Research Article

BASIC PSYCHOLOGICAL NEEDS, MOTIVATIONAL ORIENTATIONS, EFFORT, AND VOCABULARY KNOWLEDGE

A COMPREHENSIVE MODEL

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Abstract

This study examined an integrated process model of second language motivation based on the framework of self-determination theory (SDT). Specifically, this research investigated the extent to which satisfying basic psychological needs (BPN) are related to SDT orientations and, in turn, to the effort expended and how these factors relate collectively to vocabulary knowledge. Revised scales assessing students' BPN (the Basic Psychological Needs of Second Language Scale) and SDT orientations (the Self-Determination Theory of Second Language Scale) were considered and tested using a higher-order confirmatory factor analysis solution. The results of the structural model showed that BPN were only directly related to vocabulary knowledge, which indicated their direct importance for the attainment of the vocabulary. No other indirect effects through SDT orientations or effort were identified. Nonetheless, SDT orientations were both directly and indirectly linked to vocabulary knowledge over and above the role of expended effort. The results elucidated motivational pathways that yielded pedagogical implications for language learning.

INTRODUCTION

Most second language (L2) educators would agree that L2 students may delay their learning of a L2 and avoid investing efforts when they are unmotivated. In contrast, motivated learners are active in pursuing their language goals and attending to the learning tasks that are necessary to attain them. As such, researchers have explored different perspectives of motivation to better understand its association with the attainment of an L2 (Alamer, 2021; Alamer & Lee, 2019; Al-Hoori, 2017; Alrabai, 2016; Clément & Dörnyei, 2001; Dörnyei & Ryan, 2015; Gardner, 2010; Noels, 2013; Tremblay & Gardner, 1995). Recent studies have witnessed greater importance being given to the "self"

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component in motivating language learning. The L2 motivational self-system is one of the most dominant motivational theories, focusing on two competing possible selves: the "ought-to L2 self" and the "ideal L2 self" (Dörnyei, 2009; Dörnyei & Ushioda, 2009). It is often reported that the ideal form of the self is more closely related to positive linguistic outcomes than the ought-to self (see Dörnyei & Ushioda, 2011 for a review). Another motivation model that utilizes the "self" component in the discipline is self-determination theory (SDT; Ryan & Deci, 2000, 2017). Although previous studies have employed SDT to examine its association with different linguistic outcomes, there is a lack of empirical research that has tested a comprehensive model that explains why motivated learners can be more successful in learning English vocabulary (as an L2) than their counterparts from an SDT perspective.

Fundamentally, SDT postulates that some learners may learn simply because they find learning a language to be inherently enjoyable, important, and interesting (i.e., they are autonomously motivated). Others, however, may be compelled by instrumental and external goals (i.e., they are controlled motivated). In addition, SDT proposes a mechanism through which learners can exhibit autonomous forms of motivation. Specifically, the theory suggests that three basic psychological needs (BPN) should be satisfied among learners for optimal functioning and learning; that is, learners should have a sense of *autonomy*, *competence*, and *relatedness.* SDT-based research has shown that when these needs are satisfied, L2 learners exhibit autonomous forms of motivation (Alamer & Almulhim, 2021; Alamer & Lee, 2019; Hiromori, 2003; Jang et al., 2010; Noels et al., 1999; Oga-Baldwin et al., 2017). Although it is often reported that autonomous motivation is associated with various language outcomes, some suggest that the link is not always direct. That is, additional factors (such as effort) can mediate this relationship and unfold the underlying processes in the relationship among BPN, SDT, and the attainment of vocabulary (Alamer & Lee, 2019; Cerasoli et al., 2014). However, there is little systematic evidence devoted to disentangling the relationships among BPN, SDT orientations, effort, and vocabulary knowledge in one comprehensive model in the field. Including these constructs in one model would allow us to meaningfully substantiate the mechanisms that underlie the relationship between BPN and vocabulary learning.

Accordingly, this study aims to (1) examine the factorial structure of BPN and SDT orientations among Saudi undergraduate students of English based on the most recent formulation developed by Ryan and Deci (2017) and (2) examine a theory-driven model based on SDT to explain learners' vocabulary knowledge. In particular, we focused on assessing how BPN facilitate learners' autonomous motivation and hinders controlled motivation (from SDT), which, in turn, predicts increased effort and, ultimately, the attainment of L2 vocabulary. Such an examination may unpack the nature of the mediational processes of SDT orientations and effort in the relationship between BPN and vocabulary knowledge. These objectives were addressed using the structural equation modeling (SEM) approach to examine the direct, indirect, and total effects.

LITERATURE REVIEW

BASIC PSYCHOLOGICAL NEEDS AND LANGUAGE LEARNING

SDT advocates the importance of BPN for sustained and enhanced autonomous motivation (autonomous motivation will be discussed further in the "Autonomous and

Controlled Motivation in Language Learning" section). SDT postulates that autonomy, competence, and relatedness are essential conditions for learners to thrive in their learning environment (Deci & Ryan, 1985; Ryan & Deci, 2017). *Autonomy* refers to the sense of control and freedom that individual develops when s/he can elect to engage in an activity that is personally meaningful and interesting. Social learning contexts (usually provided by instructors, parents, or peers) should nurture learners' need of autonomy by allowing them to choose language activities that are personally relevant. *Competence* refers to a state in which the learner feels effective, competent, and capable of successfully performing the target activities. For learners to develop a sense of competence, a clear structure and learning goals should be provided from the beginning of their language learning activities. *Relatedness* refers to connectedness with other people and the development of a sense of warmth with others. It has been suggested that the psychological need for relatedness is important for the internalization of learning processes as well as for taking ownership of learning and engagement (Niemiec & Ryan, 2009).

