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Majid Elahi Shirvan & Abdullah Alamer

To cite this article: Majid Elahi Shirvan & Abdullah Alamer (2022): Modeling the interplay of EFL learners' basic psychological needs, grit and L2 achievement, Journal of Multilingual and Multicultural Development, DOI: [10.1080/01434632.2022.2075002](https://doi.org/10.1080/01434632.2022.2075002)

To link to this article: <https://doi.org/10.1080/01434632.2022.2075002>



Published online: 09 May 2022.



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# Modeling the interplay of EFL learners' basic psychological needs, grit and L2 achievement

Majid Elahi Shirvan <sup>a</sup> and Abdullah Alamer <sup>b,c</sup>

<sup>a</sup>Department of English Language, University of Bojnord, Bojnord, Iran; <sup>b</sup>Department of English, Al-Hasa campus, Imam Mohammad Ibn Saud Islamic University (IMSIU), Saudi Arabia; <sup>c</sup>Department of English, King Faisal University, Al Hofuf, Saudi Arabia

## ABSTRACT

Given the recent attention to language-domain-specific grit in the field of SLA and the scarcity of research on the antecedents of L2 grit, we proposed a model that links L2 learners' basic psychological needs (BPN) (i.e. autonomy, competence, and relatedness), L2 grit (i.e. perseverance of effort (PE) and consistency of interest (CI)), and L2 achievement (measured by students' scores on English courses). L2 Saudi undergraduate students who study English were invited to participate. The findings indicated that except for the path from competence to achievement and from CI to achievement, all direct paths in the model were significant. More specifically, only PE, but not CI, was positively associated with L2 achievement. Also, all constructs of BPN have a positive influence on PE, but only autonomy has a positive link with CI. The findings illustrated plausible antecedents of L2 grit and showed pathways in which L2 grit operated as mediators in the association between BPN and L2 achievement. Using partial least squares structural equation modelling (PLS-SEM) to examine the mediational model allowed us to predict unseen scores on the outcome; thus, providing support for the out-of-sample predictive power (predictive validity) of our structural model.

## ARTICLE HISTORY

Received 3 March 2022  
Accepted 25 April 2022

## KEYWORDS

Basic psychological needs; structural equation modeling; predictive validity; PLS-SEM; L2 grit; L2 achievement

## Introduction

Considering the complex, nonlinear, dynamic, and variable nature of foreign/second language (L2) learning (Larsen-Freeman 2007), many factors can be conceived to predict L2 achievement. These have long been in the interest of second language acquisition (SLA) researchers (Matsuda and Gobel 2004). Among these factors are personality traits, which have been recently studied more in the process of language learning, as they account for individual differences (Batstone and Ellis 2009; Kramsch 2008; Larsen-Freeman 2015). Besides, the interplay of psychological factors and L2 achievement has long attracted the attention of SLA researchers (Karbakhsh and Safa 2020). Thus, it can be useful to explore the interrelationship of L2 learners' personality traits, psychological needs, and L2 learning, as addressed in the present research.

A life-determining personality trait marked by persistence, consistency, resilience, and perseverance is grit (Akbağ and Ümmet 2017). Strong claims were made about grit by Duckworth (2013) to introduce it as even a better predictor of success than IQ and aptitude (Credé, Tynan, and Harms 2017). Since the development of the domain-specific grit scale in SLA, more investigations have been carried out to explore the role of L2 grit in language learning (Oxford and Khajavy 2021).

Grit can, directly and indirectly, affect academic success; thus, it can supposedly mediate the effect of other factors on achievement, or its effect could be moderated by other antecedent variables (Credé, Tynan, and Harms 2017). Also, a key point to be taken into consideration is how grit predicts L2 achievement when it plays a meditative role in the association of basic psychological need (BPN) and L2 achievement. However, Oxford and Khajavy (2021) indicated that research is scarce with regard to the antecedent of L2 grit. Thus, the present study investigates potential psychological antecedents of grit that can be useful for both theory and implications. More specifically, in this study, we aim to test how learners' basic psychological needs (BPN) can operate as antecedents of L2 grit, and then examine how L2 grit mediates the effects of BPN on L2 achievement through structural equation modelling.

For one, it can be hypothesised that BPN as drawn in Deci and Ryan's Self-Determination Theory (SDT) (1985) can be potential antecedents for L2 learners' grit levels. BPN aim to clarify how social behaviours and interpersonal contexts influence autonomous behaviours among individuals (Deci and Ryan 2008). BPN consist of the need for autonomy, competence, and relatedness, which eventually affect psychological health and academic success (Ryan and Deci 2000). It can be hypothesised that the effect of satisfying language learners' BPN on their learning is filtered by their personality traits such as their grit, along with its two dimensions (i.e. CI and PE). From a theoretical perspective, two components of BPN, autonomy, and competence, emphasise the integrated efforts for the achievement of learning goals and the sense of accomplishment to meet the challenges (see Ryan and Deci 2000). Thus, we can postulate that BPN could be associated with grit. From an empirical perspective, the satisfaction of BPN (Alamer 2022c; Alamer and Almulhim 2021; McEown and Oga-Baldwin 2019) has been revealed to have a significant effect on L2 use and the consistent efforts (similar to the perseverance of effort in grit) put into L2 learning and use (Alamer 2022a; Clément, Dörnyei, and Noels 1994; Dörnyei and Ushioda 2009; Hiver, Al-Hoorie, and Mercer 2020; Noels 2013). That is, it is inferred that language learners with a sufficient amount of autonomy might be consistent in their interest and perseverance. The nature and quality of these consistent efforts have also been suggested to affect the L2 learning success (Alamer 2021b). Therefore, it can be hypothesised that grit may act as a mediator of the effect of the BPN satisfaction on L2 achievement.

