

# Introducing the Basic Psychological Needs Frustration in Second Language Scale (BPNF-L2): Examining its factor structure and effect on L2 motivation and achievement

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## ABSTRACT

Research on the satisfaction of the basic psychological needs for autonomy, competence, and relatedness is well-established in second language (L2) research. However, little is known about the *frustration* of these basic psychological needs and how they can undermine intrinsic motivation and L2 achievement. Importantly, there is no valid scale of the frustration of the basic psychological needs in the L2 context. Accordingly, the present study introduces a new scale called the *Basic Psychological Needs Frustration in Second Language (BPNF-L2)* and assesses its factor structure and criterion-related validity through the application of bifactor exploratory structural equation modeling (bifactor ESEM). Our results showed that scores obtained on the BPNF-L2 scale are reliable and valid. Moreover, our results support the criterion-related validity of this factor structure by showing that the general factor of BPNF-L2 negatively explains intrinsic motivation and L2 achievement while the BPNF-L2 specific factors (i.e., autonomy, competence, and relatedness frustration) explain the outcomes differently. The results indicate that feeling frustrated because basic psychological needs are not met may hinder the enjoyment and acquisition of the L2. Educational implications, methodological advancements, and directions for future research are provided.

## 1. Introduction

Self-determination theory (SDT; Deci & Ryan, 1985; Deci et al., 2017; Ryan & Deci, 2020) is a comprehensive theory of human motivation primarily concerned with understanding individuals' goal-directed behavior, well-being, and psychological functioning. SDT research has demonstrated the importance of the satisfaction of the basic psychological needs (BPN) for autonomy (i.e., feelings of volition and control), competence (i.e., feelings of effectiveness and mastery), and relatedness (i.e., feelings of belongingness and connection) as key drivers of motivation, growth, and well-being. SDT assumes that when BPN are satisfied, individuals thrive and function optimally (Ryan & Deci, 2000). This assumption has been supported in relation to students' motivation and functioning across different research contexts (Alamer & Alrabai, 2023; Alamer & Al Sultan, 2022; Chen et al., 2015; Costa et al., 2018; Huyghebaert-Zouaghi et al., 2021; Olafsen et al., 2021), including

the second language (L2) domain (Alamer, 2022a, 2022b, 2022c; Alamer & Al Khateeb, 2023; Alamer et al., 2023; Dincer et al., 2019; Elahi Shrivani & Alamer, 2022; Leeming & Harris, 2022; Noels, 2023; Noels et al., 2019; Oga-Baldwin et al., 2017). A consistent finding of research conducted in this area is that the three BPN should be satisfied for sustain motivation, persistence, and positive functioning to occur. However, research also shows that the satisfaction of these BPN satisfaction does not suffice to completely explain students' motivation and functioning. Rather, it can be argued that it is equally important to consider the frustration of these BPN to achieve a complete picture of links between BPN and student's motivation, learning, and achievement (e.g., Alamer, 2022b; Alamer & Lee, 2019; Oga-Baldwin et al., 2017; Olafsen et al., 2021).

Unfortunately, in the language learning domain, research has yet to consider the distinct role of BPN frustration as a need state distinct from BPN satisfaction. Although one might assume that lower levels of BPN

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satisfaction might reflect the frustration of these needs, many have argued that this is not the case (e.g., Bartholomew et al., 2011; Bhavsar et al., 2020; Chen et al., 2015). For instance, feeling low sense of autonomy to function does not mean that one necessarily feels frustrated to act (e.g., Szulawski et al., 2021). Accordingly, the first objective of the present study was to present and examine the construct validity of the frustration of the basic psychological needs in second language (BPNF-L2) scale, which was developed for the context of L2. The second objective was to test the criterion-related validity of this novel instrument in relation to intrinsic motivation (i.e., a self-driven desire to engage in learning activities for the pleasure and enjoyment that they procure; Deci & Ryan, 1985, Ryan & Deci, 2020) and achievement in L2. Given the increased consideration of the role played by BPN in L2 research, the availability of a new instrument (i.e., BPNF-L2) would be useful to increase our conceptual and empirical understanding of the role played by BPN in L2 acquisition (Noels, 2023), while constituting a foundation upon which to conduct further theoretical and empirical examinations with implications relevant to the L2 domain.

### 1.1. BPN satisfaction in L2

In seeking to understand what drives human beings to engage in goal-directed behaviors across domains, SDT has highlighted the critical role of BPN as primary drivers of intrinsic motivation, well-being, and positive functioning (Ryan & Deci, 2000, 2017, 2020). When applied to L2 learning, the need for relatedness reflects the extent to which language learners feel cared for and connected to others in their classroom. The need for competence reflects the extent to which language learners feel able to master their coursework, typically as a result of exposure to proper teaching practices and assistance. Finally, the need for autonomy refers to students' feelings of having some degree of choice over the classroom activities they engage in to increase their linguistic skills. It also entails accepting and feeling committed even when the choice is not from within. That is, it affords a feeling of volition and control (Lou et al., 2018).

Across various life domains, the satisfaction of individuals' BPN for autonomy, competence, and relatedness tends to be positively associated with their levels of intrinsic motivation, well-being, and functioning (Ryan & Deci, 2017). Similarly, when students' BPN are fulfilled in a specific subject, learners are expected to develop levels of higher intrinsic motivation, positive emotions, well-being, and achievement in that specific subject (Alamer & Alrabai, 2023; Alamer & Lee, 2019; Dincer et al., 2019; Noels et al., 2019; Oga-Baldwin et al., 2017). For instance, Alamer (2022a) found a positive effect of BPN satisfaction on L2 achievement through the mediating role of intrinsic motivation and effort. Dincer et al. (2019) also showed that in language classrooms, BPN satisfaction was associated with higher levels of engagement in the classroom. However, it is important to keep in mind that the bulk of SDT in L2 domain has solely focused on satisfaction side of BPN, thereby ignoring the potentially important role of the frustration of BPN. The current study addresses this limitation.

### 1.2. The need for BPN frustration in language learning domain

One of the first indications that BPN frustration represented a qualitatively distinct state from BPN satisfaction comes from Bartholomew et al.'s (2011) seminal investigation of the meaning of BPN in the sport setting. These authors defined BPN frustration as a negative experience characterized by the impression that one's BPN are actively undermined in a specific context. More precisely, they positioned autonomy frustration as the subjective experience of being controlled and pressured by one's environment. In the L2 area, this could translate into an impression of being forced to engage in tasks seen as irrelevant, or of experiencing a strongly directed learning experience. For its part, competence frustration refers to feelings of inadequacy and inability to adequately complete, or engage with, a variety of domain-specific activities (such as

one's work-related tasks; e.g., Szulawski et al., 2021). In the L2 area, this could translate into students' feelings of being unable to successfully complete their learning activities, as well as to more general feelings of a lack of L2 mastery. Lastly, frustration of relatedness refers to the feeling of isolation, exclusion, and rejection in a specific domain (e.g., Olafsen et al., 2021). In the L2 area, this could occur in situations where the student feels rejected, ignored, or excluded by one's classmates and teacher.