Few studies have been conducted to date on the role of BPN in language learning outcomes. For instance, Noels et al. (1999) presented correlations between students' final L2 course grades and their perceptions of their language teachers as supportive of their competence and autonomy. The results showed that neither students' perceived autonomy nor competence were correlated with final grades. A more recent study (Alamer & Lee, 2019) has shown a link between BPN and L2 achievement through the mediation of SDT orientations. Alamer and Lee (2019) illustrated that BPN are only indirectly related to L2 achievement by means of intrinsic motivation, goal setting, and language positive emotions. These studies suggest that motivated behaviors related to language learning (such as engagement and expended effort) might elucidate the relationship between BPN and language learning outcomes. Furthermore, SDT researchers have used aspects of BPN to assess their direct associations with SDT orientations (Alamer & Lee, 2019; Noels et al., 1999, 2019; Oga-Baldwin et al., 2017; Wu, 2003). In these studies, BPN variables were set as exogenous for autonomous motivation because SDT postulates that satisfying the three basic needs is expected to yield a positive derivative in the form of the embodiment of autonomous motivation (Ryan & Deci, 2020). Research indicates that perceived competence often outperforms other BPN variables in predicting autonomous motivation and that perceived autonomy shows a positive, albeit slightly weaker, relationship with autonomous motivation (see, Noels, 2013, for a review).

Overall, empirical studies investigating the underlying process of BPN in relation to vocabulary knowledge are scarce. Another issue in L2 literature is the lack of evidence for the underlying factor structure of BPN. This is an important methodological issue to consider because it permits researchers to determine, for example, whether a global BPN construct could coexist with the three constructs of autonomy, relatedness, and competence in one measurement model, a conceptualization that has been empirically supported in previous studies outside the language learning domain (e.g., Guay et al., 2015; Gunnel & Gaudreau, 2015; Tóth-Király et al., 2018). Hence, understanding the factorial structure helps researchers utilize the theory more accurately in the field. Therefore, another goal of the present study was to test and assess the BPN dimensionality.

AUTONOMOUS AND CONTROLLED MOTIVATION IN LANGUAGE LEARNING

The concepts of autonomous and controlled motivation in SDT (Deci & Ryan, 1985; Ryan & Deci, 2020) are drawn from the notion that different types of orientations can be delineated by varying degrees of self-determination or relative autonomy, expressed as personal and impersonal. A key concept of SDT is that when learning is integral to the learner's sense of self, an intrinsic motivation toward the task will develop. SDT posits that individuals can hold a diverse range of orientations to and reasons for engaging (or not engaging) in tasks. The different types of motivational orientations can illuminate learners' purpose and manner of approaching, doing, and completing L2 tasks.

An individual may pursue learning an L2 because it is interesting, fun, and enjoyable (intrinsic orientation), that is, the activity is pleasurable in and of itself. Alternatively, an individual may feel that learning an L2 aligns well with other pursuits and desires in life (identified orientation), that is, the activity is seen as valuable and important to achieve. These two orientations can be described as *autonomous motivation* because they indicate personal volition (Ryan & Deci, 2017). Language learners, however, may learn an L2 in a controlled fashion. An individual may undertake a task because they feel obligated, that is, not because the task is personally important but rather to avoid feeling guilty or disappointing others (introjected orientation); learning involves some external source(s) that push one to behave in a certain way, although the reason is relatively internal. An individual may also learn an L2 to receive rewards for engaging in learning tasks and/or to avert punishments or rejection from others (external orientation); for example, the reason for learning may be to pass course exams or perhaps get a job at a prestigious organization in the future. These two reasons can be described as *controlled motivation* because they are based on external pressures (Ryan & Deci, 2017).

METHODOLOGICAL ISSUES

Previous research has assessed the multidimensionality of intrinsic, identified, introjected, and external orientations to determine whether two general constructs (i.e., autonomous and controlled motivation) could coexist with these four more specific orientation constructs. For example, Howard et al. (2018) recently investigated the underlying factor structure of SDT orientations using the bifactor exploratory structural equation modeling (ESEM) method and provided precise information about the presence of the global constructs, which yielded a better fit to the data than the first order confirmatory factor analysis (CFA) model (see Alamer, in press for an introduction to ESEM in L2 domain). Generally, empirical research supports the coexistence of these two general factors over the specific factors (e.g., Alamer & Almulhim, 2021; Alamer & Lee, 2019; Behzadnia et al., 2018; Howard et al., 2018; Olafsen et al., 2018).

Among the early studies, Noels et al. (1999) modified an SDT orientations scale to assess L2 (French) learning orientations among anglophone Canadian university students. The study claimed to provide some evidence for the construct validity of the SDT instrument by demonstrating positive correlations between intrinsic and identified motivation, combined with students' intention to continue learning, their self-evaluation as individual learners, and their final grades in the L2. However, Noels et al. (1999) presented a less than acceptable internal consistency of reliability ($\alpha = .67$) for the

introjected orientation subscale. This issue often occurs when limited number of observed items (e.g., only two) presumed to represent the latent variable (Hair et al., 2019). This issue has been further observed in subsequent studies that used introjected subscale items, with some researchers reporting alpha (α) values as low as $\alpha = .57$ (see, e.g., Alamer & Lee, 2019; Joe et al., 2017; Noels et al., 2001; Zhang et al., 2017). These results seem to warrant modifications of the instrument, as well as an examination of the factorial structure of the SDT orientations, which has not been considered in the field. Moreover, a measurement's lack of internal reliability will have a certain impact on the estimated relationship in bivariate and multivariate analyses and may yield biased results (Hair et al., 2019).

Establishing the measurement model of SDT orientations is therefore important for gaining a better understanding of the nature of SDT constructs. For instance, examining the extent to which the existence of autonomous and controlled motivation as two global factors over and above the four specific factors of intrinsic, identified, introjected, and external orientations would be useful for L2 researchers and educators. It should be noted that relying on EFA cannot fully substantiate the underlying measurement model because it lacks the fixability that CFA offers in testing competing models (Alamer, in press; Hair et al., 2019).

