



Effects of using the WhatsApp application on language learners motivation: a controlled investigation using structural equation modelling

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ABSTRACT

The study of language learners' motivation has long been considered a key, determining factor of success in second/foreign language acquisition. Based on self-determination theory (SDT), the more autonomously motivated learners are, the better they engage in an activity. To sustain autonomous motivation, the learners' basic psychological needs (BPN) of autonomy, competence, and relatedness should be satisfied. Nevertheless, the role of these three components and their relation to autonomous motivation in the mobile-assisted language learning (MALL) context has not yet been addressed in the literature. Therefore, a social networking mobile application (*WhatsApp*) has been used to explore how teachers' informal use of such an application relates to an increase in students' motivation. A quasi-experimental design was adopted for two groups of Saudi university students enrolled in the English language department at two major universities (N=447). The structural model revealed a significant improvement in the effects of Time 1 autonomy on Time 2 autonomous motivation as well as in the effects of Time 1 autonomous motivation on Time 2 autonomous motivation exclusively in the experimental group. The two-time repeated measure of ANOVA substantiated the increase in autonomous motivation exclusively among students in the experimental group. This study contributed to greater recognition of the advantages and challenges of applying *WhatsApp* as a tool of MALL in the educational system.

KEYWORDS

m-learning; mobile assisted language learning (MALL); second language motivation; self-determination theory; structure equation modeling (SEM); WhatsApp

1. Introduction

Mobile-assisted language learning (MALL), a subset area of mobile learning (m-learning), is seen as a pedagogical approach that explores the educational applications of various tools and their relationship to the motivation of language learners (Alamer, 2015; Shadiev, Liu, & Hwang, 2020; Loewen et al., 2019). Such a pedagogical approach has its own learning theories and practices, which are also influenced by the psychological and social development of individuals. In fact, MALL is supported by the implementation of handheld devices and portable technologies (Kohnke, 2020; Refat, Kassim, Rahman, & Razali, 2020). Nevertheless, MALL may drag the instructors and second language (L2) learners into passive roles when sufficient teacher interaction is ignored or when more attention is given to the tools than the pedagogical approaches.

One aspect that started to gain much attention in MALL is the investigation of the extent to which the use of mobile devices in language teaching could be related to and increase L2 learners' motivation. This is a valid question to be addressed especially in the context of Saudi Arabia, where many learners of English are still lagging behind and feeling unmotivated to engage in language learning activities inside and outside the classroom (Alamer, 2021a; Alamer & Lee, 2019; Alqurashi, 2014; Alrabai, 2017). Although the usefulness of MALL for English language learners and its effectiveness in increasing their motivation may be intuitively self-evident and thus ingrained, empirical research is needed to test these assumptions (Alamer, 2015). As such, the main purpose of this study was to test the effects of MALL on learners' motivation by scrutinizing the directional relationship between *WhatsApp*, one of the tools belonging to the field of MALL, and L2 motivation.

The relationship between learners' social context and their language motivation has been examined in cross-sectional research design; however, few empirical investigations have assessed the effects of MALL over time (e.g. a duration of whole language course). Such a temporal perspective is vitally important to better evaluate casual associations and to recognize how MALL can be relevant to students' motivation over time. This standpoint allows researchers to better recognize the potential of MALL in enhancing and fostering motivation and, if supported, indicates how such implementation can be sustained through the hurdles, challenges, and success that are central in the learning of L2. In line with some key studies such as Alamer (2015), Fathali and Okada (2016), Jenö, Adachi, Grytnes, Vandvik, and Deci (2019), and Ryan and Deci (2020), this study examined how the use of *WhatsApp* by L2 instructors with their learners promotes feelings of the three basic psychological needs (BPN), namely autonomy, competence, and relatedness, in the

learning process, which, in turn, foster more autonomous motivation throughout an entire one-semester language course.

2. Background

2.1. Motivation and language learning

Motivation has been largely investigated in several areas, and yet many others need to be explored. In fact, understanding the nature of motivation and reasons for each learner to study the target language is complex (Alamer, 2021b; Al-Hoorie, 2017; Gardner, 2010; Kikuchi, 2019). In the field of L2 research, motivation is an essential factor related to success in learning the L2 (Muñoz-Restrepo, Ramirez, & Gaviria, 2020). Research inquiry into L2 motivation is rooted in social psychologists' Gardner and Lambert (1972) widely known notion of integrative motivation (i.e. motivation toward learning the target language due to a wish to be closer to the target language community). Research on L2 motivation during the 1970s and early the 1980s was largely guided by this construct and came to the general conclusion that achievement in L2 was associated with language learning aptitude, motivational intensity to learn the language, and integrative orientation.

Much of the recent motivational research has highlighted the prominence of identity and self-related aspects of language learning motivation (Dörnyei, 2006, 2014; Dörnyei, MacIntyre, & Henry, 2015; Ibarra-Sáiz, Rodríguez-Gómez, & Boud, 2020; Kim, 2009; Miyahara, 2014; Noels, Lascano, & Saumure, 2019; Ushioda, 2009). These conceptualized themes and paradigms have been reflected in a considerable amount of research through the study of how and why motivation, with its complex construct, affects language learning achievement (Alamer, 2021b). Such trends have given rise to different educational designs, instructional practices, and motivational techniques for classroom application.

2.2. Self-determination theory in language learning

The framework of SDT is drawn from the psychological perspective of Deci and Ryan (1985) and Ryan and Deci (2020), although until the early 2000s it was not framed to language learning. According to Noels (2001), SDT posits that L2 learners can be described as holding a diversity of orientations to (or reasons for) engaging in language learning. These orientations are significant in that they illuminate the purpose and manner of learning an L2. Some orientations can be more predictive than others, with increased attainment of the L2 learning process (Alamer, 2021a; Alamer & Lee, 2019).