Importantly, the frustration of BPN is seen as qualitatively distinct from a lack of BPN satisfaction (e.g., Cordeiro et al., 2016; Olafsen et al., 2021), and represented as a distinct mechanism reflecting the obstruction of individuals' BPN. Thus, although high levels of BPN frustration are likely to go hand in hand with low levels of BPN satisfaction, this association is asymmetrical so that low levels of BPN satisfaction do not necessarily entail high levels of BPN frustration (Vansteenkiste et al., 2020). Interestingly, emerging research on BPN frustration shows that it does play a role complementary to BPN satisfaction and tends to be typically associated with suboptimal levels of functioning, ill-being, and less desirable forms of motivation (e.g., Ryan & Deci, 2017, 2020; Vansteenkiste et al., 2020). In the language learning context, Reeve (2022) referred to BPN frustration as the dark side of the learning process, occurring in situations where the instructor may come to adopt controlling interpersonal behaviors, prescriptive instructions about what students should do and think in their learning classes, as well as punitive behaviors or behaviors seeking to encourage competition rather than collaborative learning. In turn, BPN frustration can be expected to increase students' passivity, maladaptive functioning, and ill-being, as well as interfere with learning.

Thus far, various attempts have been made to assess BPN frustration as a state distinct from BPN satisfaction in different domains (e.g., Bhavsar et al., 2020; Cheon et al., 2019; Huyghebaert-Zouaghi et al., 2021; Vander Elst et al., 2012). Arguably, the most established of those measures is Chen et al.'s (2015) Basic Psychological Need Satisfaction and Frustration Scale (BPNFS), which separately assesses autonomy satisfaction, autonomy frustration, competence satisfaction, competence frustration, relatedness satisfaction, and relatedness frustration across all life domains. Although the original scale was validated in English, Chinese, Dutch, and Spanish, this scale has since been adapted and validated in Italian (Costa et al., 2018), Norwegian (Olafsen et al., 2021), Polish (Szulawski et al., 2021) and Hungarian (Tóth-Király et al., 2018), among others. These studies all supported the validity of the BPNFS in measuring BPN satisfaction and frustration. Unfortunately, none of these measures have been created to specifically capture BPN frustration in the L2 learning context.

Therefore, there is a need for a measure specifically designed to assess BPN frustration in the L2 context to inform research and practice about whether and when learners come to feel frustrated in their experience of learning an L2 (Alamer & Al Khateeb, 2023; Alamer & Al Sultan, 2022). It is documented in the literature that learning an L2 shares some similarities with other educational subjects as L2 learning often takes place in a classical classroom setting where teachers explain the materials to their students. However, it differs from other subjects as L2 teaching also entails cultural and social aspects of the target language requiring special types of motivational dispositions (Alamer & Lee, 2019; Alrabai, 2021; Dong et al., 2022; Noels, 2023). Thus, the BPNF-L2 questionnaire would provide language educators and researchers greater insight into the nature of BPN frustration as it occurs during the language learning process, and find solutions to better deal with it when it is experienced in the language classroom. Moreover, to assess its criterion-related validity, we consider the extent to which scores on this instrument will negatively relate to student's levels of intrinsic motivation and achievement in L2, two traditional outcomes of BPN satisfaction and frustration in the L2 area (e.g., Alamer, 2022a; Dincer et al., 2019). Based on previous research conducted in the area, we expect negative relations between the frustration of all three needs and students' levels on both outcomes (e.g., Chen et al., 2015; Olafsen et al.,

2021; Szulawski et al., 2021).

Accordingly, the present study aims to address two research questions:

**RQ1:** How reliable and valid are scores obtained on the newly developed BPNF-L2 scale?

**RQ2:** How do the three factors in BPNF-L2 scale (autonomy, competence, and relatedness frustration) relate to intrinsic motivation and L2 achievement?

## 2. Methods

### 2.1. Participants

This study relies on a convenience sample of 206 Saudi undergraduate students (148 female and 58 male) enrolled in the Department of English in a public university located in the Eastern Province of Saudi Arabia. In this university, admission decision is based on students' high school grades and on their scores on the Saudi General Aptitude Test (GAT). Generally, students choose to study at the Department and motivated to learn English for different reasons including intrinsic reasons such as knowing more about the language community and personal growth, and extrinsic reasons such as getting a job and social recognition. Moreover, students seeking admission in the Department of English typically have to complete a foundation year (to demonstrate their L2 proficiency) before entering the main program. Those who fail this foundation year are offered the possibility of transferring to another major that does not require a foundation year (usually majors taught mainly using the L1). Participants have been exposed to English previously since elementary school (students enrolled in this program typically have been exposed to English for at least seven years of education). Students can use English in places other than the university for example, in shopping centers. Generally, students attend this program to obtain a Bachelor's in English Language and Translation. Students experience standard teaching, which included carrying out learning tasks that were to be completed via ordinary methods using paper and pen (i.e., a typical language classroom).

At the time of data collection, the age of roughly half of the sample was from 18 to 22 years (49.5 %), whereas the other half was over 22 years old (50.5 %;  $M_{\text{age}} = 19.1$ ,  $SD = 1.22$ ). The participants' first language was Arabic, and they all studied English as their L2. Students were invited to participate in this study via an online message sent via a Telegram channel dedicated to departmental news and announcements. The online questionnaire was developed via Google Forms and those who were willing to participate were asked to click on the link sent to the group. Those who were not interested were asked simply to ignore the invitation and refrain from completing the questionnaire. The Department of English granted permission to collect data from the students. Accordingly, students were invited to participate in the middle of the semester and the data was cross-sectional.

### 2.2. Measures

#### 2.2.1. Basic Psychological Needs Frustration in Second Language (BPNF-L2)

Students' BPN frustration in L2 was measured using twelve items. These items were selected from the consultation of the items used to assess BPN frustration in other domains, such as the sport (Bhavsar et al., 2020), work (Huyghebaert-Zouaghi et al., 2021; Vander Elst et al., 2012), or general life areas, and adapted to best reflect the unique reality of the L2 domain. This initial process of adaptation was realized by all members of the authorship team and converged on a final set of four items for each of the three needs. An expert in the field was asked to verify the quality of the items and their wording, and minor modifications were applied. The resulting BPNF-L2 scale was translated from English into Arabic using a classical translation back-translation

procedure to ensure response accuracy among participants whose first language is not English.

Participants were asked to complete the questionnaire in relation to their L2 class, and to indicate their agreement with a final set of 12 items using a seven-point scale (1 = *strongly disagree* to 5 = *strongly agree*). Each subscale included four items: autonomy frustration ( $\alpha = 0.82$ ; e.g., "I feel forced to follow decisions about the language exercises I should do"), competence frustration ( $\alpha = 0.91$ ; e.g., "I feel like a failure when trying to do language tasks"), and relatedness frustration ( $\alpha = 0.92$ ; e.g., "I feel brushed aside by the L2 users around me in the class (e.g., peers and teachers)").

#### 2.2.2. L2 intrinsic motivation

Intrinsic motivation was assessed with five items (e.g., "for the satisfaction I feel when I use English") from the Self-Determination Theory Second Language scale (SDT-L2; Alamer, 2021a, 2022a). In this scale, students are asked to respond to the question "Why are you learning English?" by indicating their agreement with a series of items ( $\alpha = 0.86$ ; e.g., Because of the pleasure I get when I hear and read English) using a five-point scale (1 = *strongly disagree* to 5 = *strongly agree*). Students' mean value on this measure was.