With regard to the predictive power of SDT orientations, previous studies have supported the associations between autonomous motivation and different learning outcomes (Ryan & Deci, 2020), such as with regard to intention to persist (McEown et al., 2014; Noels, 2001; Noels et al., 1999), engagement in the language process (Noels et al., 2019; Spratt et al., 2002; Woodrow, 2012), and teacher assessment (Oga-Baldwin et al., 2017). However, past research has made few attempts to extend the utility of SDT in a comprehensive mediational pathway leading to increased vocabulary knowledge, considering BPN and effort as antecedents and consequences, respectively.

EFFORT AS A MEDIATIONAL VARIABLE

It is more likely that language learners will be successful in completing language tasks and will acquire the language more efficiently when they expend efforts on the learning process. Motivated learners are persistent and dedicated in terms of their time, and they practice the language whenever they have the opportunity (Hiver et al., 2020). In general, motivation seems to have a substantial effect on the frequency of L2 use and the expenditure of consistent effort (Clément et al., 1994; Dörnyei & Ushioda, 2009; Gardner, 2010; Gardner & MacIntyre, 1993; Hiver et al., 2020; Noels, 2013). It is further suggested that the nature and quality of the expended effort will have an overall effect on L2 outcomes (Alamer, 2021) (e.g., whether learners continue to use the L2, achieve higher levels of L2 fluency, and/or engage more with the L2 community). Thus, effort can be said to operate as a proximal variable that mediates the effect of motivation on L2 outcomes.

Although this paradigm might seem obvious, it has mostly been researched within the socioeducational model of motivation (Gardner, 1985, 2010). In fact, no study has attempted to show how BPN and SDT orientations can be linked to vocabulary knowledge by means of effort. It seems that both motivation and effort are necessary for attaining a satisfactory level of vocabulary knowledge and that a lack of either one may result in unsatisfactory learning. For example, Kim (2006) noted that Korean students

spent a relatively long time learning English as an L2 and practiced the required materials regularly to enter and complete higher studies. However, the Test of English as a Foreign Language scores of these dedicated students do not live up to expectations. The author suggested that psychological variables, such as interest, instrumentality, and attitudes, seem to explain the situation and identify possible means of increased success in English language learning. Therefore, some learners may invest effort even though they have no strong motivation to learn and engage, but they are less likely to succeed in the learning process (Alrabai, 2017; Gardner, 2007; Oxford & Shearin, 1994). This is because each variable, taken individually, is seen as necessary to distinguish between learners who are more and less successful in learning an L2. From this perspective, it is proposed that orientations serve as the foundation of effort and that effort mediates the relationship between motivation and increased linguistic and nonlinguistic outcomes (Gardner, 2010). So far, however, it is only implicitly maintained that autonomous motivation (from SDT) facilitates increased effort and that effort may mediate this effect on L2 outcomes (Gardner, 1985; Noels et al., 1999, 2019). However, such processes have remained largely unproven.

VOCABULARY KNOWLEDGE AND MOTIVATION

Despite the importance given to vocabulary knowledge for successful language learning, few studies have attempted to link different motivational variables to vocabulary knowledge in a comprehensive manner. Among these, Zhang et al. (2017) found support for the joint effects of autonomous motivation and vocabulary learning strategies on vocabulary knowledge. Their results revealed that 53% of the total variance was accounted for by autonomous motivation and learning strategies. Fontecha and Gallego (2012) also found a positive correlation between integrative motivation (Gardner, 2010) and vocabulary knowledge among Spanish students of English. However, neither study assessed the relationship between BPN and vocabulary knowledge in one comprehensive model. Consequently, it remains unclear how this complex relationship can be understood through plausible mediators, such as motivational orientations and effort.

THE PRESENT RESEARCH

This study uses a motivational process based on the SDT framework to assess the interrelationships among BPN, SDT orientations, effort, and vocabulary knowledge. Based on previous studies, the BPN were set as exogenous variables in the model because they have been confirmed as the antecedents of autonomous types of motivation (McEoen, 2014; Niemiec & Ryan, 2009; Noels, 2013; Olafsen et al., 2018). The BPN were also allowed to be directly linked to effort and vocabulary knowledge because this would provide us with the extent to which the influence of BPN on these variables can be direct or indirect. Next, the two global types of motivation (i.e., autonomous and controlled motivation) were set as mediators in the relationships among BPN, effort, and vocabulary knowledge. Similar to BPN, the two general motivational orientations were allowed to be directly linked to vocabulary knowledge to assess their ability to predict variance in the outcome variable over and above the effect that can be explained by effort (Noels et al., 2019; Oga-Baldwin & Nakara, 2017). Finally, it has been well
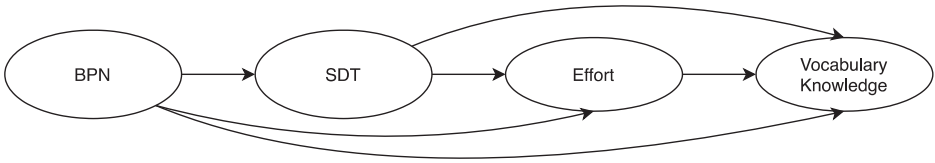
FIGURE 1.   The structural (conceptual) model of the relationships among BPN, SDT, efforts, and vocabulary
knowledge.

established that effort plays a key role in translating the effects of the motivational
orientations into actual learning (Gardner 2007, 2010; Hiver et al., 2020; Jang et al.,
2010; Oga-Baldwin et al., 2017). Therefore, in the present study, we used effort as a final
mediator in the model. The postulated relationships of the SDT process model are
depicted in Figure 1. The intention here, however, is not to establish the temporal causality
of BPN on the eventual vocabulary learning but rather to assess the mediational pathways
that might explain the complex relationship between the predictor variables (i.e., BPN)
and the predicted variable (i.e., vocabulary knowledge).