In this sense, a key concept of SDT is that learning an L2 is personally important and integral to the language learner's sense of self. This conceptualization is reflected by the notion of *autonomous motivation*. In essence, autonomous motivation consists of two sub-constructs: *intrinsic orientation* and *identified orientation*, both of which refer to the centrality of the active to the learner's self. Specifically, intrinsic orientation concerns feelings of enjoyment and vitality that arose from involvement in the activity. Intrinsic orientation occurs when learning the language is perceived as a pleasurable process in and of itself. Identified orientation refers to the value and importance that an individual attaches to the activity. In some cases, learning the L2 may be less enjoyable to the learner self, but s/he can see what is valuable and beneficial from engaging in the activity to him/her in an optimal way.

Several studies show that students' endorsement of autonomous type of motivation is linked to increased amount of engagement in language activates overtime (Noels, Clement, & Pelletier 1999, 2019; Oga-Baldwin & Nakata, 2017), better engagement with the target language community (McEown, Noels, & Saumure, 2014), higher self-evaluation of reading, writing, speaking, and comprehension of the language, increase in vocabulary knowledge (Alamer, 2021a) and ultimately to the achievement of the language (Alamer & Lee, 2019). Research outside language learning domain indicated that undergraduate students who learned the required materials using mobile phone app (comparing to the traditional textbook method) appeared to had greater perceived autonomy, perceived competence and autonomous motivation (Jeno et al., 2017). However, there is still a lack in the literature regarding the relationship between using MALL and students' autonomous motivation in the L2 domain, and whether MALL enhances the development of autonomous motivation among the learners is still an unresolved issue.

SDT also proposes a conceptualization through which autonomous motivation can be fostered and sustained. From the initial introduction of the ultimate objectives of situated materials, the L2 course content, and the style and strategies of instruction, to the assessments, learners are more likely to endorse autonomous motivation when their fundamental psychological needs for a sense of *autonomy*, *competence*, and *relatedness* are supported by circumstances and people in the learner's social world (Alamer & Almulhim, 2021; Alamer & Lee, 2019; Noels et al., 2019; Ryan & Deci, 2017).

Accordingly, there are three core concepts that are related to SDT, known as the basic psychological needs (BPN). First, *autonomy* reflects situations in which circumstances (e.g. instructors, course materials, or the group of learners) offer choices to learners so that they can pursue options that are personally preferable to them. Second, *competence* refers to the perception

of learners' ability to perform an activity. Third, *relatedness* is experienced when learners have a sense of warmth, security, and connection between themselves and other people in that social context. In view of that, Ryan and Deci (2017) asserted that autonomy is significant for more internalized regulation, and stronger self-determination, competence, and relatedness have also been found as necessary. As such, self-determination is likely undermined when external factors control learners' learning.

The framework of SDT could contribute to a better understanding of the relationship between L2 learners' motivation and the pedagogical approach of mobile learning in general and MALL in particular. For example, Jenö et al. (2019) investigated the impact of an m-learning application on students' well-being and achievement via the lens of SDT. The study showed that the three BPN had facilitated learners' autonomous motivation as well as achievement. Further, Jenö et al. (2017) noted that the use of m-learning tools is particularly relevant to students' autonomous motivation, as these tools are often perceived as interesting relative to traditional classroom learning. Thus, we employed SDT in this study as an enabler to explore the motivational profiles of learners when they use *WhatsApp* with their instructors (Alamer, 2015).

2.3. Mobile-assisted language learning

The literature indicates a wide interest in MALL research worldwide, with the possibility of having more than 345 different mobile-related technologies that can be implemented in the process of L2 learning and teaching (Burston, 2014). The significance of mobile learning is a result of there being aiding collaborations with course content, classmates, and extending learning spaces (Jenö et al., 2019). The launching of smartphones in 1994 and Android devices in 2008 have opened the door for more integrated MALL implementations. MALL has become more prevalent, as its applications have become widespread in various L2/FL settings (Sailer, Hense, Mayr, & Mandl, 2017; Zainuddin, 2018). While this has led to an increase in potential rewards, it poses various challenges to learning motivation (e.g. Al-Kathiri, 2015; Oriji & Torunarigha, 2020; Pallas, Eidenfalk, & Engel, 2019). The investigation of the effects of MALL in L2 learning has shown MALL to have great potential in enhancing learners' engagement and achievements (Burston, 2014; Elola & Oskoz, 2017). However, in many non-native English-speaking countries, the lack of motivation among students to learn English in an engaging environment is of serious research concern (e.g. Alqurashi, 2014; Elaish, Shuib, Ghani, & Yadegaridehkordi, 2019). Such mobile technologies can provide a wealth of ideas and strategies to foster the process of L2 learning and teaching (Klimova, 2018; Zou, Yan, & Li, 2020).

Regarding motivating the learners via the use of mobile technologies, most relevant studies include an examination of learners and instructors' attitudes towards the use of mobile tools both inside and outside the classroom (Hao, Lee, Chen, & Sim, 2019; Thornton & Houser, 2003). Nevertheless, little attention has been paid to the role of learners' motivation and, more specifically, to the BPN within the MALL environment (Alamer, 2015).

2.4. Whatsapp and language learning

WhatsApp is an instant messaging application available for nearly all smartphone operating systems. The popularity of *WhatsApp*, an application of MALL, has continued to rise worldwide, particularly in Saudi Arabia, for it has become one of the most popular communication applications with roughly four hundred million active users Bouhnik, Dshen, and Gan (2014). *WhatsApp* not only allows people to send and receive messages free of charge but also offers a variety of other functions, including the sending of different types of media such as photos, videos, and audio to others, in addition to recording voice and sending it straightaway to other users. With these functionalities, Bouhnik et al. (2014) assert that *WhatsApp's* simple operating scheme has become popular because of the accessibility it offers most smart phone owners of different ages and backgrounds.