#### 2.2.3. L2 achievement

A single global score reflecting students' achievement in L2, encompassing their performance in listening, speaking, reading, and writing English, were obtained from the university records. Specifically, each of these language skills is covered in separate courses in the Department of English. These courses are based on the second edition of the *Unlock English* language course books of the University of Cambridge, thus corresponding to a five-level English language skills course that targets the development of language skills in different settings using carefully scaffolded exercises taking a comprehensive approach to critical thinking-. The course levels are developed based on propositions from the Common European Framework of Reference for Languages (CEFR), and each level (i.e., each book in the series) covers all four language domains (i.e., listening, speaking, reading, and writing) as applied to a specific CEFR level (e.g., Level 1 targets A1, Level 2 targets A2). The only exception is the pre-A1-level "Unlock Basic Skills" course, which is not part of the Departmental plan and thus not covered by assessments. Further details in Appendix B.

### 2.3. Analyses

#### 2.3.1. A brief introduction to bifactor-exploratory structural equation modeling

Confirmatory factor analysis (CFA) was created almost 50 years ago to help test theoretical measurement models (Joreskog, 1969). This development led analysts to rely on CFA when analyzing the factor structures of a variety of theoretical constructs, across multiple research domains, including language learning (Collier, 2020; Liu et al., 2022). However, CFA is not free from limitations. Indeed, recent simulations studies and empirical investigations have shown that CFA solutions often fail to reach an acceptable level of model fit, even for instruments with a well-established factor structure (Alamer, 2022c; Alamer & Marsh, 2022; Marsh et al., 2009; Morin et al., 2016). This phenomenon has been found to result from the highly restrictive assumption that standard CFA has. Specifically, a proper CFA model assumes cross-loadings between items on non-target factors to be zero. However, these cross-loadings, as estimated in exploratory factor analysis (EFA), can be meaningful and reflect nothing more than the presence of true (i.e., reliable) score associations between items and conceptually-related factors (Alamer, 2021a; Morin et al., 2020). Perhaps more importantly, research has demonstrated that forcing all cross-loadings to be zero tended to result in an inflation of the factor correlations (Asparouhov et al., 2015; Shao et al., 2022), which, in turn, making it harder to support the discriminant validity of the constructs. These observations

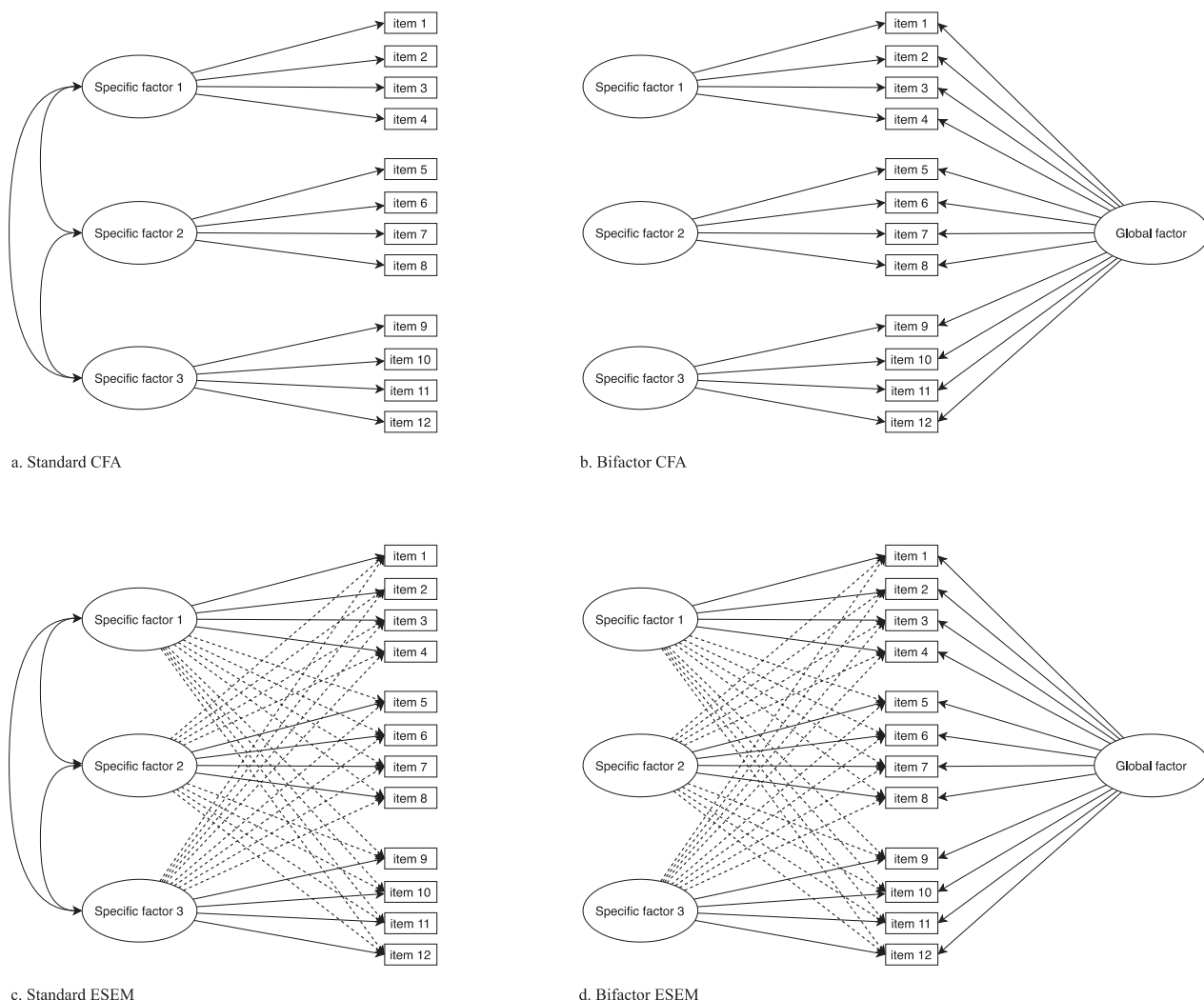
have led an increasing number of researchers to advocate the reliance on exploratory structural equation modeling (ESEM; [Asparouhov & Muthén, 2009](#)), a novel analytic framework that makes it possible to incorporate cross-loadings to any kind of measurement or predictive model defined based on a priori specifications, to model the factor structure of conceptually-related constructs ([Morin et al., 2016, 2020](#)) such as BPN satisfaction and frustration (e.g., [Tóth-Király et al., 2018](#)). Thus far, ESEM has been successfully applied to the L2 domain (e.g., [Dong et al., 2022](#); [Liu et al., 2022](#)) and guidelines for the field have been established ([Alamer, 2022c](#); [Alamer & Marsh, 2022](#)).