Another piece of empirical evidence for the association between BPN and grit was provided by Akbağ and Ümme (2017), who showed that grit and the satisfaction of BPN can significantly predict young adult learners' academic success. Yet, this study was out of the SLA context. The positive influence of grit on L2 achievement has already been indicated in the findings of some recent studies (e.g. Liu and Wang 2021; Sudina and Plonsky 2021 a; Teimouri, Plonsky, and Tabandeh 2020; Khajavy and Aghaee 2022). Nevertheless, one point which should be taken into consideration is whether L2 grit can mediate the association between BPN and L2 achievement.

Accordingly, the present research aims to propose and test an integrated process model of SLA based on the framework of SDT with a focus on the mediating role of L2 grit. This current study explored the extent to which satisfying BPN is related to L2 learners' grit and consequently to their L2 achievement.

## Review of the related literature

### *BPN in education and SLA*

Three basic psychological needs were introduced within the SDT framework including autonomy, competence, and relatedness as the fundamental components required for individuals' integration, growth, and healthy development (Ryan and Deci 2017). The first need, autonomy, involves learners' self-organisation and regulation of behaviour and integrated efforts to achieve educational goals (Ryan and Deci 2000). Although influenced by the surrounding educational setting and rules, the learner's autonomy is fulfilled if she or he perceives the usefulness of the assigned

tasks and activities (Alamer 2022a, 2022c). The second psychological need, competence, is satisfied when learners engage in challenging learning experiences in which they receive adequate help to understand the situation and handle it successfully (Ryan and Deci 2000; Hammond et al. 2001-2003; Yarwood et al. 2019). The third basic need, relatedness, is met when learners have a sense of belonging to the learning environment and perceive and internalise the values of learning (Deci and Ryan 2008; Ryan, Deci, and Grolnick 1995; Yarwood et al. 2019)

According to SDT, the social learning environment that supports learners' basic psychological needs can facilitate and maintain autonomous performance, more successful learning and achievement; it can increase adaptability, raise awareness, and contribute to well-being (Reeve 2016; Ryan and Deci 2017; Vansteenkiste et al. 2019). Despite the inherent potential and value of investigating BPN (McEown and Oga-Baldwin 2019), SLA researchers have been less productive in exploring the role of BPN in the growth rate and direction of L2 achievement. Among the primary exemplary works of research is the review of SDT-based studies and their impact on academic practices by Niemiec and Ryan (2009), who reported that teachers' support of learners' psychological needs can positively affect their academic achievement. Also, McEown, Noels, and Saumure (2014) found that language learners with teachers supporting their competence and relatedness benefitted a higher level of motivation than those perceiving their teachers as less supportive, which was later confirmed by Oga-Baldwin et al. (2017).

Focusing on the association between BPN, self-efficacy and academic goals, Diseth, Danielsen, and Samdal (2012) found that BPN were a predictor of learners' self-efficacy and academic achievement goals. Their findings also revealed that these variables could predict the level of academic achievement. The same results were also found by Zhen et al. (2017) in an exploration of the association among BPN, self-efficacy in education, positive/negative emotions in learning, and engagement in the learning process. Also, Dincer et al. (2019) in their study of the predictors and outcomes of classroom engagement found that BPN can be predicted by teachers' autonomy support and can predict classroom engagement.

From a diverse perspective, Kanat-Maymon et al. (2015) examined the effect of autonomous motivation and the satisfaction of BPN, and found that satisfying learners' needs were positively associated with autonomous motivation. Also, taking a behavioural approach, Korthagen and Evelein (2016) examined the interrelationship of student teachers' BPN with their professional behaviour. They reported a statistically significant relationship between these variables. Besides, Milyavskaya and Koestner (2011) scrutinised the interplay of BPN, autonomous motivation, and subjective well-being. This study showed that BPN managed to significantly predict autonomous motivation and well-being.

One of the applications of the association between BPN and language achievement in the Middle East is the motivational process model established by Alamer and Lee (2021). The authors tested a mediational model that links BPN with goal orientation motivation, several types of positive and negative emotions, and the two types of motivational orientations specified by SDT.

The results showed that BPN are associated with L2 achievement through different psychological mediators. Similarly, Yarwood et al. (2019) examined the three major components of BPN to determine the autonomy-supportiveness of a self-access learning centre in Japan. They provided insights into the significance of relatedness to the learners of the target learning centre and elaborated on the contrast between learners' wish to communicate in English and their unwillingness to actualise their wishes. In a similar vein, in the Iranian context, Karbakhsh and Safa (2020) examined the direct and indirect association of L2 learners' BPN satisfaction, goal orientation, willingness to communicate, learning strategy use, self-efficacy, and L2 achievement using path analysis. They found that though satisfying BPN did not directly account for L2 achievement, it was indirectly linked with it via goal orientation. These results suggested that teachers had better first find the most relevant individual sources of performance for their learners in their immediate context and then develop ways to best deal with preventive psychological or cognitive variables that correlate with their achievement.