Numerous studies have confirmed the possible effectiveness of *WhatsApp* in academic settings and language learning (e.g. Aburezeq & Ishtaiwa, 2013; Ali & Bin-Hady, 2019; Almekhlafy & Alzubi, 2016; Alshammari, Parkes, & Adlington, 2017). For instance, Aburezeq and Ishtaiwa (2013) have shown that *WhatsApp* has the power to potentially promote three types of interaction: *student-student interaction*, *student-content interaction*, and *student-instructor interaction*. In addition, *WhatsApp* is found to be unequivocally effective in enhancing English language learners' performance and competence, along with lowering their anxiety (Ali & Bin-Hady, 2019). Nevertheless, internet connectivity and lack of participants' commitment were among the main challenges associated with such social networking applications. The participants also felt that group conversation was an extra workload. Furthermore, Alshammari et al. (2017) found that *WhatsApp* had a role in encouraging autonomous and peer learning, repositioning instructors as facilitators, and organizing learning communities. On the contrary, *WhatsApp* has emerged with an increase in informal, anywhere-anytime learning, which must be supported by rigorous guidelines. Such findings confirm what was found by Kartal (2019), who argued that instant messaging using MALL applications (including *WhatsApp*) can

positively contribute to writing and vocabulary building skills. Kartal (2019) also found that *WhatsApp* provides flexibility and freedom for language learning beyond the classroom, which may consequently boost learners' motivation.

Only few empirical studies have investigated the link between m-learning and students' BPN and autonomous motivation. Among these was Jenö et al. (2017) which found that using m-learning among Biology undergraduate students positively impacted their sense of competence, autonomous motivation, and ultimately their achievement. Jenö et al. (2019) extended these findings and reported that mobile applications appear to be more needs satisfying, which in turn, led to increase in students' wellness and decrease in negative affect. Therefore, we hypothesized that the relationships between BPN and autonomous motivation should be deeper when using *WhatsApp* in language teaching than conventional teaching using textbooks. There is a potential for positive enhanced feelings of competence, autonomy and relatedness which would, in turn, positively affect autonomous motivation and achievement (Fathali & Okada, 2016). Fathali and Okada (2016) indicated a positive relationship between BPN (called, motivation determinants) and autonomous motivation using out-of-class technologies including MALL, which resulted in learners' actual achievement. Yet, their results have shown that relatedness was seemingly less influenced compared to autonomy and competence.

3. Study purpose and research questions

Despite the enthusiastic attitude of language learners toward using mobile phones, it has not yet been thoroughly proven how the use of such devices in L2 settings could relate to their motivation in a systematic manner. Given the influence of the L2 learning situation on language learning motivation (Dörnyei, 2014), it is critical to understand the role that MALL plays in enhancing students' motivation. Building on the framework of self-determination theory (SDT), this study tested a motivational model using path analysis technique to capture a more comprehensive picture of student motivation overtime in the context of MALL. Two research questions were formulated as follows:

RQ1. Would the effects of BPN on autonomous motivation be significantly greater among students who use WhatsApp with their language teachers?

RQ2. Would utilising WhatsApp in language teaching, compared to conventional teaching, enhances students' autonomous motivation?

Figure 1 represents the conceptual framework that the present study endorses while Figure 2 shows the hypothesised model to be assessed.

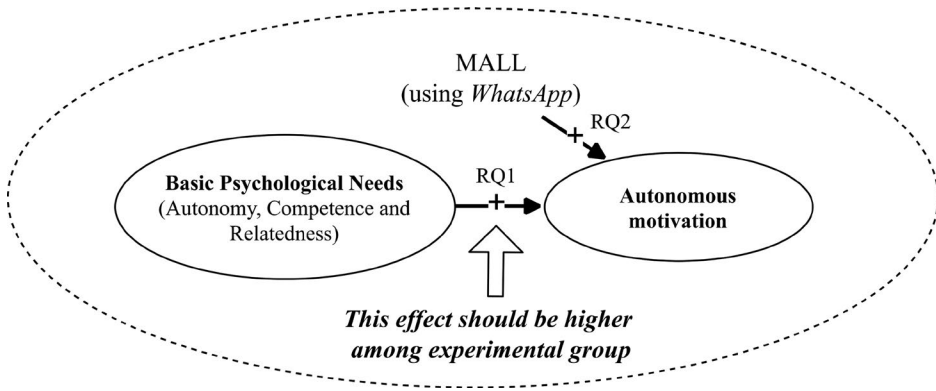


Figure 1. The conceptual framework of the effect of MALL on L2 motivation.

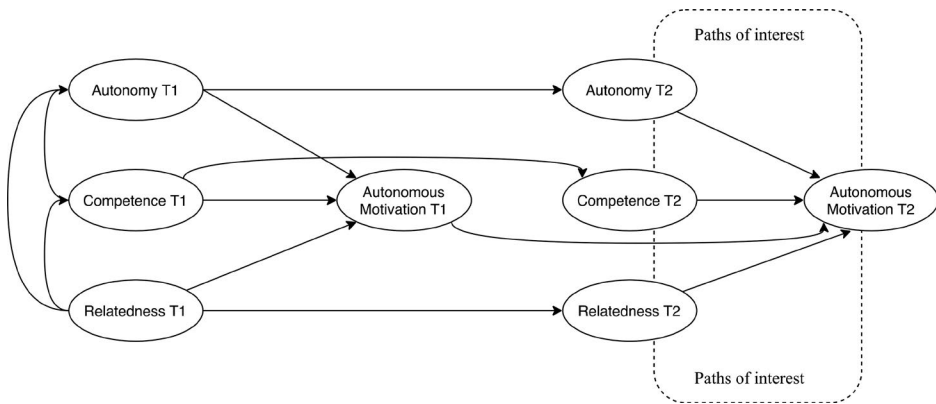


Figure 2. Interrelationships among the motivational constructs in Time 1 and Time 2 with an interest in Time 2 paths.