METHOD

PARTICIPANTS

The study sample consisted of 366 Saudi students learning English as their L2. The
participants were aged between 18 and 22 years, with a mean age of 19.3 years ($SD = .46$).
The sample was 42% male and consisted of undergraduate foundation-year students from
the Department of English at two Saudi universities. A convenience sample strategy was
used, and an e-mail was sent to all students in the English department, inviting them to
participate in the study by completing an online survey. Students at these universities were
required to pass an English placement test to enter the foundation year and those who
show extraordinary results were allocated to the next level. Thus, students' language
levels at the first level of the foundation year are believed not to be unsimilar.

MEASURES

The instruments used in the current study are scales that have been developed in the
context of English language learning. The scales were originally developed in English-
speaking countries and written in English, and thus translation to Arabic was necessary.
Although the research participants were English learners, it was deemed appropriate to
translate the English version of the survey into Arabic to avoid any confusion or difficulty
in answering the survey among students with low proficiency levels. The translation was
done by the researcher. Two additional Saudi professors who did their research in
English-speaking countries were involved in the back-translation. They were asked to
translate the Arabic version of the survey back to English. The researcher then addressed
any issues that persisted in the questionnaire (e.g., the clarity of some questionnaire
items).

Basic Psychological Needs

The Basic Psychological Needs of Second Language (BPN-L2) Scale was formulated based on Ilardi et al.'s (1993) subscale. Changes were made to measure the three main constructs of the BPN: autonomy, competence, and relatedness. The scale is designed to elicit self-reports. It consists of a total of 12 items in a 5-point Likert-type response format. The 12 items are divided equally across the three constructs (autonomy, competence, and relatedness), with four items in each construct. Students were asked to indicate to what extent they agreed or disagreed with each statement. 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, "My English teacher cares about my progress."

Self-Determination Theory

The Self-Determination Theory of Second Language (SDT-L2) Scale is a revised 20-item scale adapted from Noels et al. (1999). It was employed to measure the motivation for L2 learning. There are four main subconstructs used in this study to assess students' autonomous and controlled motivation: intrinsic, identified (for autonomous motivation), introjected, and external orientation (for controlled motivation). These four subscales were aggregated into two general factors, that is, autonomous and controlled motivation (Ryan & Deci, 2017). The scale is a self-reported measure, and a 5-point Likert-type response format was used. Each subscale of motivation consists of five items. Participants were asked to ponder the question "Why are you learning English?" and then indicate the extent to which they agreed with the statements that followed. Example items are as follows: for intrinsic orientation, "because I enjoy learning English"; for identified orientation, "because learning English is important for my personal growth"; for introjected orientation, "because I would feel ashamed if I am not successful in English learning like my friend(s)/family"; and for external orientation, "because I just want to pass the English exam."

Effort

To assess the degree of effort expended by the participants when learning the L2, three items taken from Gardner's (2010) measure of effort were used. Participants were asked to choose one of three levels of expended effort while learning the language. An example item is "I really work hard to learn English."

Vocabulary Knowledge

The outcome variable in the present study was students' vocabulary knowledge. Vocabulary knowledge was assessed using the vocabulary levels test (Schmitt et al., 2001). It was chosen as a criterion variable because it represents an essential component of language use and comprehension (Schmitt et al., 2001; Schmitt, 2010). The test assesses students' vocabulary knowledge with 30 items based on the 2,000-, 3,000-, and 5,000-words level. Each cluster of items consists of six English words and three

definitions. The students were asked to choose the correct word from each six-word list and match its meaning from a set of three definitions. For example, they were given *equivalent*, *financial*, *forthcoming*, *primary*, *random*, and *visual* and asked to match them to *most important*, *concerning sight*, and *concerning money*. Participants were awarded one point for each correct answer and zero for incorrect matches. The maximum and minimum possible scores for vocabulary knowledge were 90 and 0, respectively. The vocabulary test was administered to the participants after the study had been conducted. Permission was obtained from the participants and the head of the English department.

STATISTICAL ANALYSES

SEM was used in the present study because it allows for complex relationships to be assessed in one comprehensive analysis. It includes two major parts: measurement and structural models. Because SEM entails the assessment of measurement models, researchers need to first evaluate the factor structure of the variables involved through CFA, which tests the relationship between observed and latent variables (e.g., how the observed variables of autonomy belong to their presumed latent variable, autonomy). Part of establishing the construct validity of the measures is the assessment of convergent validity, which is obtained by evaluating the average variance extracted (AVE). It is suggested that AVE be .50 or preferably higher (Hair et al., 2019). Upon confirming the measurement models in the CFA, researchers are then able to assess the structural part of the model (Alamer, in press).

To evaluate the quality of the model (in both CFA and the structural model), χ^2 statistics were first assessed. However, χ^2 statistics produce a higher value with an increasing number of observed variables. Therefore, it is customary to evaluate several alternative model fit indices in SEM (Hair et al., 2019). The alternative fit indices that were used were the comparative fit index (CFI), the Tucker–Lewis Index (TLI), the root mean square error of approximation (RMSEA) fit index, and the standardized root mean residual (SRMR). It is suggested that CFI and TLI are in the region of .90, but values above .95 reflect a good fit (Hair et al., 2019). In contrast, both RMSEA and SRMR are recommended to be around .07 or less. These guidelines depend on the complexity of the model and the sample size (Hair et al., 2019). Because the data appear to be relatively nonnormally distributed (see the "Univariate and Multivariate Normality" section), a maximum likelihood estimation with robust standard errors was employed using lavaan software, which is an SEM package based on R (Yves, 2012).