Beyond the need to incorporate cross-loadings, another form of construct-relevant psychometric multidimensionality often has to be taken into account in psychometric measurement ([Morin et al., 2016, 2020](#)): The joint assessment of global and specific constructs from the same set of indicators. This form of multidimensionality requires the reliance on bifactor (CFA or ESEM) models, which incorporate the assessment of one global factor (G-factor) underlying responses to all items included in an instrument, together with the assessment of non-redundant (orthogonal, non-correlated) specific factors (S-factors) reflecting the variance uniquely shared among the indicators of each subscale beyond that already explained by the G-factor ([Morin et al., 2016, 2020](#)). Research generally shows that bifactor models are better than higher-order models because the bifactor models allow the items to load directly onto the global factor, thus providing meaningful representation and model fit results ([Alamer, 2021a, 2021b](#)), while avoiding

redundancies and a series of problematic implicit proportionality constraints ([Morin et al., 2016, 2020](#)). Importantly, research on the structure of ratings of BPN satisfaction and/or frustration supported the superiority of a bifactor-ESEM representation ([Alamer, 2022c](#); [Gillet et al., 2019, 2020](#); [Sánchez-Oliva et al., 2017](#); [Tóth-Király et al., 2018](#)). From a theoretical standpoint, this representation results in a G-factor capturing the extent to which all three needs are frustrated in a global manner, together with S-factors reflecting the presence of the extent to which the frustration of any specific needs lies in a state of imbalance relative to the others.

### 2.3.2. Models estimated in the present study

All analyses were conducted using Mplus 8.1 ([Muthén & Muthén, 2018](#)). Models were estimated using the maximum likelihood robust (MLR) estimator, which is robust to nonnormality. Following previous recommendations ([Alamer, 2022c](#); [Alamer & Marsh, 2022](#); [Morin et al., 2016, 2020](#)), a series of alternative measurement models were compared: (a) a one-factor CFA, (b) a three-factor CFA, (c) a three-factor ESEM, (d) a bifactor CFA including one G-factor and three S-factors, and (e) a bifactor ESEM including one G-factor and three S-factors. The one-factor-CFA model was mainly considered to explicitly test, and hopefully reject, the unidimensionality of the model. The four other alternative models are illustrated in [Fig. 1](#). To assess the adequacy of these models to our data, we rely on goodness-of-fit indicators ([Hu & Bentler, 1999](#); [Marsh et al., 2004](#)): The root mean square error of approximation



**Fig. 1.** The differences between CFA, ESEM, bifactor CFA, and bifactor ESEM.



(RMSEA) with its 90 % confidence interval, the confirmatory fit index (CFI) and the Tucker-Lewis index (TLI). CFI and TLI values approaching 0.95 indicate an excellent level of fit, although values around 0.90 remain acceptable. RMSEA values should ideally be equal to or lower than 0.08 (acceptable fit) or 0.06 (excellent fit). Although we also report the chi-square test of exact fit ( $\chi^2$ ), we do not interpret this indicator given its known oversensitivity to sample size, omitted variables, and minor misspecifications (Hu & Bentler, 1999; Marsh et al., 2004).

Lastly, the criterion-related validity of the final model was tested by allowing all factors to predict two outcome factors representing L2 intrinsic motivation and achievement. This predictive model is illustrated in Fig. 2, in which we present a single outcome without its indicators (both outcomes are modeled as latent variables defined from their indicators) to avoid cluttering the figure.

3. Results

The model fit indices of the five alternative models used to assess the factor structure of scores obtained on the BPNF-L2 (i.e., to assess the factor validity component of RQ1) are reported in Table 1. The one-factor CFA model resulted in an unacceptable level of fit to the data, supporting the multidimensionality of BPNF-L2 ratings. All other models had a satisfactory level of fit, although that of the three-factor CFA was marginal and that of the bifactor-ESEM was superior to all alternatives. Parameter estimates from these four models are reported in Table 2 (factor loadings, uniquenesses, and composite reliability), whereas CFA and ESEM factor correlations are reported in Table 3.

When we first contrast the CFA and ESEM solutions, we can see that both result in similarly well-defined and reliable factors (CFA:  $\lambda = 0.63$  to  $0.92$ ,  $M_i = 0.81$ ,  $\omega = 0.82$  to  $0.92$ ; ESEM:  $\lambda = 0.51$  to  $0.94$ ,  $M_i = 0.77$ ,  $\omega = 0.82$  to  $0.91$ ). However, when we consider the size of the CFA and ESEM factor correlations, we can easily see that those correlations are lower in the ESEM solution, particularly that between the competence frustration and relatedness frustration factors (e.g.,  $r$  in CFA =  $0.74$  and ESEM =  $0.63$ ). When considered in combination with the marginal fit of

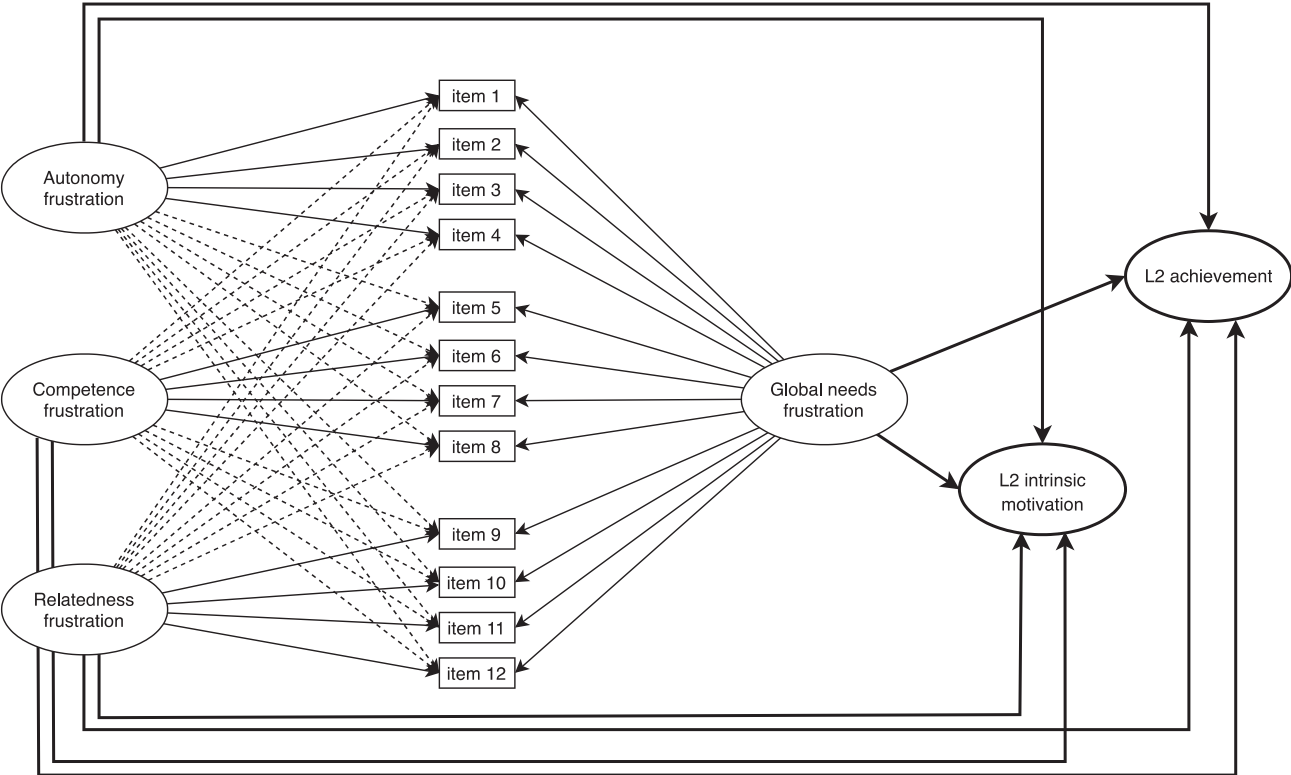
**Table 1**  
Model fit indices for the four measurement models of the BPNF-L2 scale.