4. Methods

This study was conducted using a quasi-experimental approach between two groups of learners (control group and experimental group) at two time points to understand the impact of utilising *WhatsApp* in language teaching on learners' motivation, and to verify whether such a tool can be perceived to promote learners' BPN. The main difference between the control group and the experimental group is that the former group have not received any treatment where the participants held at ordinary conditions (not using *WhatsApp*) while the latter group (i.e. the experimental) received the treatment (using *WhatsApp* with their teachers) as a learning tool by listening to broadcasts, reading handouts, and to respond to the questions assigned. It is important to state that *WhatsApp* was applied as a tool to deliver the tasks which were chosen to meet the content of the existing courses designed by the instructors. Therefore, such tasks were placed as additional commitments to promote the objectives of the courses and to vary the nature of the tasks given to the participants.

The profile of the instructors involved in the study varied including lecturers and assistant professors. Within the research context, they mainly teach English language for undergraduate students. But they have different years of teaching experience of EFL courses which ranged between eight to twenty years in several public and private institutes at different countries in the Middle East and Europe. In fact, despite the difference of age between the instructors, they were familiar with computer assisted language learning and its applications as they regularly adopt learning management system for their teaching (i.e. Blackboard) and provide learners with e-oriented feedback and computer-mediated communication. However, they had limited experience in utilising MALL for academic purposes. For example, they usually use *WhatsApp* and other similar mobile applications for entertainment and chatting rather than for language-related aspects with their colleagues and or their students.

4.1. Participants

Participants in this study were 447 undergraduate students from Saudi Arabia enrolled in the Department of English of two large public universities in the Eastern province, Saudi Arabia. These students are native speakers of Arabic and are in the foundation year of the department of English. Students' age ranged from 18 and 20 and their English proficiency are relatively similar because students were required to undertake a placement test and only those pass the test can enter the foundation year. Saudi students of these ages are usually familiar with using their smartphones and frequently use *WhatsApp* in their daily life (Alshammari et al., 2017). Participants of this study were chosen from a convenience sample method, as shown in [Table 1](#).

4.2. Instruments

This study adopted two instruments from Alamer (2021a) to obtain information about students' BPN and autonomous motivation. The first scale was used to measure the participants' BPN in both control and experimental groups. This scale consists of three main constructs: *autonomy*, *competence*, and *relatedness*. A total of 12 items and a five-point Likert-type response format are used in the scale. Example items are "I am able to freely decide my own English learning pace" for autonomy; "I feel that I am capable of learning English" for competence; and "My English teacher cares about my progress" for relatedness.

The second instrument was used to collect information about students' autonomous motivation (Alamer, 2021a). This scale comprises 10 items and is used to assess students' intrinsic orientation and identified

Table 1. Study participants (control and experimental groups).

Control group		Experimental group	
Initial N=131	Follow-up N=103	Initial N=316	Follow-up N=160
Men N=75	Men N=65	Men N=68	Men N=44
Women N=56	Women N=38	Women N=248	Women N=116

orientation (collectively forming autonomous motivation) towards their learning of English. This scale starts with the following question to participants: “Why are you learning English?” Then, it indicates the extent to which the participants agree with other relevant items, such as “because I enjoy learning English.”

4.3. Experimental treatment

The main duty of the participants in the experimental group was to respond to the content provided by the instructors. Therefore, the instructors’ main duty, on the contrary, was to share the tasks with the volunteered participants and encourage them to complete them before the deadline. Prior to start sharing the links of the tasks by instructors, the participants were introduced the ‘netiquette rules’ which are concerned with the proper way to communicate in an online environment. Such rules involve the need to adhere online to the same behaviour standards/ethics followed in real life and to respect the time and bandwidth of others.

Accordingly, after completing the initial questionnaire, the participants in the experimental group were requested to respond to ten tasks over five weeks (two tasks per week). These tasks focused on *listening to podcasts* and *reading texts*. The tasks were carefully chosen from BBC Learning English and BBC Sounds websites to reinforce two key learning goals: (1) enable learners’ extensive listening and (2) enhance their reading reception skills. The various types of involved post-questions were used to identify gist, detailed understanding, specific information, and overall comprehension. The tasks precisely contained listening for information, announcements, and entertainment, in addition to the reading for orientation, information, and pleasure.

The entire tasks ranged between intermediate to upper-intermediate level which match the language proficiency level of the participants. It was decided to allocate two tasks (aural and visual commitments) every week on Thursday to be completed before the following Wednesday. The tasks were solely designed for boosting listening and reading skills employing MALL (i.e. *WhatsApp*) to ensure participants’ engagement.

As each instructor had two classes per week, the first fifteen minutes from the second class were allocated to promote in-class students-students interaction and discussion. The instructors used *WhatsApp* to send

the links of tasks via the class *WhatsApp* group. The instructors also encouraged the participants to have group communication and peer feedback. The links for each task, along with task reminders, were sent to the participants over *WhatsApp*. The ten tasks are presented in Appendix 1.

In fact, *WhatsApp* was recruited to share knowledge, extend learning time and encourage mutual collaboration with the students and instructors. After ensuring that the entire participants already downloaded the App, they used *WhatsApp* outside classes as a learning platform for everyone to exchange materials, share messages via screenshots or forwarding media and promote informal student-student/student-instructor interaction. The participants used this tool inside classes to create their own personal space and build confidence along with supporting face-to-face teaching. The rules of the study were as follows: each participant was required (a) to start with the listening and then move to the reading tasks per week (for the entire four weeks); and (b) to give brief information about the two tasks at the end of every week. Furthermore, the instructor's rule was to supervise this process of MALL and encourage more peer communication.

5. Data collection and analysis

The data for this study were collected on two occasions. Time 1 commenced during the second week of the semester to allow students to begin their class tasks with their instructors. Time 2 was selected to be the second week of the following semester (approximately a 15-week gap between the two sets of data collection). In Time 1, the researchers (who do not teach or have any responsibility for the participants) approached both the control and experimental groups by describing the language learning motivation questionnaire to the participants, as well as emphasized that participation was completely optional. Accordingly, all participants were invited to complete the language learning motivation questionnaire electronically, which took no more than 15 minutes. The same procedures were also applied in the visit in Time 2.

