102. https://doi.org/10.1016/j.system.2011.01.009

Cheon, S. H., Reeve, J., & Ntoumanis, N. (2018). A needs-supportive intervention to help PE teachers enhance students' prosocial behavior and diminish antisocial behavior. *Psychology of Sport and Exercise, 35*, 74-88. https://doi.org/10.1016/j.psychsport.2017.11.010

Cheon, S. H., Reeve, J., & Vansteenkiste, M. (2020). When teachers learn how to provide classroom structure in an autonomy-supportive way: Benefits to teachers and their students. *Teaching and Teacher Education, 90*, 103004. https://doi.org/10.1016/j.tate.2019.103004

Chiu, T. K. F., Sun, J. C.-Y., & Ismailov, M. (2022). Investigating the relationship of technology learning support to digital literacy from the perspective of self-determination theory. *Educational Psychology, 42*(10), 1263-1282. https://doi.org/10.1080/01443410.2022.2074966

Church, A. T., Katigbak, M. S., Locke, K. D., Zhang, H., Shen, J., de Jesus Vargas-Flores, J., Ibáñez-Reyes, J., Tanaka-Matsumi, J., Curtis, G. J., Cabrera, H. F., Mastor, K. A., Alvarez, J. M., Ortiz, F. A., Simon, J.-Y. R., & Ching, C. M. (2013). Need satisfaction and well-being: Testing self-determination theory in eight cultures. *Journal of Cross-Cultural Psychology, 44*(4), 507-534. https://doi.org/10.1177/0022022112466590

Cohen, L., Manion, L., & Morrison, K. (2011). *Research methods in education* (7th ed.). Routledge.

Colliers International. (2022). *Saudi Arabia higher education: The changing demand landscape under Vision 2030*. https://argaamplus.s3.amazonaws.com/145fe9ce-36a1-455f-bc8f-ebe24101c636.pdf

Conesa, P. J., & Duñabeitia, J. A. (2021). The basic psychological needs in the classroom scale (BPN-CS). *Behavioral Sciences, 11*(7), 96. https://doi.org/10.3390/bs11070096

Conesa, P. J., Onandia-Hinchado, I., Duñabeitia, J. A., & Moreno, M. Á. (2022). Basic psychological needs in the classroom: A literature review in elementary and middle school students. *Learning and Motivation, 79*, 101819. https://doi.org/10.1016/j.lmot.2022.101819

Cortina, K. S., Arel, S., & Smith-Darden, J. P. (2017). School belonging in different cultures: The effects of individualism and power distance. *Frontiers in Education*, *2*, 56. https://doi.org/10.3389/feduc.2017.00056

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. Springer. https://doi.org/10.1007/978-1-4899-2271-7

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227-268. https://doi.org/10.1207/S15327965PLI1104_01

Deng, S. (2021). Comparing students' engagement in classroom education between China and Germany. *Frontiers in Psychology, 12*, 754637. https://doi.org/10.3389/fpsyg.2021.754637

Di Battista, R., Robazza, C., Ruiz, M. C., Bertollo, M., Vitali, F., & Bortoli, L. (2019). Student intention to engage in leisure-time physical activity: The interplay of task-involving climate, competence need satisfaction and psychobiosocial states in physical education. *European Physical Education Review, 25*(3), 761-777. https://doi.org/10.1177/1356336X18770665

Elahi Shirvan, M., & Alamer, A. (2024). Modelling the interplay of EFL learners' basic psychological needs, grit and L2 achievement. *Journal of Multilingual and Multicultural Development, 45*(32), 2831-2847. https://doi.org/10.1080/01434632.2022.2075002

Erten, İ. H. (2014). Interaction between academic motivation and student teachers' academic achievement. *Procedia – Social and Behavioral Sciences, 152*, 173-178. https://doi.org/10.1016/j.sbspro.2014.09.176

Feng, E., & Hong, G. (2022). Engagement mediates the relationship between emotion and achievement of Chinese EFL learners. *Frontiers in Psychology, 13*, 895594. https://doi.org/10.3389/fpsyg.2022.895594

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74*(1), 59-109. https://doi.org/10.3102/00346543074001059

Gillison, F. B., Rouse, P., Standage, M., Sebire, S. J., & Ryan, R. M. (2019). A meta-analysis of techniques to promote motivation for health behavior change from a self-determination theory perspective. *Health Psychology Review, 13*(1), 110-130. https://doi.org/10.1080/17437199.2018.1534071