One of the recent BPN investigations in the SLA domain is Alamer's (2022a) examination of an integrated process model of L2 motivation in the light of the self-determination theory (SDT). Specifically, this study examined to what extent satisfying BPN is associated with SDT orientations and with the efforts put in. This study also explored how these variables relate together to vocabulary knowledge and revealed that BPN were directly but not indirectly related to vocabulary knowledge. In addition, motivational orientations (i.e. autonomous and controlled motivation) were both, directly and indirectly, associated with vocabulary knowledge. The results revealed motivational directions which had pedagogical implications for L2 achievement. Regarding the developmental nature of BPN, Noels, Lascano, and Saumure (2019) examined the development of BPN of 162 university students across a language course of French via latent growth curve modelling. Their finding indicated that the students' autonomy, competence, and relatedness followed an increasing pattern across the language course. Recently, Alamer and Almulhim (2021) examined the association between BPN and different types of language anxiety that emerged from a qualitative phase. They found that certain types of anxiety could be negatively predicted by the sense of competence and relatedness while no sub-types of language anxiety could be explained by the perception of autonomy. Also, very recently, Alamer (2022b) has investigated the extent to which satisfying the BPN can be related to autonomous motivation through the application of bifactor exploratory structural equation modelling (bifactor ESEM). First, the study examined the factor structure of the recently developed BPN-L2 scale which includes three factors, autonomy, competence, and relatedness. The study illustrated that the scale is valid and reliable. Second, it was found that both three specific factors as well as the global BPN sufficiently predict the outcome, autonomous motivation. Alamer's (2022b) study was the first to test the multidimensionality of the BPN-L2 scale using bifactor ESEM in the L2 research and showed that standard CFA failed to provide adequate results.

### ***Grit in education and SLA***

Grit is a non-cognitive skill and a personality trait that has found its way into academic success as well as life success (McCain 2017). It involves the two dimensions, perseverance of efforts (PE) and consistency of interest (CI) (Duckworth et al. 2007). Both PE and CI can noticeably influence achievement because PE paves the way for the accomplishment of mastery despite failure, and CI is essential to deliberate practice for the achievement of mastery (Credé, Tynan, and Harms 2017). The general approach to grit has been mostly employed in the body of research on academic success and it led to a bulk of research in different educational settings (see Wang, Elahi Shirvan, and Taherian 2021). The salience of grit is also associated with investigations on the growth of expertise along with the focus on continuous deliberative practice (Ericsson, Krampe, and Tesch-Romer 1993; Krampe and Ericsson 1996).

The earliest study of the trait with the general domain scale in the context of language learning was by Lake (2013), who used the general grit scale. He found that learners with higher levels of grit are more willing to spend time and put effort into learning a second language. Also, Changlek and Palanukulwong (2015) examined the predictive validity of motivation and grit on the achievement of English language among 180 Thai students. These researchers found that motivation and grit had significant and positive association among high-achievers. Kramer, McLean, and Shepherd (2017) also used a modified module of the general grit scale to investigate the predictive validity of grit among 58 Japanese learners of English language as a foreign language via a Rasch analysis. Their findings indicated a moderate link between their participants' vocabulary knowledge and grit. Furthermore, Robins (2019) applied the general grit scale to test the influence of grit on retention and academic achievement of online learners of English as a second language in the US. The results revealed a significant correlation between grit and the learners' GPA. In a search for the relationship between L2 learners' grit and language learning among a large sample of Chinese secondary school students, Wei, Gao, and Wang (2019) found a positive but low link between grit and English

language achievement. However, Yamashita (2018) reported no association between the two variables among a sample of Japanese learners. Interestingly, PE had a negative correlation with GPA for some participants.

Some recent research has highlighted the association of L2 grit with a range of L2 variables. For instance, a link between socio-biographical variables such as multilingualism, age, and gender with L2 grit in the Chinese context was reported by Wei, Liu, and Wang (2020). Also, in their longitudinal investigation of L2 grit and foreign language enjoyment, Elahi Shirvan, Taherian, and Yazdanmehr (2021) found an increasing pattern of association between the two variables over time. Moreover, highlighting the role of the classroom environment, Li and Dewaele (2021) found that general grit in the context of online English language classes predicts foreign language classroom anxiety. In addition, Resnik, Moskowitz, and Panicacci (2021) found L2 grit as an antecedent of foreign language enjoyment. In their investigation of the link between language learning grit and L2 and L3 achievement, Sudina and Plonsky (2021) found that, compared to CI, the language domain-specific PE had stronger criterion validity for learners' achievement. On the other hand, testing the bond between L2 grit and L2 achievement with the inclusion of other related variables, Khajavy and Aghaee (2022) found that PE could predict L2 achievement when it is regarded as the only variable in the analysis but when emotions and personal bests were involved in the analysis, neither CI nor PE could predict L2 achievement. As noted by Credé and Tynan (2021), perseverance and passion might be needed for the achievement of language but inadequate on their own as other variables are also required to be present, which paves the way for further exploration of L2 grit (Oxford and Khajavy 2021).

It should be noted that a tangible point in the literature on L2 grit is that CI as a subscale of L2 grit has been mostly revealed to be nonsignificant or have an only a weak association with a range of L2 variables. For instance, Schmidt et al. (2018) reported that the results for the overall grit were more like the results for PE than those of CI. Also, Muenks et al. (2017) discovered students' PE, but not CI, as a predictor of their later grades. Furthermore, in contrast to PE as a positive predictor of L2 proficiency, CI was found to negatively predict L2 proficiency in Sudina et al.'s (2020) study. Moreover, compared to PE, CI had a weaker association with vocabulary acquisition in Alamer's (2021) study. Finally, the negligible variance of CI to academic achievement, compared to the meaningful incremental variance of PE, was reported by Credé, Tynan, and Harms (2017). Oxford and Khajavy (2021) contended that these findings echo the limited utility of CI in domain-general grit studies.