RESULTS

PRELIMINARY ANALYSES

Descriptive statistics, reliability estimates, and bivariate correlations for the variables included in the BPN, SDT orientations, effort, and vocabulary knowledge are displayed in Table 1. A reliability estimate of the variables was calculated using two indices: Cronbach's alpha (α) and composite reliability (CR). CR is recognized as more advantageous because it accounts for model parameters, especially in measurement errors, and it considers the different loadings of items. It is based on the assumption that each item

TABLE 1.   Descriptive statistics and zero-order correlations for the variables

Variable	(α)/CR	M	SD	1	2	3	4	5	6	7	8	9
1. Vocabulary knowledge	–	62.60	9.12	1	–	–	–	–	–	–	–	–
2. Effort	.88/.85	3.44	1.17	.55**	1	–	–	–	–	–	–	–
3. Autonomy	.81/.82	3.46	1.04	.25**	.10	1	–	–	–	–	–	–
4. Competence	.89/.89	4.05	.81	.37**	.15**	.51**	1	–	–	–	–	–
5. Relatedness	.87/.87	3.71	.90	.40**	.18**	.31**	.53**	1	–	–	–	–
6. Intrinsic orientation	.89/.90	3.66	.89	.21**	.15**	.18**	.20**	.17**	1	–	–	–
7. Identified orientation	.80/.83	4.17	.90	.22**	.21**	.15**	.27**	.20**	.58**	1	–	–
8. Introjected orientation	.80/.80	3.38	1.34	−.13*	−.12*	.07	−.02	.009	−.38**	−.33**	1	–
9. External orientation	.82/.84	4.23	.86	−.09	−.06	−.02	−.05	−.02	−.22**	.21**	.33**	1

Abbreviation: CR, composite reliability.
*Correlation is significant at the 0.05 level.
**Correlation is significant at the 0.01 level.

should be weighted in terms of its individual item reliability, which results in different weights for individual items (Hair et al., 2019). With regard to effect size, Plonsky and Oswald (2014) noted that correlation coefficients (*r*) in L2 research can be used as indicators of effect size; correlation coefficients that are close to .25, .40, and .60 are indicative of small, medium, and large effect sizes, respectively. Similarly, beta (*β*) values of predictor variables can be used as effect sizes, following Cohen et al. (2011) guidelines, such that *β* values in the ranges of 0–.1, .1–.3, and .3–.5 and those that are >.5 are indicative of weak, modest, moderate, and strong effect sizes, respectively.

STATISTICAL ASSUMPTIONS AND CONSIDERATIONS OF STRUCTURAL EQUATION MODELING

Data Distribution

The normality of data was tested before conducting the analyses. To determine univariate normality, the skewness and kurtosis of the data distribution were examined. Values exceeding the 3.0/−3.0 guideline are considered severely skewed and kurtosis values exceeding the 10.0/−10.0 guideline are considered severely peaked or flat (Kline, 2016). Assessing univariate normality using these guidelines yielded three cases under identified orientation, which were deemed to be distinctly different from the rest. These cases were removed based on empirical justifications, as recommended (Kline, 2016).

Outliers

Outliers are data points that are substantially different from the rest of the data points (Tabachnick & Fidell, 2013). The boxplot technique was employed to check for potential extreme values. Following Hoaglin and Iglewicz (1987), any values that exceeded three interquartile ranges from the end of a box were considered to be extreme outliers. However, the examination failed to identify any outliers. In addition, visual examination of the collected data yielded no concerns about systematic or intentional carelessness in completing the questionnaire (e.g., providing the same answer throughout the question-naire). Therefore, it was concluded that outliers' data points were not evident in the dataset. Multivariate outliers were tested using the Mahalanobis D^2 measure. Any data point that has a D^2 value that deviates substantially from the D^2 values of the dataset at $p < 0.001$ should be considered for removal (Hair et al., 2019). Accordingly, our results showed that six cases exceeded the acceptable threshold and they have been removed from the analysis.

EXAMINING THE FACTOR STRUCTURE OF THE CONSTRUCTS

Factor Structure of the Basic Psychological Needs (BPN-L2) Scale

The factor structure of the BPN consisted of three constructs representing autonomy, competence, and relatedness. Because these factors are highly correlated and to avoid multicollinearity issues a higher-order CFA was conducted to conceive an empirically and theoretically supported model that accounts for the general BPN construct in the

TABLE 2.   Model fit indices for basic psychological needs (BPN-L2) scale

χ^2	P	df	SRMR	RMSEA	RMSEA Lo 90%	RMSEA Hi 90%	CFI	TLI
89.11	.00	49	.06	.07	.04	.08	.95	.93

TABLE 3.   Factor loadings for basic psychological needs

Items	Autonomy	Competence	Relatedness
Autonomy Item 1	.86 (.06)	–	–
Autonomy Item 2	.88 (.06)	–	–
Autonomy Item 3	.44 (.09)	–	–
Autonomy Item 4	.77 (.07)	–	–
Competence Item 1	–	.75 (.04)	–
Competence Item 2	–	.81 (.05)	–
Competence Item 3	–	.82 (.04)	–
Competence Item 4	–	.89 (.04)	–
Relatedness Item 1	–	–	.60 (.07)
Relatedness Item 2	–	–	.88 (.05)
Relatedness Item 3	–	–	.92 (.03)
Relatedness Item 4	–	–	.80 (.05)
Higher-order factor (BPN) *factor loadings*	.70 (.07)	.91 (.05)	.69 (.05)

Notes: Standard errors are shown in parentheses. All values are significant at $p > 0.001$.

TABLE 4.   Model fit indices for the self-determination theory orientations

χ^2	p	df	SRMR	RMSEA	RMSEA Lo 90%	RMSEA Hi 90%	CFI	TLI
335.239	.00	141	.07	.08	.07	.09	.93	.91

measurement model. The model fit indices are listed in Table 2. The results showed that the model provided a satisfactory fit to the data. The factor loadings of the subscale items are listed in Table 3. The AVE of autonomy, competence, and relatedness were .52, .68, and .66, respectively. Thus, the measures of BPN-L2 have shown acceptable levels of convergent validity.