Guérin, E., Bales, E., Sweet, S., & Fortier, M. (2012). A meta-analysis of the influence of gender on self-determination theory's motivational regulations for physical activity. *Canadian Psychology/Psychologie canadienne*, *53*(4), 291-300. https://doi.org/10.1037/a0030215

Hair, J., & Alamer, A. (2022). Partial least squares structural equation modeling (PLS-SEM) in second language and education research: Guidelines using

an applied example. *Research Methods in Applied Linguistics, 1*(3), 100027. https://doi.org/10.1016/j.rmal.2022.100027

Hwang, G.-J., & Chang, C.-C. (2025). A self-determination theory-based digital gaming approach to enhancing EFL learners' competence in applying professional English. *Educational Technology Research & Development, 73*(2), 1205-1223. https://doi.org/10.1007/s11423-024-10445-y

Jeno, L. M., Grytnes, J. A., & Vandvik, V. (2017). The effect of a mobile-application tool on biology students' motivation and achievement in species identification: A self-determination theory perspective. *Computers & Education, 107*, 1-12. https://doi.org/10.1016/j.compedu.2016.12.011

Kácovský, P., Snetinova, M., Chval, M., Houfková, J., & Koupilová, Z. (2023). Predictors of students' intrinsic motivation during practical work in physics. *International Journal of Science Education, 45*(1), 1-21. https://doi.org/10.1080/09500693.2023.2175626

Kim, Y., Albeiz, T., Aburizaizah, S., Bridges, M., Fuller, B., & Qutub, M. (2019). Cognition and participation: Classroom reform in the Arab world. *Comparative Education Review, 63*(4), 529-561. https://doi.org/10.1086/705382

Lee, W., & Reeve, J. (2012). Teachers' estimates of their students' motivation and engagement: Being in synch with students. *Educational Psychology, 32*(6), 727-747. https://doi.org/10.1080/01443410.2012.732385

Liang, J. (2025). Exploring English learning motivation based on self-determination theory of first-year Chinese students at Yunnan University of Finance and Economics. *Journal of Buddhist Education and Research (JBER), 11*(1), 372-389. https://so06.tci-thaijo.org/index.php/jber/article/view/282110

Locquiao, J., & Gronlund, A. (2024). Basic psychological needs to online engagement and achievement among first-year undergraduates. *Journal of Learning Development in Higher Education*, *31*. https://doi.org/10.47408/jldhe.vi31.1350

Lonsdale, C., Lester, A., Owen, K. B., White, R. L., Peralta, L., Kirwan, M., MacMillan, F., . . . & Salmon, J. (2019). An internet-supported school physical activity intervention in low socioeconomic status communities: Results from the Activity and Motivation in Physical Education (AMPED) cluster randomized controlled trial. *British Journal of Sports Medicine, 53*(6), 341-347. https://doi.org/10.1136/bjsports-2017-097904

Marsh, H., & Alamer, A. (2024). When and how to use the set-exploratory structural equation modelling to test structural models: A tutorial using the R package lavaan. *British Journal of Mathematical and Statistical Psychology, 77*(3), 459-476. https://doi.org/10.1111/bmsp.12336

Marsh, H. W., Guo, J., Dicke, T., Parker, P. D., & Craven, R. G. (2019). Confirmatory factor analysis (CFA), exploratory structural equation modeling (ESEM), and set-ESEM: Optimal balance between goodness of fit and parsimony.

Multivariate Behavioral Research, 55(1), 102-119. https://doi.org/10.1080/00273171.2019.1602503

Martela, F., Lehmus-Sun, A., Parker, P. D., Pessi, A. B., & Ryan, R. M. (2023). Needs and well-being across Europe: Basic psychological needs are closely connected with well-being, meaning, and symptoms of depression in 27 European countries. *Social Psychological and Personality Science, 14*(5), 501-514. https://doi.org/10.1177/19485506221113678

Martela, F., & Ryan, R. M. (2016). The benefits of benevolence: Basic psychological needs, beneficence, and the enhancement of well-being. *Journal of Personality, 84*(6), 750-764. https://doi.org/10.1111/jopy.12215

Messerer, L. A. S., Karst, K., & Janke, S. (2023). Choose wisely: Intrinsic motivation for enrolment is associated with ongoing intrinsic learning motivation, study success and dropout. *Studies in Higher Education, 48*(1), 137-150. https://doi.org/10.1080/03075079.2022.2121814

Nakamura, S. (2025). Engagement. *ELT Journal, 79*(2), 297-299. https://doi.org/10.1093/elt/ccaf002

