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Perceived usefulness predicts second language learners' continuance intention toward language learning applications: a serial multiple mediation model of integrative motivation and flow

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Abstract

Mobile language learning has attracted much attention in recent years. Previous research has demonstrated a relationship between perceived usefulness and continuance intention to use technology. This study used a cross-section design to further investigate the possible association between perceived usefulness and continuance intention in the context of language learning and the mediating effects of integrative motivation and flow. A total of 500 college students who were learning English through mobile applications (apps) completed the Perceived Usefulness Scale, Integrative Motivation Scale, Flow Scale, and Continuance Intention Scale. Correlation analysis showed that perceived usefulness, continuance intention, integrative motivation, and flow were significantly positively correlated with each other. Results of regression analysis showed that integrative motivation and flow played multiple mediation roles in the relationship between perceived usefulness and continuance intention. That is, (1) perceived usefulness was positively related to continuance intention toward language learning apps, (2) both integrative motivation and flow played partial and parallel mediating roles between perceived usefulness and intention to use language learning apps, and (3) integrative motivation and flow mediated the relationship between perceived usefulness and continuance intention toward language learning apps sequentially. These results indicated that intention to use language learning apps among language learners can be promoted by way of the increasement of perceived usefulness of these apps, the enhancement of integrative motivation, and the improvement of flow experience. This creates the foundation for apps designers to focus more on inspiring learners to use the social connection functions of the apps, which helps them stay engaged in interactive language learning.

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Keywords Mobile language learning · Perceived usefulness · Integrative motivation · Flow · Continuance intention

1 Introduction

With the rapid development of the Internet and the popularity of mobile devices, mobile learning is becoming more and more common. Compared with traditional learning, mobile learning is mainly characterized by portability and mobility, which ensures learning widely available, accessible, and adaptable (Zydney & Warner, 2016). For example, English vocabulary can be delivered to learners through mobile phones anytime and anywhere, making learning more effective (Chen & Chung, 2008; Thornton & Houser, 2005). English learning applications (apps) serve as a major component of the learning apps for smartphones. These apps can not only track and record the learner's learning activities but also provide customized and detailed English learning instructions to the learners. With the help of English learning apps, learners can easily stay motivated to achieve their learning goals. As trendsetters, more and more Chinese college students are voluntarily choosing this novel way to monitor and improve their English learning.

Previous studies have investigated the general features of mobile apps, attaching great attention to the continuance intention to use those apps. For example, it was found that users' continuance intention toward mobile apps was closely related to perceived usefulness (Lee & Kim, 2021), motivation (Kohnke, 2020), service satisfaction (Li & Fang, 2019), and flow experience (Chen et al., 2018). While the main findings of these studies helped explain the functional aspects of mobile apps, their main limitation has been a lack of concern for how language learning apps are actually used. That is, the existing research has paid little attention to people's actual feelings toward language learning apps and their behavior in using these technologies. Additionally, it still needs to figure out the reasons people use these apps.

In China, most students start to learn English from the third grade of primary school and have learned English for about 11 years by the university level (Wu, 2015). However, Chinese college students still have to spend a lot of time on English learning to pass CET-4 and thus meet the graduation requirements. Obviously, Chinese college students as second language (L2) learners have formed a strong user base of English learning apps (Cheon et al., 2012; Yang et al., 2019). Therefore, this study aimed to pursue an exploration of the psychological mechanism that determined Chinese college students' continuance intention to use English learning apps. In particular, this study focused on the potential relationship between perceived usefulness and continuance intention and the effects of integrative motivation and flow on this association in the context of using mobile language learning apps.

1.1 Theoretical framework

The Technology Acceptance Model (TAM; Davis, 1989) is a widely used model to describe and predict the acceptance and use of new information technology.

According to the TAM, perceived usefulness determines continuance intention toward an information system. Perceived usefulness refers to the extent to which a user believes that a certain system can improve their job performance. It can be reflected by users' perceptions of the benefit from using the information system.