Model	$\chi^2$	df	RMSEA (90 % CI)	CFI	TLI
CFA (one factor)	445.24*	66	0.19 (0.17; 0.21)	0.63	0.55
CFA (three factors)	152.79*	51	0.10 (0.08; 0.12)	0.90	0.88
ESEM (three factors)	80.55*	33	0.08 (0.06; 0.10)	0.96	0.91
Bifactor CFA (four factors)	77.08*	42	0.06 (0.04; 0.09)	0.97	0.95
Bifactor ESEM (four factors)	34.90	24	0.05 (0.00; 0.08)	0.99	0.97

Note. CI: 90 % confidence interval for the RMSEA.

\*  $p < .01$ .

the CFA solution (TLI =  $0.88$  and RMSEA =  $0.10$ ), these results support the need to incorporate cross-loadings to the model (e.g., Morin et al., 2016, 2020; Shao et al., 2022). Further supporting this need, the bifactor-CFA resulted in a G-factor that did not adequately capture autonomy frustration ratings ( $\lambda = 0.08$  to  $0.38$ ) as much as those of relatedness ( $\lambda = 0.81$  to  $0.90$ ) or competence ( $\lambda = 0.59$  to  $0.76$ ) frustration, as well as in a weak relatedness frustration S-factor ( $\lambda = -0.10$  to  $0.58$ ,  $\omega = 0.63$ ). In contrast, the bifactor ESEM model not only resulted in a higher level of model fit relative to all other models, it also resulted in a well-defined and reliable G-factor ( $\lambda = 0.41$  to  $0.80$ ,  $M_i = 0.59$ ,  $\omega = 0.94$ ), accompanied by similarly well-defined S-factors for autonomy frustration ( $\lambda = 0.37$  to  $0.61$ ,  $M_i = 0.51$ ,  $\omega = 0.70$ ), competence frustration ( $\lambda = 0.37$  to  $0.60$ ,  $M_i = 0.52$ ,  $\omega = 0.81$ ) and relatedness frustration ( $\lambda = 0.40$  to  $0.87$ ,  $M_i = 0.61$ ,  $\omega = 0.9$ ). Thus, these results address the reliability component of RQ1. Moreover, this solution revealed no concerning cross-loadings ( $> 0.30$ ). For these reasons, the bifactor-ESEM solution was retained, supporting the idea that BPNF-L2 measure can be used to reflect L2 students' global level of needs frustration and the extent to which their specific needs for relatedness, competence, and autonomy are frustrated beyond this global level.



**Fig. 2.** Structural model based on bifactor ESEM.

**Table 2**

Standardized parameter estimates for the measurement models assessing the BPNF-L2.

	CFA		ESEM				Bifactor-CFA			Bifactor-ESEM				
	$\lambda$	$\delta$	$\lambda$	$\lambda$	$\lambda$	$\delta$	S- $\lambda$	G- $\lambda$	$\delta$	S- $\lambda$	S- $\lambda$	S- $\lambda$	G- $\lambda$	$\delta$
aut1	0.76	0.42	<b>0.80</b>	−0.05	−0.08	0.39	0.79	0.08	0.38	<b>0.57</b>	−0.10	−0.24	<b>0.47</b>	0.39
aut2	0.80	0.36	<b>0.90</b>	−0.14	0.01	0.27	0.82	0.13	0.31	<b>0.61</b>	−0.17	−0.21	<b>0.53</b>	0.28
aut3	0.63	0.61	<b>0.51</b>	0.21	0.10	0.57	0.53	0.38	0.58	<b>0.37</b>	0.12	0.06	<b>0.54</b>	0.55
aut4	0.72	0.48	<b>0.66</b>	0.06	0.00	0.53	0.67	0.20	0.52	<b>0.49</b>	0.03	−0.13	<b>0.48</b>	0.51
$\omega$	<i>0.82</i>		<i>0.82</i>				<i>0.82</i>			<i>0.70</i>				
com1	0.84	0.30	0.05	<b>0.87</b>	−0.08	0.28	0.61	0.59	0.27	0.03	<b>0.57</b>	0.09	<b>0.64</b>	0.26
com2	0.83	0.31	0.06	<b>0.67</b>	0.20	0.30	0.38	0.76	0.28	−0.12	<b>0.37</b>	0.26	<b>0.71</b>	0.28
com3	0.88	0.23	0.04	<b>0.84</b>	0.03	0.24	0.56	0.67	0.24	−0.03	<b>0.54</b>	0.16	<b>0.67</b>	0.24
com4	0.87	0.24	−0.08	<b>0.92</b>	−0.03	0.22	0.60	0.65	0.22	−0.09	<b>0.60</b>	0.17	<b>0.62</b>	0.22
$\omega$	<i>0.92</i>			<i>0.91</i>			<i>0.82</i>				<i>0.81</i>			
rel1	0.81	0.35	0.14	0.23	<b>0.61</b>	0.35	−0.10	0.90	0.19	−0.35	−0.08	<b>0.40</b>	<b>0.80</b>	0.07
rel2	0.83	0.31	0.10	0.29	<b>0.59</b>	0.32	−0.01	0.88	0.23	−0.21	0.13	<b>0.45</b>	<b>0.68</b>	0.27
rel3	0.90	0.19	0.05	0.04	<b>0.89</b>	0.16	0.58	0.81	0.01	0.00	0.23	<b>0.87</b>	<b>0.41</b>	0.01
rel4	0.92	0.16	0.11	−0.02	<b>0.94</b>	0.12	0.35	0.82	0.20	−0.09	0.16	<b>0.72</b>	<b>0.51</b>	0.20
$\omega$	<i>0.92</i>			<i>0.91</i>			<i>0.63</i>	<i>0.93</i>			<i>0.92</i>	<i>0.94</i>		

Note. aut\_1-aut-4: Items 1 to 4 from the autonomy frustration scale; com\_1-com-4: Items 1 to 4 from the competence frustration scale; rel\_1-rel-4: Items 1 to 4 from the relatedness frustration scale  $\lambda$ : Standardized factor loading;  $\delta$ : standardized item uniqueness; S: specific factor; G: global factor;  $\omega$  = omega coefficient of model-based composite reliability shown in italic; target ESEM and bifactor ESEM factor loadings are indicated in bold.

**Table 3**

Factor correlations in the CFA and ESEM solutions.

	1.	2.	3.
<b>CFA</b>			
1. Autonomy frustration	–		
2. Competence frustration	0.38*	–	
3. Relatedness frustration	0.15	0.74*	–
<b>ESEM</b>			
1. Autonomy frustration	–		
2. Competence frustration	0.39*	–	
3. Relatedness frustration	0.03	0.63*	–

\*  $p < .01$ .