Noels, K. (2023). Self-determination theory and language learning. In R. M. Ryan & E. L. Deci (Eds.), *The Oxford handbook of self-determination theory* (pp. 619-637). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780190666453.013.33

Noels, K. A., Clément, R., & Pelletier, L. (2001). Intrinsic, extrinsic, and integrative orientations of French-Canadian learners of English. *Canadian Modern Language Review, 57*(3), 424-442. https://doi.org/10.3138/cmlr.57.3.424

Noels, K. A., Vargas Lascano, D. I., & Saumure, K. (2019). The development of self-determination across the language course: Trajectories of motivational change and the dynamic interplay of psychological needs, orientations, and engagement. *Studies in Second Language Acquisition, 41*(4), 821-851. https://doi.org/10.1017/S0272263118000189

Oga-Baldwin, W. L. Q., Al-Hoorie, A. H., & Hiver, P. (2025). Is "the L2 learning experience" simply intrinsic motivation by another name? A content validity analysis. *Studies in Second Language Acquisition*. https://doi.org/10.1017/S0272263125100880

Oga-Baldwin, W. L. Q., & Nakata, Y. (2017). Engagement, gender, and motivation: A predictive model for Japanese young language learners. *System, 65*, 151-163. https://doi.org/10.1016/j.system.2017.01.011

Oga-Baldwin, W. L. Q., & Ryan, R. M. (2025). Competence need satisfaction in language learning (and beyond): Current state of the evidence and directions for exploration. *Studies in Second Language Learning and Teaching, 15*(2), 279-299. https://doi.org/10.14746/ssllt.48236

Quested, E., Bosch, J. A., Burns, V. E., Cumming, J., Ntoumanis, N., & Duda, J. L. (2011). Basic psychological need satisfaction, stress-related appraisals,

and dancers' cortisol and anxiety responses. *Journal of Sport and Exercise Psychology, 33*(6), 828-846. https://doi.org/10.1123/jsep.33.6.828

Reeve, J. (2012). A self-determination theory perspective on student engagement. In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 149-172). Springer. https://doi.org/10.1007/978-1-4614-2018-7_7

Reeve, J., Ryan, R. M., Cheon, S. H., Matos, L., & Kaplan, H. (2022). *Supporting students' motivation: Strategies for success* (1st ed.). Routledge. https://doi.org/10.4324/9781003091738

Reis, H. T., Sheldon, K. M., Gable, S. L., Roscoe, J., & Ryan, R. M. (2000). Daily well-being: The role of autonomy, competence, and relatedness. *Personality and Social Psychology Bulletin, 26*(4), 419-435. https://doi.org/10.1177/0146167200266002

Reschly, A. L., & Christenson, S. L. (2012). Jingle, jangle, and conceptual haziness: Evolution and future directions of the engagement construct. In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 3-19). Springer. https://doi.org/10.1007/978-1-4614-2018-7_1

Rodrigues, F., Hair, J. F., Neiva, H. P., Teixeira, D. S., Cid, L., & Monteiro, D. (2019). The Basic Psychological Need Satisfaction and Frustration Scale in Exercise (BPNSFS-E): Validity, reliability, and gender invariance in Portuguese exercisers. *Perceptual and Motor Skills, 126*(5), 949-972. https://doi.org/10.1177/0031512519863188

Roth, G., Assor, A., Kanat-Maymon, Y., & Kaplan, H. (2007). Autonomous motivation for teaching: How self-determined teaching may lead to self-determined learning. *Journal of Educational Psychology, 99*(4), 761-774. https://doi.org/10.1037/0022-0663.99.4.761

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology, 25*(1), 54-67. https://doi.org/10.1006/ceps.1999.1020

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. The Guilford Press.

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology, 61*, 101860. https://doi.org/10.1016/j.cedpsych.2020.101860

Slemp, G. R., Field, J. G., Ryan, R. M., Forner, V. W., Van den Broeck, A., & Lewis, K. J. (2024). Interpersonal supports for basic psychological needs and their relations with motivation, well-being, and performance: A meta-analysis. *Journal of Personality and Social Psychology, 127*(5), 1012-1037. https://doi.org/10.1037/pspi0000459

Sparks, R., & Alamer, A. (2023). How does first language achievement impact second language reading anxiety? Exploration of mediator variables. *Reading and Writing, 36*, 2667-2692. https://doi.org/10.1007/s11145-022-10410-2

Teraoka, E., Honda, S., Okade, Y., & Yomoda, K. (2025). Understanding the role of basic psychological needs in motivating and demotivating teaching styles: Insights from Japanese physical education teachers. *Teaching and Teacher Education, 165*, 105149. https://doi.org/10.1016/j.tate.2024.105149