The representativeness of the TAM has been verified in many studies (Chuttur, 2009; Marangunić & Granić, 2015; Rafique et al., 2020). It has been applied in different contexts including the areas of mobile apps (Ikhsan & Sunaryo, 2020), e-learning (Hussein, 2017), and electronic textbooks (Hsiao et al., 2015). That is, the TAM has been widely used to explore continuance intention in a variety of mobile service contexts. Thus, it is also appropriate to apply the TAM framework to language learning apps because repeated app usage reflects continuance intention. Additionally, language learning apps can be regarded as one type of technology, thus this study explores the continuance intention of learners by applying TAM. We extend the key variables of the TAM and introduced the following new variables: integrative motivation and flow. In the following section, the relationship between each variable will be reviewed in more detail.

1.2 Perceived usefulness and continuance intention

Recent studies had demonstrated that perceived usefulness was significantly positively correlated with continuance intention toward various mobile apps such as health apps (Yan et al., 2021), shopping apps (Nasidi et al., 2020), payment apps (Liébana-Cabanillas et al., 2021), and online learning apps (Tsai et al., 2021). Language learning apps are tools that help learners to perform language learning tasks. It was found that as the degree of task-technology fit increases, the performance of a particular task improves (Dang et al., 2020). As an indicator of task-technology fit, perceived usefulness should be considered during the exploration of learners' continuance intention.

In China, English learning apps are considered to provide complementary services to the primary traditional learning in the classroom for Chinese L2 learners. This study focused on Chinese college students who were currently using English learning apps. They used particular apps to improve their L2 learning, so the perceived usefulness of an app should be the crucial factor affecting their continuous use behaviors. Additionally, beyond the direct impact of perceived usefulness on continuance intention toward L2 learning apps, the true feelings and flow experience elicited by perceived usefulness can also be a crucial determinant. Hence, this study involved two constructs of integrative motivation and flow. These constructs were used as mediators to build the hypotheses.

1.3 The potential mediating effects of integrative motivation and flow

As some researchers had pointed out, TAM was incomplete in one important respect: it primarily focused on the influence of perceived ease of use and perceived usefulness in the adoption and utilization of new technology, but did not account for subjective and social influence (e.g., Lee et al., 2005). Ngai et al. (2008) also argued that system adoption was influenced not only by technological factors but also by many other subjective factors such as planning, vision, justification, and support. Regarding language

education, learners' motivation is one of the important factors for their attainment of the target language (Hurd, 2006). Thus, some researchers had incorporated motivational factors into TAM to provide broader perspectives and better explanations in the context of learning (Abduljalil & Zainuddin, 2015; Thompson, 1998; Zhang et al., 2008).

Gardner and Lambert (1972) proposed two types of learning motivation: instrumental motivation (i.e., learning the language as an instrument to achieve the practical goal) and integrative motivation (i.e., learning the language out of interest or desire to identify with the target culture). As Gardner (2010) had pointed out, integrative motivation included not only learning orientation, but also the attitude toward language learning, desire, motivation intensity as well as other attitude variables toward target language groups. Integrative motivation reflects a genuine interest in learning L2 to be closer to another language community. Recent studies found that students' integrative motivation had a positive impact on learning performance in foreign languages such as Chinese (Ter et al., 2019), Spanish (Hernández, 2006), and English (Khorsheed, 2021).

Lamb (2012) and Li (2014) posited motivation was significantly influenced by contextual features. Accepting this view, prior research had established that perceived usefulness was an important factor in shaping the evolution of motivation and feeling. For example, from Hsu's (2017) research, perceived usefulness increased learners' motivation in the computer-assisted language learning environment. Chan et al. (2017) also stated that increased learners' perceived usefulness could enhance their learning motivation. Similarly, Kong and Wang (2021) found that perceived usefulness could effectively foster students' learning motivation. Kim and Shin (2021) further found that integrative motivation played a mediating role between L2 learners' self-efficacy and their actual ability to succeed in L2 learning, indicating that integrative motivation is a response to subjective factors such as perceived self-efficacy. Although several studies had examined motivation in language learning (Syafrizal, 2019; Ter et al., 2019), there was little research about the association between learners' integrative motivation and perceived usefulness and the association between integrative motivation and their continuance intention toward technology when language learner's integrative motivation was a considered mediating variable in the mobile language learning context. The research reviewed above indicated the possibility that integrative motivation played a mediating role in the relationship between perceived usefulness and continuance intention to use mobile apps within an L2 language learning environment.