### 3.1. Criterion-related validity of BPN-L2 measure

To assess the criterion-related validity of scores obtained on the BPNF-L2 (i.e., to address RQ2), a structural model was built from our retained measurement model to estimate the relations between the BPNF-L2 factors and our criterion measures. Criterion-related validity refers to the ability of the factors in the structural model to explain scores on external variables assumed to be related to the variables of interest (e.g., Alamer, 2021a; Alamer & Marsh, 2022). In the present study, we tested the associations between our four factors (i.e., the G-factor as well as the S-factors of autonomy, competence, and relatedness) and two additional factors (defined using CFA) representing students' levels of intrinsic motivation in L2 and their levels of English language achievement (Alamer, 2022c). As noted earlier, our hypothesis was that both types of factors (G- and S-) would be negatively associated with the outcomes. The model fit indices of the complete bifactor-ESEM model including the outcomes indicated a satisfactory level of fit to the data ( $\chi^2 = 164.23$ ,  $df = 98$ ; RMSEA = 0.06; RMSEA 90 % confidence interval = 0.04 to 0.07; CFI = 0.96, TLI = 0.94). As can be seen in Table 4, the analysis indicated that the G-factor (i.e., BPN frustration) was significantly and negatively associated with intrinsic motivation and achievement. Moreover, the S-factors of autonomy frustration and competence frustration were both significantly and negatively associated with intrinsic motivation, whereas the relatedness frustration S-factor was not associated with this outcome. With regards to L2 achievement, only the competence frustration S-factor shared a statistically significant negative association with this outcome, whereas the S-factors of autonomy frustration and relatedness frustration shared no associations with this outcome. This model explained 17 % of the

**Table 4**

Path coefficients from the basic psychological needs frustration on the outcomes.

	$b$ [standard error]	$\beta$	$p$
<b>Effects on intrinsic motivation</b>			
Global needs frustration	−0.12 [0.06]	−0.18	<.05
Autonomy frustration	−0.09 [0.08]	−0.14	<.01
Competence frustration	−0.20 [0.06]	−0.32	<.01
Relatedness frustration	0.07 [0.11]	0.10	.53
<b>Effects on L2 achievement</b>			
Global needs frustration	−0.88 [0.06]	−0.16	≤.05
Autonomy frustration	0.15 [0.68]	−0.03	.83
Competence frustration	−1.71 [0.42]	−0.31	<.01
Relatedness frustration	0.64 [0.75]	0.12	.53

variance in intrinsic motivation and 13 % of the variance in L2 achievement which represent modest explanatory power (Hair & Alamer, 2022).

## 4. Discussion

Based on the recognition that BPN frustration is qualitatively distinct from BPN satisfaction and yet an equally important driver of motivation, well-being, and performance (Chen et al., 2015; Costa et al., 2018; Deci et al., 2017; Reeve, 2022; Ryan & Deci, 2017, 2020), the purpose of this study was to assess the psychometric properties of a novel measure of BPN frustration specific to the L2 educational context, the BPNF-L2 scale. Our results supported the factor validity, reliability, and criterion-related validity of scores obtained from this new measure, thus contributing to increasing the toolkit of L2 researchers and practitioners interested in capturing and understanding students' BPN frustration.

Consistent with emerging research conducted in other domains (Gillet et al., 2019, 2020; Sánchez-Oliva et al., 2017; Tóth-Király et al., 2018), our results confirmed the multidimensionality of students' ratings of BPN frustration, which were found to match a bifactor-ESEM representation. More precisely, this solution was able to account for the conceptually-related nature of students' ratings of competence, relatedness, and autonomy frustration via the incorporation of cross-loadings to the model to achieve a more accurate representation of these constructs (Alamer, 2021a, 2022c; Alamer & Marsh, 2022; Morin et al., 2016; Szulawski et al., 2021). Moreover, this solution also made it possible to account for the dual global and specific nature of BPN satisfaction ratings (e.g., Alamer, 2021b; Morin et al., 2016, 2020) via the estimation of a global factor reflecting students' global levels of BPN

frustration across all three needs together with a non-redundant estimate of the extent to which the frustration of each of their three needs fell into a state of imbalance relative to these global levels (Gillet et al., 2019, 2020). Importantly, all of these factors were well-defined by adequate factor loadings and associated with satisfactory estimates of composite reliability in our final model.

A key advantage of this bifactor representation comes from the orthogonality of the factors, which makes it possible to assess the complementary role played by students' global levels of BPN frustration while also considering the unique role played by the frustration of each specific need in a way that is untainted by multicollinearity (Morin et al., 2016, 2020). Thus, our reliance on a bifactor-ESEM representation of BPN frustration ratings also made it possible for us to achieve a more accurate representation of the criterion-related validity of these ratings. In this regard, our predictive analysis revealed that students' global levels of BPN frustration were significantly associated with lower levels of intrinsic motivation and achievement in L2, thus providing evidence that results previously reported in other research areas generalize to the L2 context (Alamer, 2022a, 2022b; Noels et al., 1999, 2019; Oga-Baldwin et al., 2017; Ryan & Deci, 2017, 2020; Szulawski et al., 2021).

Beyond these associations shared across all three needs captured by the associations involving the G-factors, our results also showed that participants' specific levels of autonomy frustration and competence frustration also shared significant negative associations with levels of intrinsic motivation in L2. This implies that frustrating students' need of autonomy and competence, even beyond their global levels of BPN frustration, is likely to interfere with their intrinsic motivation for learning a second language. This result is consistent with previous reports highlighting the key role played by these two needs in relation to L2 students' motivation (Alamer, 2022c; Alamer & Lee, 2019; Leeming & Harris, 2022; Noels et al., 1999; Reeve, 2022). Moreover, imbalanced levels of competence frustration were also found to be associated with lower levels of L2 achievement beyond the effects of students' global levels of BPN frustration. This dual role of competence frustration on intrinsic motivation and achievement is consistent with the idea that the frustration of this specific need seems to represent a significant threat in relation to L2 learning experiences (Reeve, 2022).

Put simply, our results thus support the idea that BPN frustration seems to represent a significant deterrent factor preventing L2 students from enjoying their learning experience as well as mastering the L2. These effects are consistent with what Reeve (2022) refers to as the dark side of BPN as he highlighted the ways in which teachers' controlling behaviors in the classroom are likely to interfere with students' learning experience by frustrating their basic psychological needs. Moreover, our results also show that students' needs for competence, and to a lesser extent for autonomy, seem particularly important to consider in L2 classrooms.