Factor Structure of the Self-Determination Theory Orientations (SDT-L2) Scale

The factor structure of SDT orientations consisted of four constructs representing intrinsic, identified, introjected, and external orientation. A higher-order CFA was conducted to conceive a parsimonious model that empirically accounts for the general autonomous and controlled motivation constructs in the measurement model. That is, intrinsic and identified orientation were loaded on the higher-order factor of autonomous motivation. Similarly, introjected and external orientation were loaded on the higher-order factor of controlled motivation. The model fit indices are shown in Table 4. The results showed that the solution fit the data moderately, with RMSEA approaching the

TABLE 5.   Factor loadings for the self-determination theory orientations (SDT-L2) scale

Items	Intrinsic	Identified	Introjected	External
Intrinsic Item 1	.82 (.05)	–	–	–
Intrinsic Item 2	.65 (.06)	–	–	–
Intrinsic Item 3	.77 (.06)	–	–	–
Intrinsic Item 4	.73 (.06)	–	–	–
Intrinsic Item 5	.82 (.05)	–	–	–
Identified Item 1	–	.82 (.05)	–	–
Identified Item 2	–	.66 (.06)	–	–
Identified Item 3	–	.78 (.05)	–	–
Identified Item 4	–	.74 (.06)	–	–
Identified Item 5	–	.68 (.05)	–	–
Introjected Item 1	–	–	.69 (.09)	–
Introjected Item 2	–	–	.62 (.10)	–
Introjected Item 3	–	–	.57 (.11)	–
Introjected Item 4	–	–	.64 (.09)	–
Introjected Item 5	–	–	.63 (.09)	–
External Item 1	–	–	–	.63 (.10)
External Item 2	–	–	–	.63 (.11)
External Item 3	–	–	–	.60 (.11)
External Item 4	–	–	–	−.60 (.11)
External Item 5	–	–	–	−.55 (.12)
Higher-order factor (autonomous motivation) factor loadings	.89 (.05)	.76 (.06)	–	–
Higher-order factor (controlled motivation) factor loadings	–	–	.75 (.06)	.63 (.07)

Notes: Standard errors are shown in parentheses. All values are significant at $p > 0.001$.

conventional cutoff value (RMSEA = .08). The factor loadings of the subscale items are listed in Table 5. The correlation between autonomous and controlled motivation was negative, $r = −.06$, and insignificant at $p = 0.42$. The AVE of autonomous motivation and controlled motivation were .64 and .51, respectively. Thus, the measures of SDT-L2 have shown acceptable levels of convergent validity.

ANALYSES OF THE STRUCTURAL MODEL

As shown in Figure 2, the hypothesized model was formulated based on the results of the measurement models described earlier. The model yielded an acceptable fit: (χ^2 = 305.52, p = 0.001, df = 123, SRMR = .06, RMSEA = .06, RMSEA 90% CI: [.05, .07], CFI = .95, TLI = .93). The results showed that the SDT process model explained about 47% of the variance in vocabulary knowledge with a 95% confidence interval varying from 35 to 56. Because the data were not perfectly normal the path coefficients were assessed through a 5,000-bootstrap analysis with 95% confidence interval to confirm whether path estimates fall within the interval's range, thus normalizing the data (Kline, 2016). The results of the bootstrap showed that the significant paths in the model have fallen within the 95% confidence interval and did not include zero. The
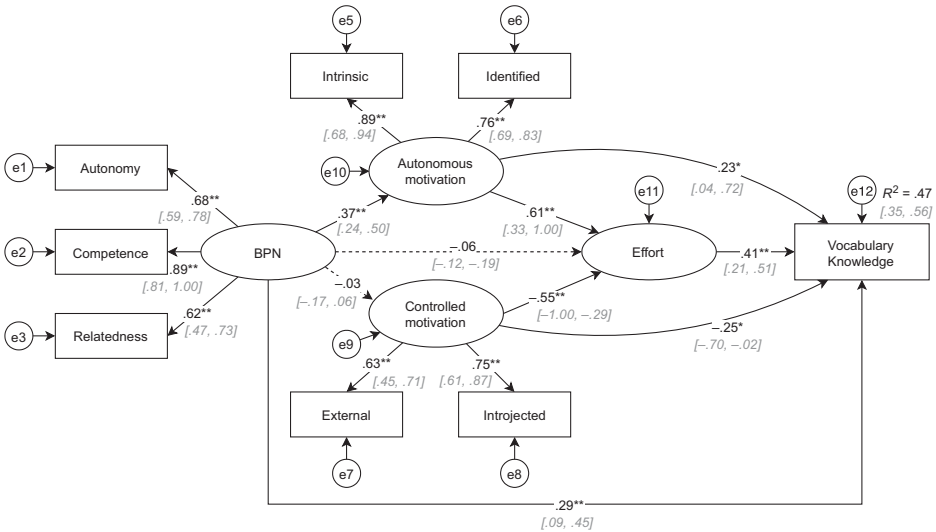
FIGURE 2. The SDT process model linking BPN, SDT orientations, effort, and vocabulary knowledge.
* Path is significant at the $p < 0.05$ level.
** Path is significant at the $p < 0.01$ level.
Note: Italic and gray values are the 95% confidence interval.

TABLE 6. Standardized direct and indirect effects of the motivational variables on vocabulary knowledge

	Paths	β	p	R^2
#1	BPN	.29	<0.01	.08
#2	BPN → Autonomous motivation	.09	0.08	>.00
#3	BPN → Effort	−.02	0.75	>.00
#4	BPN → Autonomous motivation → Effort	.09	00.08	>.00
#5	BPN → Controlled motivation → Effort	.003	0.86	>.00
#6	BPN → Controlled motivation	.01	0.85	>.00
#7	**BPN (*total*)**	.46	–	.22
#8	Autonomous motivation	.23	<0.01	.05
#9	Autonomous motivation → Effort	.25	<0.01	.06
#10	**Autonomous motivation (*total*)**	.48	–	.23
#11	Controlled motivation	−.25	<0.01	.06
#12	Controlled motivation → Effort	−.23	<0.01	.05
#13	**Controlled motivation (*total*)**	−.48	–	.23
#14	**Effort**	.41	<0.01	.17

path coefficients results indicated that BPN positively predicted autonomous motivation (i.e., intrinsic and identified orientation), which was of a moderate effect size ($\beta = .37$, $p < 0.01$). However, BPN were not correlated with controlled motivation ($\beta = −.03$, $p > 0.05$) or effort ($\beta = −.06$, $p > 0.05$). Instead, BPN were directly and positively correlated with vocabulary knowledge ($\beta = .29$, $p < 0.01$), with a moderate effect size.