This study also expands the scope of TAM with flow by providing a potential explanation for the missing indirect link between integrative motivation and continuance intention of students in language learning. Csikszentmihalyi and LeFevre (1989) described flow as an optimal experience in which an individual feels simultaneously cognitively efficient, motivated, and happy. It is an optimal psychological state that is eagerly desired in most academic learning environments. For example, previous studies showed that highly motivated individuals were more likely to experience flow (e.g., Buil et al., 2019; Rheinberg & Engeser, 2018). Other studies have also revealed separate evidence to show the positive relationships between perceived usefulness toward technology and flow experience (Chen et al., 2018; Hsu et al., 2013), between flow experience and user intention (Duan et al., 2017; Nurcholis & Miftaqulkismay, 2021), and between learning motivation and flow experience (Kong & Wang, 2021; Lee, 2005; Ljubin-Golub et al., 2020). Based on the above literature, the following hypotheses are proposed.

H1. Learners' integrative motivation mediates the positive relationship between their perceived usefulness of language learning apps and continuance intention toward these mobile apps.
H2. Learners' learning flow mediates the positive relationship between their perceived usefulness of language learning apps and continuance intention toward these mobile apps.
H3. Learners' integrative motivation and learning flow serve as serial multiple mediators between the perceived usefulness of language learning apps and continuance intention toward these mobile apps.

2 Methods

2.1 Participants

Five hundred college students from a university in Guangdong Province (China) participated in the current study. There were 315 males (63%) and 185 females (37%), including 262 from urban communities (52.4%) and 238 from rural communities (47.6%). In terms of using frequency, 116 used the apps less than once a week (23.2%), 140 used once or twice a week (28.0%), 116 used three to four times a week (23.2%), and 128 used five to six times a week (25.6%). In terms of using experience, 23 of them had used language learning apps to learn English for few weeks (4.6%), 101 for a year (20.2%), 163 for two years (32.6%), and 148 for three years (29.6%).

2.2 Data collection

A convenience sampling method was used to collect data during a single period from November 2020 to January 2021. Participants completed a battery of self-report questionnaires online through Wenjuanxing (www.wjx.cn). Written informed consent was obtained from each participant. The Institutional Review Board of the South China Normal University (Guangzhou, China) approved this study.

2.3 Measures

2.3.1 Perceived usefulness

Perceived usefulness was measured by the Chinese version (Chang et al., 2013) of the Perceived Usefulness Scale (Davis, 1989). The scale had 6 items (e.g., "Using mobile devices applications enables me to accomplish my English more quickly."). Items were assessed on a Likert scale ranging from 1 (very much unlike me) to 7 (very much like me). The means perceived usefulness scores were calculated, with higher scores reflecting a higher level of perceived usefulness. In the present study, Cronbach's α was 0.918.

2.3.2 Integrative motivation

Integrative motivation was measured by the Integrative Motivation Scale (Gardner et al., 1985). The scale had 10 items (e.g., "Learning English enables me to understand English books, movies, pop music, and so on."). Items were assessed on a Likert scale ranging from 1 (very much unlike me) to 5 (very much like me). The mean integrative motivation scores were calculated, with higher scores reflecting a higher level of integrative motivation. In the present study, Cronbach's α was 0.893.

2.3.3 Flow

The flow of mobile language learning was measured by the Flow Scale (Ghani & Deshpande, 1994). The scale had 11 items dividing into three dimensions: enjoy (4 items; e.g., "You are interested when using mobile app(s) to learn English."), control (4 items; e.g., "You are deeply engaged when using mobile app(s) to learn English."), and concentration (3 items; "You exactly know what to do when using mobile app(s) to learn English."). Items were assessed on a Likert scale ranging from 1 (very much unlike me) to 7 (very much like me). The means scores were calculated, with higher scores reflecting a higher level of flow. In the present study, Cronbach's α was 0.896.