The path analysis was chosen in this study (in addition to the repeated measure of ANOVA) as it has advantages to analyse various structural relationships. Path analysis is a single-indicator technique of Structural Equation Modeling (SEM) which has the ability to estimate standardized effect sizes, better handles the missing data, evaluates the error variance of the outcome variables, and takes into account the correlation between the predictor variables (Newsom, 2015). Thus, we believe that using SEM in experimental assessment would provide rich information about the relationships between the variables over time.

5.1. Reliability and validity

The data collected on the two occasions were subjected to preliminary analyses, such as descriptive statistics, reliability estimates, and bivariate correlation among the variables included in the study. Cronbach's alpha (α) and test-retest correlations were used to obtain information about internal and stability consistency of the subscale items.

5.2. Effect size

Effect size refers to the strength of the effect of one variable on other(s) (Larson-Hall, 2010). This study adopted the L2-specific benchmarks suggested by Plonsky and Oswald (2014), who noted that correlation coefficients (r) can be used as indicators of effect size. They found that correlation coefficients close to .25, .40, and .60 are indicative of small, medium, and large effect sizes, respectively. Similarly, the beta (β) values of predictor variables can be used as effect sizes following the Cohen, Manion, and Morrison (2011) guidelines; β values between 0 and .10, between .10 and .30, between .30 and .50, and $>.50$ are indicative of weak, modest, moderate, and strong effect sizes, respectively.

6. Results and data analysis

6.1. Missing, outliers and normality

The literature suggests that less than 90% of the surveys completed during the process of data collection should be excluded from the analysis (Hair, Black, Babin, & Anderson, 2014). Accordingly, examination of such cases yielded no results. Moreover, an inspection was carried out to identify participants who participated on only one occasion (e.g. on Time 1 but not on Time 2). In the control group, the inspection identified 13 participants who participated on one occasion only in the control group. In the experimental group, 56 participants participated in one occasion only. Hence, all these participants were removed from the path model analysis as they did not meet the statistical requirements. Mahalanobis distance, D^2_M , was used to determine multivariate outliers which indicates the distance in variance units between cases (Kline, 2016). Two cases with high D^2_M and significant p value were removed from the path analysis. Normality was assessed by considering the skewness of the data. All values were below 1.32 which can be described as acceptable (Kline, 2016).

6.2. Reliability and validity

The motivational constructs involved (i.e. autonomy, competence, relatedness, and autonomous motivation) were subjected to reliability and validity tests. The resulting indices of alpha values reported in [Tables 2](#)

Table 2. Control group descriptive statistics and zero-order correlations (Note. * $p < .05$, ** $p < .01$, *** $p < .001$).

	Time 1				Time 2			
	Autonomy	Competence	Relatedness	Autonomous motivation	Autonomy	Competence	Relatedness	Autonomous motivation
Time 1								
Autonomy	$SD = .53$ $M = 4.07$ $\alpha = .59$.53***							
Competence		$SD = .64$ $M = 4.38$ $\alpha = .73$.36***						
Relatedness			$SD = .68$ $M = 3.91$ $\alpha = .69$.24**					
Autonomous motivation				$SD = .66$ $M = 4.08$ $\alpha = .80$.08				
Time 2								
Autonomy	.44***	.18	-.05	.61	.57	.51	.61	.78
Competence		.57***	.02	.11	.26**	4.48	3.86	3.99
Relatedness		.20*	.44***	.80	.04	.32**	.61	.72
Autonomous motivation		.17	.10	.08	.04	.41***	.24*	.72

Table 3. Experimental group descriptive statistics and zero-order correlations (Note. * $p < .05$, ** $p < .01$, *** $p < .001$).

	Time 1				Time 2			
	Autonomy	Competence	Relatedness	Autonomous motivation	Autonomy	Competence	Relatedness	Autonomous motivation
Time 1								
Autonomy	$SD = .64$ $M = 4.00$ $\alpha = .61$.38***							
Competence		$SD = .61$ $M = 4.17$ $\alpha = .68$.17						
Relatedness			$SD = .84$ $M = 3.65$ $\alpha = .69$.27***					
Autonomous motivation				$SD = .71$ $M = 3.59$ $\alpha = .73$.32***				
Time 2								
Autonomy	.53***	.30**	.22*	.32***	$SD = .76$ $M = 4.14$ $\alpha = .58$.36***			
Competence	.38***	.68***	.39***	.22*		$SD = .68$ $M = 4.21$ $\alpha = .81$.40***		
Relatedness	.26*	.26*	.70***	.19			$SD = .84$ $M = 3.72$ $\alpha = .72$.26***	
Autonomous motivation	.25*	.21*	.20	.59***	.38***	.41***		$SD = .66$ $M = 3.94$ $\alpha = .69$

and 3 ranged from .59 to .81, thus showing sound values for some latent variables but below the cut-off value of .70 for others. Nonetheless, the test-retest reliability between the motivational constructs Time 1 and Time 2 showed moderate and strong associations, as Pearson correlations (r) ranged between .42 and .70, which indicates stability of reliability over a period of approximately three months.