Finally, our results indicated that the need for relatedness did not share unique associations with intrinsic motivation and L2 achievement beyond the role already played by their global levels of BPN frustration. This result is consistent with previous observations highlighting the idea that this need may be less relevant to consider in L2 classes, particularly among older (i.e., university) students who may not attend these classes primarily to nurture their need for relatedness (Alamer, 2022a, 2022c; Noels et al., 1999; Olafsen & Halvari, 2017; Olafsen & Deci, 2020). In fact, some L2 studies have even opted to remove this construct from their analysis (e.g., Alamer & Lee, 2019; Noels et al., 1999). It is important to note that the lack of associations between students' specific levels of relatedness frustration and their levels of intrinsic motivation and achievement should not be taken to imply that this need is not relevant, as indicated by the negative impact of their global levels of need frustration on these two outcomes. Rather, this result simply highlights the fact that the frustration of this need does not entail further consequences beyond the role already played by students' global levels of BPN frustration across all three needs, in relation to these specific outcomes, and the specific context of L2 learning. Undoubtedly,

additional research will be needed to test whether specific levels of relatedness frustration can add to the explanation of additional outcomes (e.g., engagement, learning transfer, negative affect, boredom, perseverance when facing challenges), and how these results generalize to other L2 learning contexts or age groups. In addition, It would be interesting to see whether this conclusion generalizes to younger (e.g., primary or secondary students as part of mandatory L2 classes) and beyond university (e.g., adult immigrants seeking to learn a new language) samples.

#### 4.1. Educational implications

Having found that BPN frustration negatively affects learners' intrinsic motivation and achievement in L2 suggests that policymakers, curriculum planners, and schoolteachers would benefit from working together to offer learners a healthier and more productive learning environment that maximally nurture their needs for autonomy, competence, and relatedness. By helping to provide L2 learners with a frustration-free classroom setting, teaching authorities can hope to help these students be more engaged in their classroom activities, learn more and better, and do so while enjoying the learning process. Moreover, our findings highlight that the need for competence and, to a lesser extent, the need for autonomy might be particularly important to consider. In relation to the need for autonomy, language tasks would benefit from being designed in a way that leaves room for choice and volition in terms of classroom activities. Thus, students should be given at least some freedom to choose what learning tasks to engage in from a larger set of possible activities, and teachers should give students the opportunity to fulfill the lessons' objectives by following general guidelines. In relation to the need for competence, students might benefit from exposure to challenging tasks that remain aligned with learners' current levels of L2 proficiency. In this regard, teachers should also consider inter-individual differences among their students, and feel free to adjust the planned activities when these activities do not reflect learners' current level of linguistic competence. Finally, teachers can explain to their students the reasons for doing different language activities. This practice should help the students be more self-motivated while engaged in the classroom.

For these recommendations to be implemented, careful revisions should be conducted on L2 curricula to better meet students' needs for autonomy and competence. Additionally, teachers should be trained to handle the teaching process in a need-supportive manner and given enough freedom to diverge from planned activities to maximize students' engagement in a way that maximally connects to students' interests, sense of volition, and current level of competence.

#### 4.2. Limitations and future directions

Despite the valuable contributions of this study, some limitations should be acknowledged. First, this study relies on cross-sectional data, which makes it impossible to identify the directionality of the associations (i.e., does need frustration predict a decrease in levels of intrinsic motivation, or does intrinsic motivation predicts lower levels of need frustration). Although this limitation is not concerning for purposes of psychometric validation (as the establishment of the criterion-related validity of tests scores mainly entails demonstrating that they relate, in an expected manner, to a variety of criterion measures), it would be important for theoretically-driven research to further investigate the directionality of these associations using longitudinal designs. Second, experimental research might also prove useful to assess whether interventions specifically designed to curb BPN frustration truly help to improve students' intrinsic motivation and achievement. Moreover, testing a mediational model where intrinsic motivation functions as a mediator between the basic psychological need frustration and L2 achievement should be examined in future research relying on longitudinal data. Third, our limited sample size limits the generalizability of our results, just like our reliance on a sample of Saudi students limits the

generalizability to other specific cultural and linguistic groups. It would thus be important for future research to consider expanding the generalizability of our results to other cultural and linguistic groups. Lastly, although the present research provided evidence for the factor validity, reliability, and criterion-related validity of scores obtained on the BPNF-L2 scale among Saudi Arabia University students in the process of learning English as a second language, reliability of L2 achievement remains to be investigated in future studies.

## 5. Conclusion

We proposed a novel measure of BPN frustration, anchored in SDT (e.g., Ryan & Deci, 2017), specifically adapted to the L2 learning context, the BPNF-L2 scale, and gathered evidence supporting its reliability and validity. To the best of our knowledge, this is the first empirical investigation of the appropriateness of a BPN frustration measure for language learning research. In this regard, our results added to mounting evidence obtained in other research areas supporting the relevance of BPN frustration in the prediction of multiple outcomes, as well as the superiority of a bifactor representation of BPN ratings. Indeed, the bifactor ESEM approach advocated in this study captures the inherent multidimensionality of this scale by accounting for the conceptually-related nature of the needs for autonomy, relatedness, and competence, in addition to accounting for the dual global and specific nature of students' ratings of BPN frustration. More precisely, the resulting measurement model made it possible to obtain a direct assessment of students' global levels of BPN frustration across all three needs, while also allowing us to assess the unique role played by each need beyond that global level in a way that is untainted by multicollinearity. This thus

made it possible to realize that, beyond the negative impact of global levels of BPN frustration on students' intrinsic motivation and achievement in L2, their specific levels of competence and autonomy frustration also contributed to outcomes prediction in a meaningful manner, consistent with their important role in the L2 learning context. Overall, scores on the new BPNF-L2 scale have been shown to provide a valid and reliable measure of BPN frustration in the L2 context likely to help increase our understanding of students' L2 experiences.

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## Consent

The participants were invited to participate such that those unwilling to participate could simply ignore the invitation. A consent letter was included at the beginning of the questionnaire.

## Declaration of competing interest

All authors declare no conflict of interest.

## Data availability

The data can be requested by contacting the first (corresponding) author.

## Appendix A. Basic Psychological Needs Frustration in Second Language (BPNF-L2) Scale

(Descriptive statistics)

In my language classroom:

Item	M (SD)	Skew	Kurtosis
<i>Frustration of autonomy</i>			
I feel pushed to do the language tasks in certain ways	2.91 (1.11)	0.00	−0.68
I feel forced to follow decisions about the language exercises I should do	2.93 (1.19)	−0.01	−0.82
I feel a lot of unwanted pressure in the language tasks	2.82 (1.26)	0.11	−1.01
I feel forced to do language exercises that I would not choose to do	2.91 (1.21)	0.05	−0.98
<i>Frustration of competence</i>			
I feel like a failure when trying to do language tasks	3.88 (1.14)	−0.67	−0.61
I feel useless when trying to do language tasks	4.31 (0.88)	−1.31	1.28
I feel incapable when trying to do language tasks	4.05 (1.09)	−1.00	0.13
I feel hopeless when trying to do language tasks	4.06 (1.11)	−1.10	0.44
<i>Frustration of relatedness</i>			
I feel rejected by the L2 users around me in the class (e.g., peers and teachers)	4.36 (0.95)	−1.61	2.27
I feel brushed aside by the L2 users around me in the class (e.g., peers and teachers)	4.08 (1.15)	−1.26	0.82
I feel disliked by the L2 users around me in the class (e.g., peers and teachers)	4.35 (0.89)	−1.42	1.65
I feel excluded by the L2 users around me in the class (e.g., peers and teachers)	4.37 (0.92)	−1.70	2.79