2.3.4 Continuance intention

Continuance intention was measured by the Continuance Intention Scale (Chen et al., 2018). The scale had 3 items (e.g., "I intend to use mobile device applications for learning English frequently."). Items were assessed on a Likert scale ranging from 1 (very much unlike me) to 5 (very much like me). The means scores were calculated, with higher scores reflecting a higher level of continued use intention. In the present study, Cronbach's α was 0.918.

2.3.5 Translation process

The Integrative Motivation Scale and Flow Scale underwent forward and backward translation. A bilingual expert in psychology first converted the English version into the Chinese language. Another bilingual expert back-translated items to English. A comparison of both English versions helped perform the cross-validation.

2.4 Data analysis

Firstly, to ensure that shared variance among variables was not attributable to a common method used to measure the items, the Harman single-factor test was used to test common method variance (Podsakoff et al., 2003). Secondly, descriptive statistics were used to describe and summarize the collected data and Pearson correlation

analyses were conducted to investigate associations among the study variables. Finally, serial multiple mediation effect analyses were conducted using macro PROCESS for SPSS 26.0 software (model 6; Hayes, 2013) and the statistical significance was tested using confidence intervals constructed by bootstrapping estimates 5000 times. In serial multiple mediation effect analyses, we assessed the indirect effect of perceived usefulness on continuance intention through integrative motivation, through flow, and through both integrative motivation and flow.

3 Results

3.1 Common method bias test

We used Harman single factor analysis to test the common method bias. The results showed that the first factor accounted for 29.31% variance, which was less than 40%. Therefore, the data in this study did not suffer from common method bias. Additionally, confirmatory factor analysis demonstrated that the one-factor model did nor fit the data well: $\chi^2 = 10{,}587.33$, $df = 435$, $\chi^2/df = 24.339 > 5$, $CFI = .739 < .90$, $TLI = .715 < .90$, $RMSEA = .115 > .08$, $SRMR = .112 > .08$ (Hoyle, 2012). These results confirm that the common-method variance is not identified.

3.2 Descriptive statistics

Pearson correlation analysis was used to test the bivariate correlations of all the variables, and the results were presented in Table 1. Perceived usefulness, flow, integrative motivation, and continuance intention were significantly positively correlated with each other. In addition, gender and grade were significantly related to integrative motivation and continuance intention, majority was significantly related to

Table 1 Means, standard deviations, and Pearson correlation among variables ($n = 500$)

Variables	1	2	3	4	5	6	7	8	9
1. Gender	–								
2. Grade	.118**	–							
3. Majority	−.300***	.156***	–						
4. Using frequency	−.143**	−.215***	.115**	–					
5. Using experience	.000	.24***	.132**	−.072	–				
6. Perceived usefulness	−.030	.001	.071	.232***	.103*	–			
7. Integrative motivation	−.126**	−.098*	.101*	.138**	.000	.197***	–		
8. Flow	.038	−.006	−.062	.235***	.071	.387***	.222***	–	
9. Continuance intention	−.155***	−.091*	.085	.396***	.035	.54***	.291***	.428***	–
M	.630	2.504	.368	2.512	3.696	5.363	3.779	4.767	3.781
SD	.483	1.446	.483	1.108	1.159	.930	.621	.947	.766

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

integrative motivation, using frequency was significantly related to four target variables, and using experience was significantly related to perceived usefulness. Thus, we controlled for these demographic variables in the analysis of the chain mediating effect.

3.3 Serial multiple mediation analyses

To avoid multicollinearity, all variables were standardized prior to the analysis. We tested the mediating role of integrative motivation and flow in the relationship between perceived usefulness and continuance intention after control for the effect of gender, grade, majority, using frequency and using experience. As shown in Table 2, perceived usefulness had a significantly positive prediction effect on integrative motivation ($\beta = .177$, $t = 3.924$, $p < .001$), flow ($\beta = .319$, $t = 7.579$, $p < .001$), and continuance intention ($\beta = .382$, $t = 10.122$, $p < .001$). Moreover, integrative motivation had a significantly positive prediction effect on flow ($\beta = .158$, $t = 3.808$, $p < .001$) and continuance intention ($\beta = .124$, $t = 3.489$, $p < .001$). Finally, flow had a significantly positive prediction effect on continuance intention ($\beta = .204$, $t = 5.338$, $p < .001$).