### **Methodological issues of the L2-grit scale**

The relationship between L2 grit and different language outcomes across socio-educational contexts remains ambiguous (Khajavi, MacIntyre, and Hariri 2020; Oxford and Khajavy 2021), and that is partially due to the measurement scale of L2 grit. The domain-specific L2 grit scale firstly developed by Teimouri, Plonsky, and Tabandeh (2020) was tested using principal component analysis (PCA) and found higher correlations between their scale and L2 learners' outcome than the general grit. Also, the factor structure of this scale was further tested by Sudina et al. (2021) who tested the higher-order CFA model. However, some researchers found that the analytical strategy used to establish the factor structure of that scale was dubious (Alamer 2021b; Alamer 2022b; Elahi Shirvan, Taherian, and Yazdanmehr 2021; Muenks et al. 2017; Wang, Elahi Shirvan, and Taherian 2021). Specifically, research shows that PCA is not the method of choice when the goal of the study is to *confirm* the dimensionality of the constructs. PCA is mainly used for data reduction and when no clear factorial structure is available; thus, its aim does not align with the philosophy of theory testing (Alamer and Marsh 2022; Hair et al. 2019, 2021). That is possibly what led Teimouri, et al. to remove several items from the measurement, which made the scale deviate from the original scale of Duckworth et al. (2007). Moreover, using higher-order factor models (Sudina et al. 2021) yields statistical issues when only two first-order factors are involved in the CFA. For these reasons,



Alamer (2021b) developed an alternative scale, L2-Grit that retains the 12 items and confirmed its factor structure using the bifactor CFA. He also found that CI correlated with Ideal L2-self and that PE correlated with motivational intensity. Yet, research shows that exploratory structural equation modelling (ESEM) overcomes limitations that CFA, including bifactor CFA, present (see, Alamer 2021a, 2022b for greater details). Thus, research remains lacking full details about the construct validity of the L2-Grit scale.

### ***BPN and grit in education and SLA***

The few existing studies of BPN and grit together belong mostly to the psychology and education (in general) domains, and less to the SLA domain. The limited literature belongs to recent years. For instance, Jin and Kim (2017) investigated how grit was correlated with young adults' BPN satisfaction and subjective well-being. Their survey showed that grit was significantly correlated with autonomy and competence (two psychological needs). These needs also mediated the effect of grit on the participants' subjective well-being. Akbağ and Ümmet (2017) examined the predictive role of grit as a personality trait together with BPN satisfaction on the subjective well-being of final year undergraduates in the government universities of Turkey and graduates who worked. The relatedness satisfaction and the total score of BPN satisfaction showed significant divergence in favour of female participants. Further analysis showed that grit, the satisfaction of three BPN, and gender are significant predictors of subjective well-being for young adult participants. Also, the satisfaction of BPN predicts subjective well-being stronger than grit and gender. Besides, a statistically significant positive relationship between BPN and grit tendency was concluded.

Jiang et al. (2020) used the SDT framework to propose that needs satisfaction is the main mediator of the effect of grit on subjective well-being. Their within-subject mediation analysis showed that grit managed to increase happiness through satisfying the BPN. Furthermore, the effect was found regardless of the participants' grit at a trait level. In a similar vein, Hernnandez et al. (2020) explored the association of teacher-related autonomy support and students' academic success with the mediating effect of BPN, motivation, and grit. The sample included university students of sport sciences, and the results showed that BPN and motivation mediated between perceived autonomy support and academic success. The passion dimension of grit showed an indirect effect.

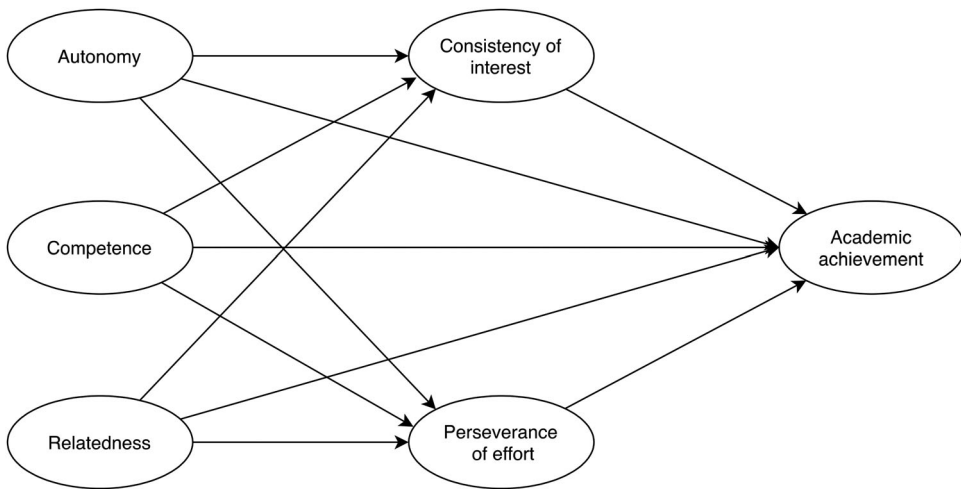
One of the latest works of research on the role of grit and BPN in education is Lozano-Jiménez, Huéscar, and Moreno-Murcia's (2021) use of the SDT framework to test the predictive capacity of teachers' interpersonal style of autonomy support in higher education, and the predictive power of grit on the satisfaction of BPN, motivation and life satisfaction of university students in Columbia. These researchers found that perceived teaching style of autonomy support and grit positively predicted the BPN, which in turn predicted motivation, which also predicted life satisfaction in the university context.

In SLA research, Alamer (2021a) adopted the SDT framework to see how satisfying BPN is related to SDT orientations and also to the efforts (a grit dimension) expended and then the extent to which these factors together could predict vocabulary knowledge. He found a direct association of BPN with vocabulary knowledge, which overshadowed the role of efforts. This researcher also drew attention to the need for further research on SDT and L2 achievement and the lack of well-established models of L2 achievement based on less explored psychological factors such as BPN satisfaction, motivation, and grit. The hypothesised model is shown below (see Figure 1).