## Appendix B

Students study these courses starting from Level 1 before moving on to the upper levels in sequence, although instructors are afforded some leeway to deliver content in a way that best matches their students' needs. Importantly, these four *Unlock* skills courses have an associated test bank that instructors can use to reliably test the progress of their students (see examples of the four domains in Appendix B). For instance, to examine students' reading proficiency, the test bank provides a passage followed by 10 open-ended/closed questions. An example of a writing test asks students to reorder seven sentences into a five-sentence paragraph that starts with a topic sentence, then has supporting sentences, and ends with a concluding sentence (meaning that two sentences cannot be used to answer this question). In the listening part, students may be required to listen to a clip provided by *Unlock*, before being asked to underline the stressed syllable or to answer true-or-false questions. To test speaking proficiency, students



may be given a topic about which to think, along with two to three opening questions, such as: "Do you think this is important for you?" Students are usually given a few minutes to reflect on the questions and take notes. Instructors then evaluate students using five criteria: students' ability to speak about the topic, pronunciation, using grammar accurately, using vocabulary accurately, and using a range of grammar and vocabulary. Instructors are required to pick from the test banks provided by the *Unlock* teacher's book to best fit their students' level while making sure to maximally avoid tests that require a subjective judgment on the part of the teacher. Each language skill test is scored out of 5 points, and thus the maximum total score is 20. The participants were informed at the outset of the questionnaire that the researchers would need to collect their global language score, and that those who did not wish to grant access to their scores were advised to avoid participation.

Following are the examples from students' L2 achievement tests.

Note that these are not the real items presented to the students, but they serve to give general examples.

## READING

- 1 Read the factsheet and match the main ideas (A–D) to the paragraphs where they were mentioned (1–4). 1 mark for each correct answer.

- A What to do if you are hurt by a man-of-war. \_\_\_\_\_
- B Portuguese men-of-war mainly swim in warm water. \_\_\_\_\_
- C Touching these creatures can be very upsetting. \_\_\_\_\_
- D Portuguese men-of-war stay together in large groups. \_\_\_\_\_

1 If you should ever go swimming in one of the world's warmer oceans, it might be a good idea to first check that there are no Portuguese men-of-war in the area. These creatures look like jellyfish, but are in fact colonies of tiny creatures working together. They are usually found in groups, each of which can contain over a 1,000 men-of-war.

2 Men-of-war prefer warm waters such as the tropical and subtropical parts of the Pacific and Indian oceans, which are rich sources of food. They float wherever the wind or the currents in the sea take them. Because of this, men-of-war have also been found in colder areas, such as the coasts of Scotland, Wales and Ireland.

3 So, why would you want to avoid swimming near these creatures? Their tentacles. Although men-of-war float on the surface, their tentacles can find prey 10 metres under the water and in some cases they can reach up to 50 metres. Each of these tentacles is covered with poisonous venom that the carnivorous man-of-war uses to paralyze fish and other small sea creatures. The sting is rarely fatal for humans, but it is extremely painful. Imagine the worst pain you have ever experienced and multiply that by ten. You are not even close. And even when they are dead, these creatures can still give you a nasty sting.

4 If you should be unlucky enough to be stung by one of these creatures, vinegar should never be used. It could cause severe bleeding. The best thing to do is to remove any parts of the tentacles that may be stuck to your skin, being careful not to touch them with your fingers. You should then apply salt water (not fresh water, as this will make the sting worse). You can further ease the pain by soaking the affected area in hot water for 15–20 minutes.

- 2 Look at the words in bold in the questions below. Which paragraph (1–4) of the factsheet should you look at to find the answer? 1 mark for each correct answer.

- A Can men-of-war **kill** people? \_\_\_\_\_
- B How far can a man-of-war reach when **attacking** a creature? \_\_\_\_\_
- C What type of **life-form** is the man-of-war? \_\_\_\_\_
- D What could cause loss of **blood**? \_\_\_\_\_
- E Do men-of-war **live** only in warm water? \_\_\_\_\_
- F What is the usual **habitat** of the man-of-war? \_\_\_\_\_

## ACADEMIC WRITING SKILLS

Correct the punctuation of the sentences below (sometimes there are two sentences to punctuate). 1 mark for each correct answer.

- 1 an animal is a living organism that eats organic matter and is typically able to respond quickly to its environment
- 

- 2 a bird has feathers wings and a beak and is usually able to fly
- 

- 3 fish have no limbs and are cold-blooded they live only in water
- 

- 4 insects are small animals with six legs usually with one or two pairs of wings
- 


- 5 arachnids are arthropods such as scorpion or spiders
- 

Put the sentences in the best order to make a 5-sentence paragraph that starts with a topic sentence, then has supporting sentences and ends with a concluding sentence. You will not need to use two of the sentences. 1 mark for each correct answer.

- a Although this skill is useful in keeping it out of danger, the lynx is a protected animal in many countries. \_\_\_\_
- b It lends its name to a constellation of stars between Ursa Major and Gemini. \_\_\_\_
- c It is possibly best known for its excellent hearing. \_\_\_\_
- d The lynx is a medium-sized wild cat with yellowish-brown fur, a short tail and pointed ears. \_\_\_\_
- e For example, the Alpenzoo in Innsbruck provides a safe environment from which young lynx cubs can be reintroduced into the wild. \_\_\_\_
- f Indeed, in some countries people are described as having the hearing of a lynx. \_\_\_\_
- g It should not be confused with the sphinx, which was a winged monster with a woman's head and a lion's body. \_\_\_\_


## LISTENING

### LISTENING 1

- 1  Listen and underline the stressed syllable in each word. 1 mark for each correct answer.

- 1 convinced
- 2 relocated
- 3 survive
- 4 communicate
- 5 poisonous
- 6 harmless
- 7 environment
- 8 treated
- 9 realize
- 10 conditions

### LISTENING 2

- 2  Listen to the recording. Are the statements true (T) or false (F)? 1 mark for each correct answer.

- 1 The speaker doesn't like dogs. \_\_\_\_
- 2 He prefers animals to people. \_\_\_\_
- 3 He has never been to a zoo. \_\_\_\_
- 4 He had a pet dog when he was younger. \_\_\_\_
- 5 He wasn't happy when his pet became ill. \_\_\_\_
- 6 He never played with his pet. \_\_\_\_
- 7 He wanted to have another pet. \_\_\_\_
- 8 His son would like a pet. \_\_\_\_
- 9 He doesn't want an exotic pet. \_\_\_\_
- 10 He thinks that people should not buy pets from shops. \_\_\_\_

## SPEAKING

Think of a tradition that is dying out in your country, or everywhere, and discuss these points.

- What are the reasons that this tradition is dying out?
- Should anything be done to preserve it?
- If yes, what? If no, why not?

## MODEL LANGUAGE

### Identifying cause and effect

Some traditions die out because of new ways of life.

More people are using the internet. That's why families can live further apart.

Now, due to developments in technology, people spend more time playing games on their phones.

But now we don't have to work so hard. The reason for this is that we have modern kitchens and supermarket food.

You can find any recipe you want on the internet. This means that many people don't need cookbooks anymore.

### Taking turns in a discussion

What do you think?

I see your point, but ...

I totally agree.

I'm really not convinced.

I'm sorry to interrupt, but ...

You may be right but ...

### Phrases with *that* to introduce an opinion or idea

I've heard that ...

Everyone knows that ...

It's a well-known fact that ...

I doubt that ...

I strongly believe that ...

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