The results of the chain mediating effect of integrative motivation and flow are shown in Table 3. The indirect effect on the perceived usefulness → integrative motivation → continuance intention path was .022, accounting for 4.637% of the total effect, while the 95% CI was [.006, .043]. The indirect effect on the perceived usefulness → flow → continuance intention path was 0.065, accounting for 13.720% of the total effect, while the 95% CI was [.032, .102]. The indirect effect on the perceived usefulness → integrative motivation → flow →

Table 2 Multiple linear regression results among variables ($n = 500$)

Variables	Integrative motivation			Flow			Continuance intention		
	β	*SE*	t	β	*SE*	t	β	*SE*	t
Constant	.077	.210	.369	−.628	.193	−3.254**	−.351	.165	−2.121*
Gender	−.166	.096	−1.732	.106	.089	1.194	−.206	.075	−2.737**
Grade	−.060	.032	−1.845	.032	.030	1.066	−.014	.025	−.536
Majority	.148	.098	1.515	−.248	.090	−2.751**	.010	.077	.136
Using frequency	.053	.042	1.265	.157	.039	4.069***	.202	.033	6.049***
Using experience	−.003	.039	−.074	.048	.036	1.334	.001	.031	.038
Perceived usefulness	.177	.045	3.924***	.319	.042	7.579***	.382	.038	10.122***
Integrative motivation				.158	.042	3.808***	.124	.036	3.489***
Flow							.204	.038	5.338***
R^2	.069			.213			.436		
F	6.073***			18.964***			47.394***		

*$p < .05$, **$p < .01$, ***$p < .001$. Original scores were transformed into Z-scores

Table 3 Chain mediating effect of integrative motivation and flow in the relationship of perceived usefulness and continuance intention ($n = 500$)

	Effect	Boot *SE*	Boot *LLCI*	Boot *ULCI*
Total effect	.475	.037	.000	.402
Direct effect	.382	.038	.000	.308
Indirect 1	.022	.010	.006	.043
Indirect 2	.065	.018	.032	.102
Indirect 3	.006	.003	.001	.014
Total indirect effects	.093	.020	.055	.134
Comparison 1: Indirect 1 – Indirect 2	−.043	.022	−.086	−.001
Comparison 2: Indirect 1 – Indirect 3	.016	.009	.001	.036
Comparison 3: Indirect 2 – Indirect 3	.059	.017	.029	.094

Original scores were transformed into Z-scores. Indirect 1: perceived usefulness → integrative motivation → continuance intention; Indirect 2, perceived usefulness → flow → continuance intention; Indirect 3: perceived usefulness → integrative motivation → flow → continuance intention

continuance intention path was .006, accounting for 1.201% of the total effect, while the 95% CI was [.001, .014]. The total mediating effect was .093, accounting for 19.557% of the total effect, while the 95% CI was [.055, .134]. The 95% CI in all paths did not overlap with zero, which indicated that all indirect effects were significantly positive.

In addition, the results of the comparison of the mediating effect were shown in Table 3. The mediating effect of integrative motivation was weaker than flow in the relationship of perceived usefulness and continuance intention, with the 95% CI was [−.086, −.001]. The mediating effect of integrative motivation (95% CI was [.001, .036]) or flow (95% CI was [.029, .094]) are both stronger than their interaction.

With the hypotheses of this study, the results showed that integrative motivation and flow respectively play a mediating role between perceived usefulness and continuance intention. In addition, flow plays a mediating role between integrative motivation and continuance intention. Therefore, integrative motivation and flow played a chain-mediating role between perceived usefulness and continuance intention. Through the above analysis, the chain mediating model was established, as presented in Fig. 1.