## **Methods**

### ***Participants***

The participants of the present study were Saudi undergraduate students studying at the Department of English at a public Saudi university. All students, male and female, speak Arabic as their



**Figure 1.** The hypothesised relationships between BPN, Grit, and achievement.

mother tongue, and their ages were between 18–26 ( $M = 20.3$ ). The university review board approved the study and granted permission to collect data from the students. An invitation was sent to all students at the department, and they were invited to participate voluntarily. Thus, A convenience sample strategy was used. A welcome message appears at the beginning of the questionnaire informing students of the purpose of the study, and in the case a student is unwilling to participate they are asked to simply close the webpage. Accordingly, 213 students participated in the online questionnaire.

## Measures

### *The basic psychological needs in second language (BPN-L2) scale*

The BPN-L2 scale (Alamer 2022a) consists of 12 items measuring participants' levels of satisfaction on autonomy, competence, and relatedness. The BPN-L2 scale has been introduced to the field and extensively validated using the bifactor ESEM technique in Alamer (2022b). Four items for each construct in a 5-point Likert-type response format ranging from 1 (strongly disagree) to 5 (strongly agree). Example items are as follows: for autonomy, 'I am able to freely decide my own pace of learning in English'; for competence, 'I feel I am capable of learning English', and for relatedness, 'People around me care about my progress'.

### *L2-Grit scale*

L2-Grit scale (Alamer 2021b) is a 12 items scale of a language domain-specific grit. 6 items for CI and 6 items for PE (see Appendix for the whole scale). Students responded to each statement on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). An example of an item that assesses PE in learning an L2 is as follows: 'I work hard towards my language learning goals irrespective of how long they take to achieve'. An example of an item that assesses CI in learning an L2 is as follows: 'My interest in learning the second language changes every month'. The scale has been validated previously in Alamer (2021b) using bifactor CFA analysis.

### *The criterion measure*

The criterion measure of the present study is students' L2 achievement which is assessed students' grade point averages (GPA) in their English courses. The units of English lessons include subjects of Reading, Listening, Speaking, Writing, Vocabulary, and Phonetics. Hence, students who have a



greater GPA are usually those who have high levels of language proficiency. In the questionnaire, there was an option for the students to indicate their GPA. Except for two students, all students provided their GPA.

## **The analyses**

The present study assessed the mediating effects of grit in the relationship between BPN and language outcome. To do so, we use partial least squares structural equation modelling (PLS-SEM) to evaluate the study's model. PLS-SEM is a variance-based approach (also called composite-based SEM) that aims to explain the variance in the outcome variable(s) (Hair et al. 2021; Sarstedt et al., 2020). PLS-SEM is an alternative to the mostly used method Covariance-based SEM (CB-SEM) which is suitable when the links between the constructs are exploratory in nature. That is, PLS-SEM is better utilised when the linkages between the factors are less established in the literature (more exploratory than confirmatory), such as in the case of the links between BPN and grit. Moreover, PLS-SEM is robust to the nonnormality; thus, making it more suitable when the data is not normally distributed (Hair et al. 2021). Because PLS-SEM objective is to maximise variance extracted from the exogenous variables, goodness-of-fit indices such as CFI, NFI, and RMSEA (among others) are not fully transferrable (Hair et al. 2019, 2021; Sarstedt et al., 2020). The focus of PLS-SEM is usually placed on model prediction effectiveness, which has a different evaluation approach. However, empirical research started to accommodate model fit indices and show their usefulness (Henseler, Hubona, and Ray 2016; Schuberth, Rademaker, and Henseler 2022). Among these measures is SRMR that can be used in PLS-SEM context. We report this index for readers to get information about the overall model fit of the model.

To evaluate PLS-SEM structural models, researchers need first to assess the measurement model and then the structural model. The measurement model is assessed by three indices: (1) Cronbach's alpha ( $\alpha$ ) and Composite Reliability (CR); (2) factor loadings with a value above .70 and .50 indicating good to acceptable loading; (3) Average Variance Extracted (AVE) with a cut-off value of .50 to indicate convergent validity; (4) discriminant validity through heterotrait-monotrait ratio (HTMT) of the correlations. HTMT values below .90 (and ideally below .85) display support for the discriminant validity of the constructs.

The structural model is assessed based on two predictive indices: (1) the coefficient of determination ( $R^2$ ) in the outcome variable and (2)  $PLS_{predict}$  which examines out-of-sample predictive power (Shmueli et al., 2016). In  $PLS_{predict}$ , researchers are recommended to compare the value of root mean squared error (RMSE) in the PLS model and the naïve linear regression model (LM). The model has good predictive power when it generates lower RMSE values in the PLS model than in the LM model (see Shmueli et al., 2016 for a greater explanation). The structural model should also be free from collinearity issues by inspecting the VIF value in the path coefficients. For the path coefficients, we use the range of 0–.10, .10–.30, .30–.50, and  $> .50$  to indicate weak, modest, moderate, and strong effect sizes, respectively (Cohen et al., 2011).

## **Results**

### **Preliminary analyses**

Descriptive statistics including reliability estimates and bivariate correlations for the BPN, L2-Grit, and language achievement are reported in Table 1. The results illustrated that all variables have achieved acceptable to good values. The data appear to deviate from normality slightly as shown in Table 1; thus, justifying the use of PLS-SEM and Spearman's rho correlation as they can handle the nonnormality. An interesting finding that this research found is the negative correlation between CI and language achievement ( $r = -.16, p < .05$ ), though it was small in size.