The jamovi project. (2022). *Jamovi* (Version 2.3) [Computer software]. https://www.jamovi.org

Tian, L., Han, M., & Huebner, E. S. (2014). Preliminary development of the adolescent students' basic psychological needs at school scale. *Journal of Adolescence, 37*(3), 257-267. https://doi.org/10.1016/j.adolescence.2014.01.005

Tóth-Király, I., Morin, A. J. S., Bőthe, B., Orosz, G., & Rigó, A. (2018). Investigating the multidimensionality of need fulfillment: A bifactor exploratory structural equation modelling representation. *Structural Equation Modeling, 25*(2), 267-286. https://doi.org/10.1080/10705511.2017.1374867

Vansteenkiste, M., Ryan, R. M., & Soenens, B. (2020). Basic psychological need theory: Advancements, critical themes, and future directions. *Motivation and Emotion, 44*(1), 1-31. https://doi.org/10.1007/s11031-019-09818-1

APPENDIX A

The measurement model of the set-ESEM

Latent	Observed	Estimate	SE	*β*	z	p
Autonomy	autonomy1	0.77	0.04	0.70	17.02	< .001
	autonomy2	0.81	0.05	0.68	16.74	< .001
	autonomy3	0.65	0.05	0.56	14.25	< .001
	autonomy4	0.62	0.05	0.50	11.54	< .001
	competence1	0.31	0.04	0.27	7.63	< .001
	competence2	0.14	0.04	0.12	3.48	< .001
	competence3	0.07	0.03	0.06	2.50	0.013
	competence4	0.07	0.03	0.06	2.09	0.037
	relatedness1	0.14	0.03	0.12	4.11	< .001
	relatedness2	0.09	0.03	0.07	2.88	0.004
	relatedness3	0.03	0.05	0.02	0.58	0.562
	relatedness4	0.17	0.03	0.15	5.19	< .001
Competence	autonomy1	0.14	0.03	0.13	4.43	< .001
	autonomy2	-0.03	0.03	-0.03	-0.89	0.372
	autonomy3	0.25	0.04	0.22	6.84	< .001
	autonomy4	0.07	0.04	0.06	1.63	0.104
	competence1	0.58	0.04	0.51	14.41	< .001
	competence2	0.68	0.04	0.60	16.31	< .001
	competence3	0.88	0.04	0.80	22.71	< .001
	competence4	0.70	0.04	0.68	18.62	< .001
	relatedness1	0.18	0.03	0.14	5.74	< .001
	relatedness2	0.10	0.03	0.08	3.60	< .001
	relatedness3	0.24	0.04	0.21	5.59	< .001
	relatedness4	-0.01	0.03	-0.01	-0.27	0.791
Relatedness	autonomy1	-0.01	0.03	-0.01	-0.34	0.732
	autonomy2	0.15	0.04	0.13	4.30	< .001
	autonomy3	0.14	0.03	0.12	4.07	< .001
	autonomy4	0.26	0.04	0.22	5.96	< .001
	competence1	0.18	0.04	0.16	5.20	< .001
	competence2	0.07	0.04	0.06	2.00	0.045
	competence3	0.04	0.03	0.04	1.66	0.096
	competence4	0.12	0.03	0.11	4.10	< .001
	relatedness1	0.84	0.04	0.69	21.08	< .001
	relatedness2	0.94	0.04	0.77	23.06	< .001
	relatedness3	0.54	0.05	0.47	11.57	< .001
	relatedness4	0.81	0.04	0.73	20.98	< .001
Engagement	engagement1	0.31	0.03	0.48	11.86	< .001
	engagement2	0.33	0.02	0.59	15.07	< .001
	engagement3	0.39	0.02	0.63	16.11	< .001
	engagement4	0.53	0.02	0.79	21.65	< .001
	engagement5	0.51	0.02	0.77	22.04	< .001
	engagement6	0.50	0.02	0.75	21.71	< .001
	engagement7	0.34	0.02	0.57	16.45	< .001
	intrinsic1	0.02	0.01	0.02	1.58	0.114
	intrinsic2	0.07	0.01	0.10	7.15	< .001
	intrinsic3	0.08	0.01	0.11	5.54	< .001
	intrinsic4	0.11	0.01	0.14	8.44	< .001
Intrinsic	engagement1	0.08	0.04	0.08	2.23	0.026
	engagement2	-0.01	0.03	-0.01	-0.34	0.737
	engagement3	-0.03	0.03	-0.03	-0.92	0.358
	engagement4	-0.01	0.02	-0.01	-0.33	0.740
	engagement5	0.03	0.02	0.03	1.18	0.238
	engagement6	0.09	0.02	0.08	3.47	< .001
	engagement7	0.20	0.03	0.21	6.93	< .001
	intrinsic1	1.08	0.04	0.90	30.32	< .001
	intrinsic2	0.99	0.03	0.89	31.07	< .001
	intrinsic3	0.87	0.03	0.79	25.26	< .001
	intrinsic4	0.97	0.04	0.82	27.52	< .001