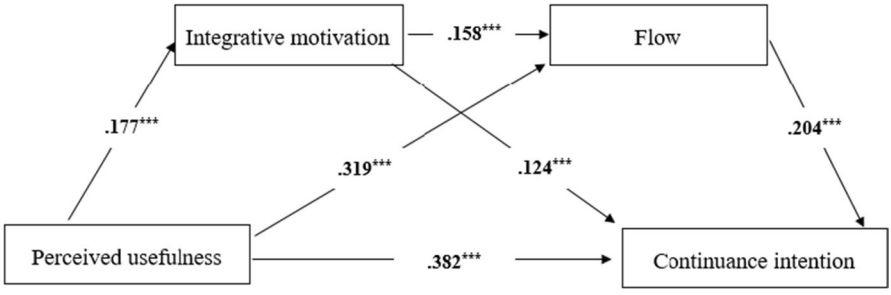

Fig. 1 Chain mediating model testing integrative motivation and flow as mediators between perceived usefulness and continuance intention (***$p < .001$)

4 Discussion

The purpose of the present study was to investigate the link between perceived usefulness and continuance intention toward language learning apps in a sample of Chinese college students and test the mediating roles of integrative motivation and flow in this link. The results indicated that perceived usefulness directly predicted learners' continuance intention toward language learning apps. Moreover, perceived usefulness could indirectly predict continuance intention via three pathways: perceived usefulness → integrative motivation → continuance intention, perceived usefulness → flow → continuance intention, and perceived usefulness → integrative motivation → flow → continuance intention. Taken together, our findings contribute to an extended understanding of the TAM in the context of language learning apps and propose a novel serial multiple mediation model in which integrative motivation and the flow mediate the relationship between perceived usefulness and continuance intention.

4.1 The relationship between perceived usefulness and continuance intention

Consistent with previous findings (e.g., Buabeng-Andoh, 2018; Koo et al., 2015), the present study demonstrated that perceived usefulness could positively affect continuance intention toward language learning apps. That is, learners with higher perceived usefulness of language learning apps are more likely to continue to use these apps. It is reasonable that when the learners consider that language learning apps can be used as a good medium in the learning process, they would certainly use it as best as possible. Our findings in the present study agree with TAM, which states that users' intention to use particular information technology is driven by their satisfaction with that technology and the perceived usefulness for further usage.

Although TAM was originally designed to predict the use of IT systems in offices, the current study is among the very few studies that use the construct of perceived usefulness to foresee learners' acceptance of language learning apps. In the case of mobile language learning, perceived usefulness measures the extent to which language learners believe that mobile apps can provide similar or greater benefits than traditional learning methods. The positive effect of perceived usefulness on the intentions to use language learning apps is important because app developers can provide benefits for the apps.

4.2 The mediation effects of integrative motivation and flow

In line with our speculation, perceived usefulness predicted continuance intention indirectly through integrative motivation. The TAM indicated that perceived usefulness was a reliable predictor of continuance intention toward new technology. A cross-section study found that perceived usefulness was positively correlated with learning motivation (Kong & Wang, 2021). Other studies also found a close

relationship between motivation and continuance intention (Panisoara et al., 2020). Thus, perceived usefulness might cause higher integrative motivation. Then, the personal affinity for the learners who are integratively motivated to learn the language might drive them to use mobile language learning apps.

Language learning apps have the potential to enable language learners to extend learning opportunities beyond the constraints of the physical classrooms, and design and engage in creative and collaborative activities. Khorsheed (2021) found that the habitual use of English mediums played a role in the development of integration motivation, thus having a positive impact on the achievement of L2 learning. When language learners believe that language learning apps are useful and using these apps could improve their language learning performance, they would produce stronger intrinsic orientation or desire to communicate with or to join the L2 user community. Such strong desire could reinforce them to use these apps.