Next, it was observed that autonomous motivation was positively associated with effort ($\beta = .61$, $p < 0.01$), which exerted a great effect. In contrast, controlled motivation was negatively and moderately correlated with effort ($\beta = -.55$, $p < 0.01$). Finally, effort was moderately associated with vocabulary knowledge ($\beta = .41$, $p < 0.01$).

The results of the indirect effects of BPN and SDT variables revealed positive and negative patterns of associations. Detailed results are reported in Table 6. First, the results of BPN did not support the mediating role of autonomous motivation in the relationship between BPN and vocabulary knowledge (see #2 in Table 6) nor did the mediation role of controlled motivation between BPN and vocabulary knowledge (see #6 in Table 6). Overall, no mediational pathways were found to be significant in the relationship between BPN and vocabulary knowledge (see #2–#6 in Table 6). Notwithstanding, the overall indirect effect of BPN on vocabulary knowledge showed a strong positive effect (see #7 in Table 6).

Furthermore, the results showed that the indirect effect on the mediating role of effort in the relationship between autonomous motivation and vocabulary knowledge was significant (see #9 in Table 6). The total indirect effects of autonomous motivation on vocabulary knowledge were moderate (see #10 in Table 6). In contrast, the relationship between controlled motivation and vocabulary knowledge was negatively mediated by the indirect effect of effort (see #12 in Table 6). Finally, the results indicated that controlled motivation had moderate negative total indirect effects on vocabulary knowledge (see #13 in Table 6).

DISCUSSION

Language learners whose BPN are satisfied are more likely to exhibit autonomous motivation and less likely to act on controlled motivation (Alamer & Lee, 2019; Noels, 2001; Noels et al., 1999, 2019; Oga-Baldwin et al., 2017; Wu, 2003). Moreover, autonomously motivated L2 learners are expected to expend further effort in their learning and become involved in tasks at hand to succeed in the language learning process (Alrabai, 2017; Dörnyei & Ushioda, 2011; Hiver et al., 2020). Consequently, when learners put effort into their learning, they are more likely to learn the language successfully (Gardner, 2010; Gardner & MacIntyre, 1993; Tremblay & Gardner, 1995). Such arguments, however, have not been discussed in a comprehensive framework within the SDT perspective, and thus this study was able to shed light and elaborate on the described motivational mechanisms.

Before testing the SDT motivational model, it was necessary to establish the factorial structure of both the BPN-L2 and SDT-L2 scales. Although the factor structures of the BPN and SDT orientations have been examined in classroom educational research, this study is, to the best of the author's knowledge, the first of its kind in the L2 domain to test the dimensionality of these constructs. By considering a higher-order CFA model, the study provided evidence of construct validity and more precisely represented the BPN-L2 and SDT-L2 scales using a fine-grained measurement approach (Alamer & Almulhim, 2021; Alamer, in press). The results suggested that BPN might be better conceptualized as three separate needs (autonomy, competence, and relatedness), with those needs belonging to BPN as an overarching construct. Similarly, the results supported the CFA model of the SDT-L2 scale, indicating that intrinsic and identified orientation belong to the overarching construct of autonomous motivation, whereas introjected and external orientation belong to the overarching construct of controlled motivation. These results

aligned with recent studies that have discussed these two global constructs (Alamer & Lee, 2019; Guay et al., 2015; Ryan & Deci, 2017; Tóth-Király et al., 2018).

The major goal of the present research was to assess a motivational model in which BPN were set to predict increased vocabulary knowledge through the mediational processes of SDT orientations and effort. Specifically, the motivational model explained approximately 47% of the variance in vocabulary learning and provided support for the theoretical assumption of SDT, which posits that satisfying BPN leads students to exhibit autonomous motivation and ultimately to an increase in various language learning outcomes (Deci & Ryan, 1985; Guay et al., 2015; Noels, 2001; Noels et al., 2019). The resultant motivational process of this study might seem logical, but it has not been previously evaluated using SDT in the L2 learning domain.

The findings indicated that BPN were directly responsible for increased vocabulary knowledge. Although no specific indirect effect was evidenced, the total effect of BPN on the outcome variable was relatively strong. A noticeable finding here is perhaps the direct effect of BPN on vocabulary knowledge, which remained significant even after controlling for the other paths in the structural model. As such, this study is the first to empirically detect such a plausible association between the two variables, and it may yield further directions in the form of research and classroom implications.

Similarly, the SDT orientations (i.e., autonomous and controlled motivation) were found to be directly and indirectly associated with vocabulary knowledge in distinct ways. These findings showed that autonomous motivation facilitated vocabulary knowledge through effort, but it was also directly responsible for greater attainment of the vocabulary over and above the effects of expended effort (see Figure 2 and Table 6). In contrast, controlled motivation seemed to have a negative effect on vocabulary knowledge directly and indirectly through effort. These results expanded on Alamer and Lee (2019), Noels (2001), and Zhang et al. (2017) to show the nature of the association between SDT and vocabulary learning and suggest that motivation is a substantial predictor of vocabulary knowledge over and above the effects of the *amount* of effort being invested in learning. This does not imply that motivated learners should not invest effort, but it is probably the *quality* and nature of the expended effort that matter the most (Alamer, 2021). As the results have suggested, students' efforts do not operate in isolation of motivation; what is important is how students' motivation translates. More so, it is crucial to note whether effort and motivation together lead to an increase in the size of students' vocabulary.