**Table 1.** Descriptive Statistics and Zero-Order Correlations (Spearman’s rho) for the Variables

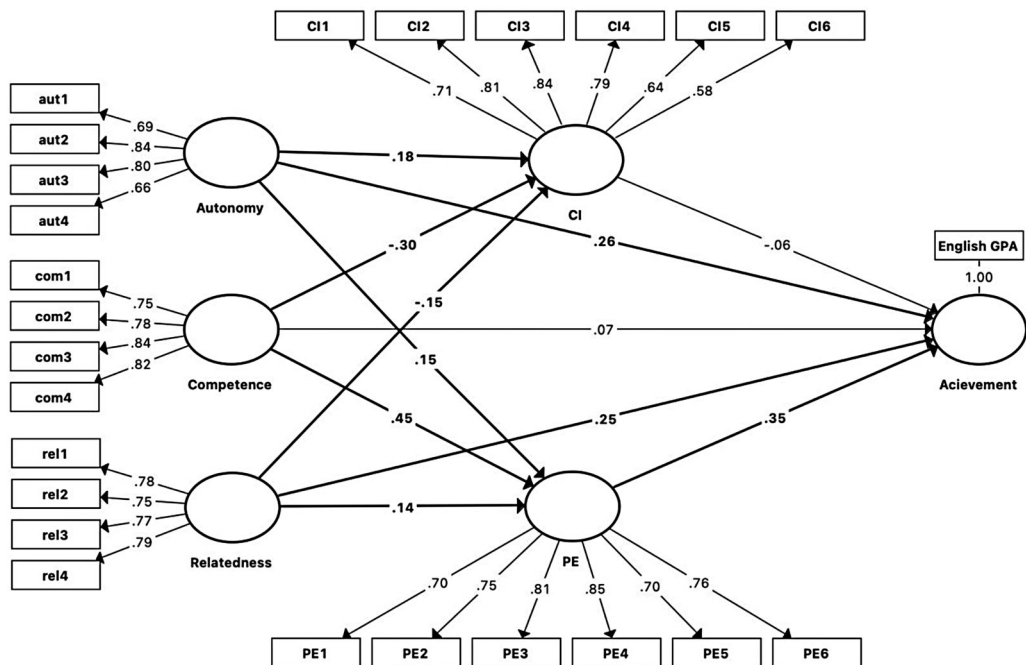
	1	2	3	4	5	6
1. Achievement (English GPA)	—					
2. Autonomy	.42**	—				
3. Competence	.48**	.37**	—			
4. Relatedness	.45**	.36**	.45**	—		
5. CI	-.16*	.05	-.26**	-.20*	—	
6. PE	.51**	.34**	.56**	.38**	-.11	—
Mean	4.07	4.13	4.16	3.58	3.19	3.90
SD	1.12	.77	.68	.86	.92	.78
Kurt/Skew	-.18/-.13	1.34/-1.11	2.51/-1.10	-.05/-.51	.70/-.90	-.71/.03
(a)/CR	—	.74/.76	.80/.81	.78/.78	.84/.84	.85/.86

Note. \*  $p < .05$ , \*\*  $p < .001$ , Kurt = Kurtosis, Skew = Skewness, CR = composite reliability (also termed  $\omega$ ).

### Results of the measurement and structural model

The first step was to ensure that the measurement model is valid and reliable. The reliability estimates as reported in Table 1 are above the cut-off value; thus, indicating a reliable measure. Factor loadings in the reflective constructs were all above .70 with one exception to one item on autonomy and one item on CI with a factor loading of .66 and .58, respectively (see Figure 2). We retain these items as the factor loadings were not substantially low. The AVE values of the reflective constructs of autonomy, competence, relatedness, CI, and PE were all above .50 which supports the convergent validity of these constructs. The HTMT values were evaluated to test the discriminant validity of the measures. All values of HTMT were below .60, which indicate excellent evidence for the discriminant validity of the measures involved in the model.

Next, we examine the structural model by inspecting the explanatory and predictive power. Before that, we inspected the VIF values in the structural model and found that no values approach 3.00. Thus, no issues of collinearity are found in the model. In addition, we evaluated the SRMR and



**Figure 2.** The results of the Structural Model

Note. Paths in bold are significant at  $p < .05$ .

**Table 2.** Indirect and Total Effects of the Variables on the Outcome

Indirect paths	$\beta$	$p$	CI 95%	
			Lower	Upper
Autonomy -> CI -> Achievement	-.01	.29	-.04	.03
Relatedness -> PE -> Achievement	.05	.04	.01	.11
Competence -> CI -> Achievement	.02	.26	-.01	.06
Autonomy -> PE -> Achievement	.05	.05	.01	.11
Relatedness -> CI -> Achievement	.01	.34	-.01	.04
Competence -> PE -> Achievement	.15	<.001	.09	.23
Autonomy (total)	.30	<.001	.19	.40
Competence (total)	.24	.002	.07	.40
Relatedness(total)	.31	<.001	.19	.42

noted that the value does not suggest substantial misfit in the structural model (SRMR = .08, SRMR Hi 95% = .07). Next, we observed that independent variables explained a large variance in the outcome variable ( $R^2 = .51$ ). With regards to the out-of-sample index, the PLS<sub>predict</sub> shows that the PLS model outperforms the naïve LM model by showing that the error value (i.e. RMSE) in the outcome indicator is lower in the PLS model (RMSE values were .601 in the PLS model compared to .611 in the LM model). Following Hair et al. (2021) benchmark, our model can be said to have strong out-of-sample predictive validity.