Confirmatory factor analysis (CFA) was carried out using the IBM Amos 23 software via maximum likelihood estimation procedure, including all latent variables in one measurement model. First, a CFA model was set to assess factorial invariance between the first and second measures of the motivational constructs. The data fit the model acceptably ($\chi^2 = 122.72$, $df = 80$, $\chi^2/df = 1.53$, $p < .001$, CFI = .93, TLI = .91, SRMR = .06, RMSEA = .06, RSMEA CI 90%: [.04, .09]). Second, another CFA model was examined to evaluate the factor loadings invariance between the two groups by restricting the paths in the measurement models. If the p -value for the unconstrained model that is assumed to be identical is less than .05, then there is support for significant differences (Marsh & Craven, 2006). In addition, it is suggested that, if the decrease in fit for the more parsimonious model is less than .01 for TLI and NFI, then there is reasonable support for the more parsimonious model. The TLI and NFI tests were chosen because they include control for parsimony comparison (Marsh & Craven, 2006). The difference in the chi-square statistic and other goodness-of-fit indices indicated no substantial differences between the constrained and unconstrained models ($\Delta\chi^2 = 36$, $p = .08$, $\Delta\text{TLI} = .002$, $\Delta\text{NFI} = .001$). Accordingly, the analysis of the factorial structure of the motivational constructs seemed to be stable between T1 and T2.

6.3. Structure model testing between the control and experimental groups

All the motivational constructs involved in the structure model were aggregated to allow the analysis to produce a manageable solution without violating the sample size assumption (Hair et al., 2014). To check for any possible pre-existing differences between the control and experimental groups on the motivational constructs, a between-subject analysis of variance (ANOVA) was carried out among the two groups at T1. The analysis revealed that the two groups showed significant differences in competence [$F(1, 234) = 36.93$, $p < .001$], relatedness [$F(1, 234) = 23.97$, $p < .001$], and autonomous motivation [$F(1, 234) = 26.47$, $p < .001$]; however, they were relatively similar in autonomy [$F(1, 234) = 2.90$, $p = .09$].

RQ1. Would the effects of BPN on autonomous motivation be significantly greater among students who use WhatsApp with their language teachers?

Multiple group tests of invariance of the path model between the control and experimental groups were conducted. The multiple group

invariance tests provided evidence of changes (or lack of changes) between the groups' model that (if observed) can be attributed to the use of *WhatsApp* by instructors with their students. The constructs of T1 and T2 were constructed and tested in one multigroup analysis.

Following previous research on multigroup invariance analysis (Guay, Morin, Litalien, Valois, & Vallerand, 2015; Morin, Arens, & Marsh, 2016; Tóth-Király, Bőthe, Rigó, & Orosz, 2017), we first tested whether the whole model was stable across the two groups (*the macro test*). If the hypothesized model was significantly different across the two groups, this would suggest that the treatment was responsible for overall model changes. We then inspected the invariance of model parameters (i.e. path coefficients) among the motivational constructs (*the micro test*). If there was a significant difference observed in any path from BPN constructs at T2 on autonomous motivation at T2 between the two groups, we then checked whether this was higher in the experimental group model. If this was the case, we conclude that the treatment may be responsible for such an increase.

An inspection of the multiple group tests of invariance for the overall model was considered (*the macro test*). Although the all-path constrained model provided a marginally accepted fit to the data ($\chi^2 = 54.74$, $df=34$, $p < .01$, CFI = .90, TLI = .87, RMSEA = .07, RSMEA CI 90%: [.05, .09]) the multigroup model provided a good fit ($\chi^2 = 74.54$, $df=24$, $p < .01$, CFI = .95, TLI = .90, RMSEA = .05, RSMEA CI 90%: [.03, .09]). Our results showed that the overall difference between the two models was significant (i.e. $\Delta\chi^2 = 20.56$, $\Delta df=10$, $p = .02$, $\Delta TLI = -.01$, $\Delta NFI = .04$).

Next, an examination of multiple group tests of invariance for individual paths was conducted (*the micro test*). As shown in [Figure 3](#), the first difference observed between the two groups was in the effect of autonomy at T2 on autonomous motivation at T2 (the difference was significant $\Delta\chi^2 = 16.452$, $p < .05$), with $\beta = -.09$ for the control group and $\beta = .13$ for the experimental group (see [Figure 3](#)). Another statistical difference between the two groups was noticed in the relation between autonomous motivation at T1 and autonomous motivation at T2 (the difference was significant $\Delta\chi^2 = 10.753$, $p = .001$), with $\beta = .38$ for the control group and $\beta = .53$ for the experimental group (see [Figures 3](#) and [4](#)). This indicates that, over and above the variance explained by the T2 BPN, the T1 autonomous motivation was a significant predictor of the T2 autonomous motivation among the experimental group. In addition to the *macro* and *micro* tests, the results of the model's predictive power (R^2) show that the experimental group model explained around 46% of variance in autonomous motivation compared to 29% in the control group. This might indicate that the later

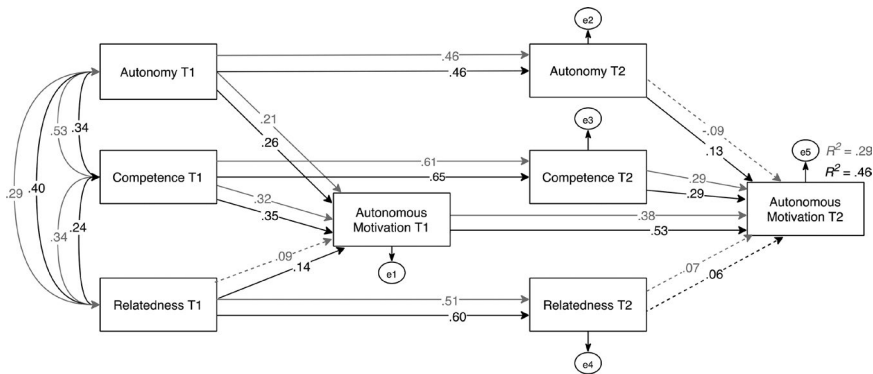


Figure 3. The results of the path analysis in control and experimental groups. Note. Gray represents the results of the control group, and black represents the results of the experimental group.