Nevertheless, the direct negative effect of controlled motivation on effort and vocabulary knowledge indicates that this motivational outlook may inversely impact the amount of effort invested in learning, specifically vocabulary learning. Although controlled types of motivation can be considered motivating, their eventual effects on optimal learning processing are minimal and could even be negative in some situations (Ryan & Deci, 2017). Our findings with regard to the effects of controlled motivation on language learning matched those observed in the field (Alamer, 2021; Alamer & Lee, 2019; Noels et al., 1999, 2001, 2019; Oga-Baldwin et al., 2017) and expanded on them to show the relationship between controlled motivation and vocabulary knowledge. The findings, nonetheless, contradicted other studies that show positive relationship between these variables (Noels et al., 2000; Zhang et al., 2017). The discrepancies between our findings and these may be attributed to the learning contexts and the types of participants being surveyed.

Overall, our findings are in substantial agreement with the SDT argument that satisfying BPN can promote more self-determined forms of motivation, which, in turn, leads to optimal and desirable learning outcomes (Alamer & Lee, 2019; Alrabai, 2017; McEown et al., 2014; Noels et al., 2019; Ryan & Deci, 2017; Spratt et al., 2002).

PEDAGOGICAL IMPLICATIONS

The findings of the present study suggest that language teachers should place particular importance on their students' needs of autonomy, competence, and relatedness because they relate directly to the greater attainment of L2 vocabulary. Moreover, according to the total effects of these three needs on better vocabulary learning, teachers may also need to recognize what motivational outlooks students hold with regard to their L2 learning and ensure that they properly embody autonomous motivation. This link appeared to be critical to students' expanded effort and ultimately to vocabulary learning. Therefore, educational interventions aimed at satisfying students' needs would do well and would prove to be fruitful. To accomplish this, language teachers should consider less controlling teaching approaches and provide students with meaningful choices about language subjects (fostering autonomy), set reasonable expectations for language tasks, provide structure in an informational and noncontrolling fashion (fostering competence), and attempt to understand students' concerns and become interpersonally involved with them (fostering relatedness).

LIMITATIONS AND CONCLUSION

There are a few limitations to the present study. First, because this research pertained to Saudi learners of English as an L2, the findings can only be generalized among Saudi learners of English. It would be interesting to assess the usefulness of the study's model in different cultural contexts or with learners of languages other than English (such as Arabic) to see if the language or the learning context could contribute to a deeper understanding of the SDT process model.

Second, the present research employed a cross-sectional survey design with one sample of participants. Hence, although the study's motivational model clarified how motivational subtypes, together with effort, can be understood, it does not identify cause-and-effect relationships among the variables involved in the model. Most importantly, the outcome measure (i.e., the vocabulary knowledge test) was administered at nearly the same time as the study's other measures. Accordingly, we have not collected data about students' previous BPN or SDT orientations, which apparently prevents us from coming to a clear conclusion about whether previous endorsement led to an increase in the outcome variable, later on or perhaps something else besides the predicted variance can predict the increase in the outcome variable. Only a longitudinal research design can clearly test the plausible propositions concerning the cause-and-effect relationships between motivation and vocabulary learning.

Overall, the present study validated the BPN-L2 scale to measure language learners' BPN and the SDT-L2 scale to measure language learners' motivational orientations based on SDT. The higher-order CFA models supported Ryan and Deci's (2017) theoretical argument of the BPN and SDT orientations. By understanding these scales' factorial structure, it was

possible to more precisely test a motivational process model linking BPN, SDT orientations, and effort to vocabulary knowledge. I hope that these findings have enriched our understanding of the complex role of motivation in the acquisition of vocabulary knowledge and that they have yielded theoretical and pedagogical implications for L2 researchers and educators. I also encourage quantitative researchers to utilize the BPN-L2 and SDT-L2 scales in their empirical research and use advanced measurement assessment methods (Alamer, in press) to enhance and improve the validity of these measures of motivation.

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APPENDIX

***Basic Psychological Needs of Second Language Scale**[*]*

Item
Autonomy
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 practice English in the classroom.
Competence
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.
Relatedness
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.

[*]Formulated based on Ilardi et al. (1993).

Self-Determination Theory of Second Language Subscale*

Why are you learning English?

Item

Autonomous motivation
Intrinsic orientation
Because I enjoy learning English.
Because of the pleasure I get when hear and read English.
For the satisfaction I feel when I use English.
For the enjoyment I experience when I achieve a new goal in English learning.
Because learning English is a fun activity in and of itself.
Identified orientation
Because learning English is important for my personal growth.
Because learning English can open new opportunities and possibilities for me.
For the value it holds in my self-development.
Because learning English is important for my current and future studies.
Because learning English allows me to read and hear English-based materials that are necessary for my personal success.
Controlled motivation
Introjected orientation
Because I would feel guilty if I didn't understand English.
Because I would feel ashamed if I'm not successful in English learning like my friend(s)/family.
Because people around me (the teacher/peers/parents) expect me to learn English.
Because people around me (the teacher/peers/parents) would think I'm a failure if I didn't speak English.
Because I feel pressured by the people around me (the teacher/peers/parents) to learn English.
External orientation
Because I want to get a prestigious job that requires English proficiency.
Because I want to get better marks in the English course.
Because English is just a required course that I want to pass.
Because I don't want to fail the final exam in the English course.
Because there will be negative consequences if I fail to learn English.

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*Formulated based on Noels et al. (1999).

Effort Subscale*

I work really hard to learn English.
When I have a problem understanding something in my English class, I always ask my teacher for help.
When I'm studying English, I ignore distractions and pay attention to my task.

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*Taken from Gardner (2010).