Several direct, indirect and total effects we found in the model. Except the path from competence to achievement and from CI to achievement all direct paths were significant. Interestingly, both competence and relatedness were negatively associated with CI. Only autonomy was positively but weakly related to CI. Conversely, all constructs in BPN have positive effects on PE with competence being moderately related to PE. Autonomy and relatedness were directly associated with L2 achievement in the model. With regards to grit constructs, only PE, but not CI, was positively linked with L2 achievement ( $\beta = .34$ ). Indirect effects were also observed in BPN constructs only through PE but not CI. In particular, PE moderately mediated the effect between competence and L2 achievement ( $\beta = .15$ ), and weakly between autonomy and L2 achievement ( $\beta = .05$ ) as well as between relatedness and L2 achievement ( $\beta = .05$ ) Table 2.

### Competing models and multigroup analysis

It is recommended in SEM research to include alternative (also called competing) models that are conceptually tenable (Hair et al. 2019). Our alternative model is a model that has full mediation effects. That is, paths from autonomy, competence, and relatedness to the outcome are removed in the competing model. This model can be said to be more parsimonious which is likely to be applied to the general population. The model to support is the one that has lower values in AIC and BIC indices (Hair et al. 2021). The analysis supported the original model as both AIC and BIC values were lower in the original model ( $-152.34$  and  $-132.17$  compared to  $-94.41$  and  $-84.33$ , respectively). Accordingly, we retain the hypothesised model for the next assessment.

The PLS multigroup analysis (PLS-MGA) indicated that gender was not a substantial factor that could affect the magnitude of paths in the model. Two exceptions to this observation were found in the path from autonomy to CI, which was .50,  $p < .001$  in the female group while non-significant in the male group .07,  $p = .46$ . Another difference was observed in the path from PE to achievement, which was .51,  $p < .001$  in the female group whereas it was nonsignificant in the male group .16,  $p = .13$ . Regarding the indirect effects, except for one path, the model was quite stable between the two groups. The direct path Relatedness -> PE -> Achievement was significant in the female group (.12,  $p = .01$ ) while it did not reach statistical significance in the male group (.02,  $p = .48$ ).

## Discussion

The research on language domain-specific grit is in its fledgling stage. Given the scarcity of research on the antecedents of L2 grit, we examined the role of BPN as antecedent of L2 grit. We sought to examine the mediational role of L2 grit in the relation between BPN and L2 achievement. We also tested the invariance of our results across the two genders. The findings of this study confirmed those of the previous studies highlighting the predictive role of satisfaction of BPN in the achievement of learning goals (e.g. Alamer & Lee, 2021; Diseth, Danielsen, and Samdal 2012; Karbakhsh and Safa 2020; Zhen et al, 2017). Also, these findings confirmed the observation that PE is more significantly related to L2 achievement than CI due to its facilitation of achievement mastery. As noted by Credé, Tynan, and Harms (2017), high levels of perseverance and deliberative practice are required for the achievement of learning goals; our findings supported this point as learners with high PE appeared to put more effort into their language learning process. On the other hand, consistency of interest was found weakly related to achievement, a finding that has been highlighted in previous studies (e.g. Alamer 2021b; Teimouri, Plonsky, and Tabandeh 2020; Sudina et al. 2020; Oxford and Khajavy 2021). Overall, the model appears to explain a substantial variance in the outcome, i.e., 51% of the variance explained in English academic achievement.

With respect to the antecedents of L2 grit, the findings of this study revealed that all basic psychological needs can be regarded as potential predictors of PE. Also, among the three constructs of BPN, only autonomy has a positive, though weak, influence on CI. The association between PE and satisfaction of BPN found in this study concur with what has been already reported in two previous studies (Akbağ and Ümmet 2017; Jin and Kim 2017). Inspired by the findings of recent studies (e.g. Alamer 2022a, 2022c; Alamer & Lee, 2021; McEown and Oga-Baldwin 2019) which put emphasis on the satisfaction of BPN in the activation of efforts in language learning. The influence of BPN on PE in this study can be attributed to the sense of satisfaction of these needs, paving the way for the learners' consistent efforts. More specifically, it is not surprising to see that self-perception of autonomy was the only variable among the three basic needs that relate to perseverance of effort as well as consistency of interest in the learning of the L2. This is because the *integration of efforts* is embedded in the definition of autonomy (see Ryan and Deci 2000). Thus, based on this definition, language learners' regulation of their learning behaviour and their self-regulation can contribute to their integrated efforts for, and consistent interest in, the achievement of their learning goals. As indicated by Oxford (2017), being the agent of their own learning and caring, language learners can deepen their sense of personal meaning. Nonetheless, sense of autonomy was positively linked with CI, indicating that autonomous learners are likely to be more consistent about their language interest. Thus, autonomy might be a key factor that increases students' likelihood of being interested in the language.

Also, another possible reason for the significant influence of autonomy satisfaction on both PE and CI may be attributed to language learners' perception of classroom activities as useful (see Alamer 2022b; Yarwood et al. 2019). That is, learners' value for the tasks and activities assigned to them underpinning the fulfilment of their autonomy could have enhanced their perseverance for, and interest in, their language learning goals. This high value of the learning process is also an important condition for the satisfaction of relatedness. It should be noted that the internalisation of the values of language learning is intertwined with the learners' sense of belonging to their learning environment (Deci and Ryan 2008; Ryan, Deci, and Grolnick 1995). Therefore, it can be postulated that learners' sense of belonging to their class could have raised their perseverance in learning the language.

The influence of language learners' competence satisfaction on their PE can also be supported by the condition for the satisfaction of this BPN (Ryan and Deci 2000). Learners' competence is satisfied when they are highly engaged in their learning experiences (Hammond et al. 2001-2003). We may conjecture that language learners' engagement in the process of their language learning has been integrated with their perseverance for their goals of learning achievement. This is quite

consistent with Yoon et al.'s. (2020) study which highlighted the mediating role of engagement between autonomy and achievement. Previous research (e.g. Reeve 2016; Ryan and Deci 2017; Vansteenkiste et al. 2019) has emphasised that supportive learning environment can set the stage for the fulfilment of autonomous learning and sustained effort in learning process.