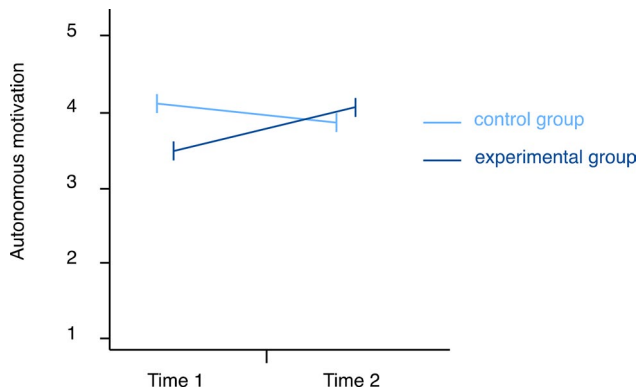


Figure 4. Changes in students' autonomous motivation as a function of time \times condition among the experimental and control groups.

endorsement of autonomous motivation was considerably pronounced in the experimental group.

RQ2. Would utilising WhatsApp in language teaching, compared to conventional teaching, enhances students' autonomous motivation?

To assess if using the WhatsApp application with the experimental group is responsible for an increase in autonomous motivation from T1 to T2, relative to the control group, a repeated measure of ANOVA was performed. Using time \times condition analysis, the results reported in Table 4 show that the students in the experimental group significantly improved their autonomous motivation in comparison to their counterpart group, as the function of time \times condition was $F(1, 163) = 28.85, p < .001, \eta^2_p = .14$. According to Cohen et al. (2011), a value of $\eta^2_p = .14$ can be considered to be large in magnitude, which indicates substantial changes between the two groups due to the condition. Furthermore, Figure 4

Table 4. Results of the repeated measure ANOVA in autonomous motivation as a function of time \times condition interaction.

	Sum of squares	df	Mean square	F	p	η^2_p
Time	0.63	1	0.63	2.77	0.098	0.02
Treatment	153.69	1	153.69	197.77	<.001	0.53
Time \times treatment	6.53	1	6.53	28.85	<.001	0.14
Residual	40.29	163	0.23			

presents a slope reflecting fluctuations in autonomous motivation over time between the two groups. The slope resonates with the findings observed in Table 4 and shows a significant rise in autonomous motivation among the members of the experimental group, owing to intervention; the control group members show a decline in autonomous motivation over time.

7. Discussion

The purpose of the present study was to evaluate the extent to which the implementation of *WhatsApp*, and possibly other similar MALL applications, could be useful in understanding students' language learning motivation. To do so, we evaluated the relationship between learners' BPN (i.e. autonomy, competence, and relatedness) and autonomous motivation over time in a structural model. Additionally, we assessed whether such implementation could directly be relate to increase in students' autonomous motivation among the experimental group compared to control group.

At the beginning of the analysis stage, there was a rise of autonomy effect on autonomous motivation over time among the experimental group, as shown in the structural model (Figure 3). As such, it could be said that the use *WhatsApp* is responsible for increase in autonomous motivation in the experimental group compared to the control group in the post-test. This study also found that the initial endorsement of autonomous motivation related to the later endorsement of autonomous motivation more substantially in the experimental group as expressed in Jenou et al. (2017, 2019). Specifically, this direct effect on the later endorsement of autonomous motivation was salient over the effects explained by the entire set of BPN. Further, our findings confirmed the increase in autonomous motivation over time exclusively among the experimental group in the repeated measure of ANOVA. These advanced statistical analyses aimed to obtain more precise results and give clearer picture of the directional relationship between using *WhatsApp* in language learning and students' motivation.

According to Ryan and Deci (2020), the entire set of BPN is considered important to support learners' autonomous motivation. Nevertheless, when *WhatsApp* and perhaps other MALL-related tools are integrated,

this mobile instant messaging tool appears to only allow students' autonomy (among the BPN constructs) to play a positive role in increasing autonomous motivation. Therefore, *WhatsApp* apparently functions as a medium of language learning that leads to higher endorsement of autonomous motivation through perception of autonomy. Thus, teachers who use *WhatsApp* with their students appear to positively help students perceive sense of enjoyment and see meaningful values behind the learning of the language. Such results have been supported by Ali and Bin-Hady (2019) who found that students' participants become more convinced of learning the L2 because of their increased autonomous motivation with the use of *WhatsApp*.

The significant change between the groups in the whole model process is consistent with the theoretical foundation set by Alamer (2015) and the empirical results reported in Kartal (2019), who found that the use of *WhatsApp* in language learning settings contributes to the development of learners' autonomy, the reduction of their anxiety, and the enhancement of their language skills (i.e. reading, listening, writing, and speaking). It seems that students perceive the use of this application as an autonomy-supportive teaching style in which they engage in extra language tasks that are free from the practice of grading. As *WhatsApp* is mostly used in informal settings by the students, it helped to shift the process of learning from the teacher to the student (Alshammari et al., 2017). This confirms the claim that *WhatsApp* can be considered an apparatus that provides one with choices to explore more language-related materials without being exclusively tied to specific textbooks or materials.

Furthermore, the analysis resulted in minimal differences in the psychological needs for competence and relatedness on autonomous motivation among the two cohorts in the post-test, which was not expected. This less substantial relationship could be mostly attributed to the procedural action taken in this research rather than to *WhatsApp* itself. The given materials were possibly not challenging the participants' abilities enough to leverage their optimal need of competence. The learners were also possibly unable to respond to the tasks on *WhatsApp* appropriately because teachers did not provide feedback on their responses. This finding contradicts Karapanos et al. (2016), who claim that both competence and relatedness are among the most prominent needs in the case of using *WhatsApp*, which can be demonstrated through various social practices.