APPENDIX B

Correlation matrix between all variables of the study

Correlation Matrix

	aut1	aut2	aut3	aut4	com1	com2	com3	com4	Relat1	Relat2	Relat3	Relat4	Int1	Int2	Int3	Int4	Eng1	Eng2	Eng3	Eng4	Eng5	Eng6	Eng7
aut1	—																						
aut2	0.58***	—																					
aut3	0.56***	0.49***	—																				
aut4	0.43***	0.47***	0.54***	—																			
com1	0.43***	0.43***	0.52***	0.48***	—																		
com2	0.38***	0.29***	0.40***	0.30***	0.51***	—																	
com3	0.41***	0.31***	0.45***	0.33***	0.59***	0.60***	—																
com4	0.36***	0.32***	0.45***	0.30***	0.57***	0.50***	0.64***	—															
Relat1	0.37***	0.41***	0.46***	0.46***	0.50***	0.36***	0.43***	0.45***	—														
Relat2	0.36***	0.41***	0.44***	0.43***	0.46***	0.36***	0.40***	0.38***	0.69***	—													
Relat3	0.30***	0.24***	0.37***	0.26***	0.34***	0.28***	0.36***	0.38***	0.42***	0.52***	—												
Relat4	0.36***	0.43***	0.42***	0.39***	0.41***	0.33***	0.31***	0.36***	0.65***	0.66***	0.47***	—											
Int1	0.29***	0.16***	0.30***	0.15***	0.25***	0.20***	0.23***	0.25***	0.22***	0.21***	0.24***	0.16***	—										
Int2	0.30***	0.19***	0.33***	0.19***	0.29***	0.25***	0.29***	0.30***	0.27***	0.28***	0.29***	0.23***	0.85***	—									
Int3	0.28***	0.20***	0.32***	0.15***	0.27***	0.28***	0.32***	0.36***	0.24***	0.24***	0.25***	0.19***	0.74***	0.75***	—								
Int4	0.31***	0.24***	0.37***	0.18***	0.29***	0.27***	0.30***	0.30***	0.26***	0.28***	0.30***	0.25***	0.77***	0.80***	0.76***	—							
Eng1	0.32***	0.21***	0.33***	0.24***	0.35***	0.36***	0.40***	0.33***	0.34***	0.37***	0.29***	0.29***	0.22***	0.28***	0.25***	0.28***	—						
Eng2	0.30***	0.24***	0.27***	0.20***	0.31***	0.33***	0.37***	0.30***	0.28***	0.26***	0.22***	0.27***	0.22***	0.22***	0.24***	0.24***	0.38***	—					
Eng3	0.32***	0.27***	0.34***	0.21***	0.30***	0.30***	0.29***	0.31***	0.30***	0.27***	0.25***	0.34***	0.19***	0.24***	0.24***	0.26***	0.35***	0.66***	—				
Eng4	0.45***	0.42***	0.41***	0.40***	0.42***	0.34***	0.37***	0.35***	0.52***	0.49***	0.30***	0.48***	0.29***	0.33***	0.27***	0.32***	0.37***	0.49***	0.54***	—			
Eng5	0.44***	0.46***	0.47***	0.45***	0.50***	0.35***	0.43***	0.39***	0.52***	0.43***	0.36***	0.47***	0.29***	0.35***	0.33***	0.36***	0.38***	0.41***	0.41***	0.63***	—		
Eng6	0.46***	0.42***	0.46***	0.45***	0.47***	0.39***	0.38***	0.43***	0.48***	0.43***	0.39***	0.47***	0.34***	0.39***	0.34***	0.40***	0.35***	0.43***	0.46***	0.62***	0.67***	—	
Eng7	0.34***	0.26***	0.35***	0.26***	0.36***	0.39***	0.38***	0.37***	0.38***	0.32***	0.32***	0.36***	0.36***	0.44***	0.43***	0.44***	0.39***	0.36***	0.41***	0.51***	0.55***	0.55***	—

Note. * p < .05, ** p < .01, *** p < .001