On the other hand, the negative effects from both competence and relatedness on consistency of effort may reflect the limited utility of CI in the literature of grit (see Oxford and Khajavy 2021) as it has been revealed to have mostly weak or insignificant link with many L2 variables (e.g. Alamer 2021b; Credé, Tynan, and Harms 2017; Datu, Valdez, and King 2016; 2017; Muenks et al., 2017; Schmidt et al. 2018; Sudina et al. 2020; Teimouri, Plonsky, and Tabandeh 2020). One possible reason for this low utility of CI, as noted by Oxford and Khajavy (2021) is that grit is not necessarily consistent with research on human development in terms of interest as the psychology of human development regards changes in interest and goals quite normal but not as an issue. Oxford and Khajavy (2021) raised this point that the emergence of new interests in lower-level undergraduate university courses is not surprising as new topics are introduced more often every semester. Another possible reason can be related to the conceptual meaning of CI for language study. For some, consistency of interest can be applied to different domains, not only to studying the language, which conceptually affects its association with language achievement. A more refined definition of CI could contribute to fill the gap and provide a solution to the inconsistency of results.

Some pedagogical implications based on the present study findings can be discussed. First, as grit has been found to be an important ingredient for success in life in general and language learning in specific, teachers need to place attention to possible conditions where students' grit can be flourished. Our study suggests that when students' basic needs are supported, students are more likely to put in effort in the learning process. For teachers to increase students' long-term passion about the learning, autonomy supportive teaching appears to be particularly relevant among the other BPN. Thus, teachers may be able to expect grittier language learners when greater satisfaction of the basic need of autonomy is fulfilled. Helping their learners to regulate their language learning behaviour and engage in their learning process, teacher may contribute to, and allow, students formulate their perseverance in their language learning efforts to achieve their short-term and long-term goals.

## Conclusion

Given the scarcity of research on the antecedents of L2 grit, we tried to test the mediation role of L2 grit in the association between the basic psychological needs and L2 achievement via structural equation modelling. We applied PLS-SEM as it is more appropriate for exploratory, rather than confirmatory, research such that when the relationships are less established in the literature. The findings of the study indicated that all constructs of the basic psychological needs have positive association with perseverance of effort, but not consistency of interest. Also, only students' effort, but not interest, was positively associated with L2 achievement. The findings of this study seem to be important for the field as they have contributed to the literature of L2 grit by assessing the possibility of basic psychological needs as plausible antecedents of grit, which, in turn, relate to language achievement. Using PLS-SEM, particularly, the PLS<sub>predict</sub> (Shmueli et al., 2016) analysis within PLS-SEM allowed us to understand the extent to which the model can be predictive of similar learning contexts, and our findings were promising. That is, one would expect similar results when similar learning situation and same variables are involved. In short, this study may be among the first in the L2 domain to use PLS-SEM and PLS<sub>predict</sub> to examine the predictive validity of the structural model.

We should note that the consideration of a qualitative phase in this study could have helped us to come up with stronger supports for the possible explanations regarding the findings of the study. We suggest that learners' meditative role of their teachers, as a central agent of the classroom environment (see, Alamer 2022a; 2022b; McEown and Oga-Baldwin 2019) can be considered in

future studies for the expansion of the model tested in this study as teachers play a pivotal role in the fulfilment of their learners' basic psychological needs. Also, given the limited utility of consistency of interest (from grit theory) in this study in terms of being an outcome of the basic need of competence and relatedness as well as being a predictor of L2 achievement, researchers are encouraged to re-assess this variable as suggested by Credé, Tynan, and Harms (2017) and Ponnock et al. (2020). Future research might adopt a more critical look at this subconstruct both qualitatively and quantitatively in different learning situations.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## ORCID

Majid Elahi Shirvan  <http://orcid.org/0000-0003-3363-8273>

Abdullah Alamer  <http://orcid.org/0000-0003-4450-0931>

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## Appendix

### L2-Grit Scale (Alamer 2021b)

Item	Factor
I work hard towards my language learning goals irrespective of how long they take to achieve.	PE
Even when I can do something more fun, I give language learning tasks my best effort.	PE
I complete my language learning tasks irrespective of how difficult they are.	PE
I am committed to the investment of my best effort in language learning tasks.	PE
Even if I am struggling to learn the language, I keep trying my best.	PE
Once I set a language learning goal, I try to overcome any challenge that arises.	PE
I often set a language learning goal but later choose to pursue a different one.	CI
New ideas and projects sometimes distract me from learning the language.	CI
I become interested in new pursuits other than language learning every few months.	CI
My interest in learning the second language changes every month	CI
I was obsessed with learning the language for a short period of time but lost interest eventually.	CI
I have difficulty in maintaining my focus on language tasks that take a long time to achieve.	CI

### Basic Psychological Needs of Second Language Scale (BPN-L2) (Alamer 2022a)

Item
<b>Autonomy</b>
I am able to freely decide my own pace of learning in English.
I am able to freely choose the tasks to be done while learning English.
My English teacher allows my class to choose how we approach English learning.
My English teacher let me freely practise English in the classroom.
<b>Competence</b>
I feel I am capable of learning English.
I can be a successful language learner.
I am competent enough to meet the challenges and tasks posed in English learning.
I feel a sense of accomplishment in my English classes.
<b>Relatedness</b>
My English teacher is friendly and cordial with me.
My English teacher is very understanding (puts him/herself in other people's place) about students' problems.
My classmates are willing to help and cooperate with me while learning the language.
My English teacher cares about my progress.