Regarding the effect of learners' competence while using *WhatsApp*, it was found that the effect of competence on autonomous motivation was quite similar between the two groups. This perhaps due to lack of motivating environment for sustainable feedback. This is supported by Ibarra-Sáiz et al. (2020), who argued for extended feedback, including peer assessment, as an inspiring tool for enhancing competence, which would lead to an

increase in motivation. Relatedness has also been observed to have similar effect size on autonomous motivation when using *WhatsApp*, as there was possibly a lack of mutual interaction. The findings confirm that, while delivering tasks on *WhatsApp*, instructors must reinforce interaction among the participants themselves along with their instructors, which is an essential component for the promotion of relatedness. Indeed, to achieve relatedness, successful interaction involves social collaboration between teammates and instructors with the application of support for engagement across these parties (Sailer et al., 2017; Zainuddin, 2018).

The recommendations endorse that it is not the use of a MALL tool that ensures sustainable all components of motivation, but rather how and when to implement such tools along with sufficiently train the instructors. As Ryan and Deci (2020) explained, teachers have their own BPN that must be supported and, once their needs are satisfied, they will be more likely to promote and nurture students' needs. In our study, the language teachers involved in the experiment were solely invited to implement the *WhatsApp* application in their teaching practice. Nonetheless, our results indicated that the use of *WhatsApp* increased students' autonomous motivation directly, possibly due to their feelings that this implementation provided a new window for enjoyment and interest in the language tasks that traditional teaching failed to offer (Alamer, 2015).

The study results are currently in need (especially in situations like COVID-19 pandemic), as most institutes have shifted to distance/blended language learning through the use of various instant messaging tools (e.g. *WhatsApp*) and learning management systems, such as Blackboard and Moodle. For this reason, these results suggest valuable insights to such institutes (particularly in terms of enhancing learners' motivation), which are currently planning, delivering, evaluating, or improving online courses/programs. Moreover, the results achieved have also led to practical implications for better understanding the relationship between BPN and autonomous motivation in the MALL context. Instructors should provide opportunities for personalized learning using *WhatsApp* with an attempt to reduce the independence of instructors. In addition, regarding task assignment, instructors must pay attention to tasks that would increase learners' positive feelings resulting from reinforcing the successful meeting of challenges (competence) and the construction of a sense of belonging and connectedness with others (relatedness).

8. Limitations and future directions

This quasi-experimental study showed how the use of MALL in the language learning context can be related to higher endorsements of autonomous motivation in the future, whereby teachers use *WhatsApp*

as an informal teaching component. Despite its contributions, this study has some limitations. First, the findings of the study may be affected by extraneous variables that could be explaining our results. For example, sending more exercises to the experimental group could explain the increase in competence without considering the use of WhatsApp. Other technologies or even as a classic/usual face-to-face homework tasks might lead to similar results (Ali & Bin-Hady, 2019; Alqurashi, 2014; Alrabai, 2016; Burston, 2014; Eissa, 2019; Fathali & Okada, 2016). Thus, future research should control for the external influences to ascertain the effects of utilising WhatsApp. In addition, the analysis conducted showed that the two groups were different at the beginning of the investigation in terms of competence, relatedness, and autonomous motivation, yielding some validity issues pertaining to the predictive power of the study treatment. This issue was expected because the two groups were drawn from two different educational institutes. The teaching style, way of delivering the content, and previous experience with the teachers could be the reasons for such differences. Moreover, our study is unrevealing with regard to the effects that a MALL application would have on other psychological and linguistic outcomes, such as anxiety, confidence, engagement with language tasks, and most importantly, actual achievement. Although the repeated-measures of ANOVA answered our second research question adequately, the latent growth model (a class of SEM) can be alternatively employed to evaluate dynamics in motivation.

As a concluding remark, the findings have shown that *WhatsApp* is a technological tool that requires well-thought implementation and comprehensive assessment to provide more communicative practices (Karapanos et al., 2016). Once these requirements are met, *WhatsApp* is expected to enhance language learners' motivation. In a nutshell, it can be argued that using *WhatsApp* to complement institutionally-oriented (formal) teaching does not enhance the process of BPN by itself, but rather only when teachers deliberately reinforce all needs. At the same time, however, *WhatsApp* can be directly effective in increasing students' autonomous motivation regardless of basic needs endorsements among the students.

Disclosure statement

The researchers declare no conflict of interest.

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Appendix 1

The tasks students asked to engage in using WhatsApp

Task 1: Listening to a podcast: How can I help the environment. The key question is as follows: Plastic has many natural variations, but where was the first artificial plastic developed?

Task 2: Reading a handout to answer: How to increase motivation. The key questions are as follows: What are the reasons for conducting these helpful activities that help maintain language-learning motivation?

Task 3: Listening to a podcast: Evolution and anxiety. The key question is as follows: What was the name of the ship that Charles Darwin travelled in when he made his discoveries?

Task 4: Reading a handout to answer: Thoughts for success (1). The key questions are as follows: What are your thoughts telling you about your life? How are your thoughts affecting your behaviour?

Task 5: Listening to a podcast: Internet: Good or bad. The key question is as follows: When did the idea of web/internet come about?

Task 6: Reading a handout to answer: Thoughts for success (2). The key questions are as follows: What benefits or rewards would you get from changing them? Are they relevant to your current life situation? How? Why?

Task 7: Listening to a podcast: The rise of emoji. The key question is as follows: When was the first emoticon used?

Task 8: Reading a handout to answer: Tips for increasing motivation. The key questions are as follows: How will achieving this goal positively change your life and lifestyle? What actions and thoughts would you change to help yourself become more motivated in achieving this goal?

Task 9: Listening to a podcast: Self-help. The key question is as follows: Which of these well-known self-help books was published first?

Task 10: Reading a handout to answer: Tips for language learning. The key questions are as follows: What are these tips? What was the first reason for learning a foreign language?

Appendix 2

The basic psychological needs and autonomous motivation. Taken from Alamer (2021a).

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 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 himself 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

Autonomous motivation

Intrinsic orientation

Because I enjoy learning English
 Because of the pleasure I get when English is used
 For the satisfaction I feel when I use English
 For the enjoyment I experience when I achieve new goal in English learning
 Because learning English is a fun activity by 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 for 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 necessary for my personal success