Our results can be accounted for by the extended TAM (Abduljalil & Zainuddin, 2015). The model maintains that motivation can serve as an extra factor explaining the continuance intention to adopt new technology. Some studies have shown a reliable positive relationship between motivation and successful language learning (e.g., Boo et al., 2015; Lasagabaster, 2011). There are, however, quite few studies that investigate the mechanism of integrative motivation in continuance intention to use mobile apps, not to mention in the context of language learning. The current study is the first to confirm the role of integrative motivation in continuance intention to use language learning apps.

The current study also showed that perceived usefulness can predict continuance intention through flow in the context of language learning. This result is in line with previous studies showing the mediation effect of flow on the association between perceived usefulness and continuance intention (Duan et al., 2017; Nurcholis & Miftaqulkismay, 2021). For example, Duan et al. (2017) found that users with high perceived usefulness were more likely to experience flow, which thus improved their stickiness in the mobile game. Recently, Nurcholis and Miftaqulkismay (2021) showed that perceived usefulness could increase repurchase intention by improving flow in the form of concentration, control, and enjoyment. Flow has been considered critical in promoting high-quality learning and creativity in educational settings (Ryan & Deci, 2000). It was found that, in the context of mobile language learning, students who frequently experience flow had higher academic performance than those who did not (Chen et al., 2021; Ibrahim, 2020). Experiencing flow is also associated with increased perceived usefulness (Chen et al., 2018; Hsu et al., 2013) and continuance intention to use a technology (Guo et al., 2016).

The convenient functions offered by mobile apps were found to play a vital role in enhancing the value and usefulness of the app service. Thus, perceived usefulness had a significant impact on flow in mobile apps. In the service domain, the experiences of pleasure could be seen as crucial indicators for continuance intention decisions (Kim & Kim, 2020). Therefore, it is possible that flow experience during the use of language learning apps further helps facilitate the continuance intention of mobile language learners. Our results also fit with the modified TAM proposed by Chen et al. (2018), which regards flow as a supplement to TAM to provide a better knowledge of individuals' behavior in mobile apps settings.

4.3 The serial multiple mediating effects of integrative motivation and flow

The present serial multiple mediation analysis showed that the perceived usefulness of language learning apps indirectly influenced continuance intention through the effects of integrative motivation and flow. The above discussions indicated that learners' perceived usefulness of language learning apps was related to integrative motivation (Berns et al., 2016), and flow was linked to continuance intention during the language learning activities (Chen et al., 2021; Ibrahim, 2020). Previous studies also found that integrative motivation was positively related to flow experience (Kong & Wang, 2021; Ljubin-Golub et al., 2020). For example, Kong and Wang (2021) found that students' learning motivation could lead to their flow experience in visual programming learning. Ljubin-Golub et al. (2020) found that students' high level of autonomous motivation led to more frequent flow experiences in learning. The integrative motivation was a favorable attitude towards the target language community (Gardner et al., 1985) and flow was an intrinsically enjoyable state (Csikszentmihalyi, 2000). The positive perception of the usefulness of the language learning apps would increase the knowledge about the target language community, which could foster the motivation to interact with that community. This desire increases the learners' engagement in language learning, which in turn promotes language learners to continuously use the language learning apps.

5 Limitations and implications

There is some limitation in this study. First, the cross-sectional design of the study prevents us from making any causal inferences. Therefore, longitudinal studies are needed to clarify the causal relationship of these variables. Second, all data were obtained by self-report and may be subject to biases inherent to this data collection method. Future researchers may consider collecting the data using other methods with experimental design to evaluate the effects of these variables on continuance intention. Third, because this study population consisted primarily of college students who were learning English as L2 and residing in China, our findings may not be generalizable to other populations. Future research should replicate and extend our findings with additional samples in China and other countries. Finally, we only explored the mediating effects of two mediators (i.e., integrative motivation and flow) in the relationship between perceived usefulness and continuance intention in this study. In addition to the pathway shown in our study, other factors might mediate the relationship between perceived usefulness and continuance intention of language learning apps, such as perceived flexibility advantages (Huang et al., 2014). These mediating effects should be verified in future studies.

Despite these limitations, this study also has its strengths. First, our findings indicated that successful language apps should make users feel convenient to use and indeed improve the language learner's efficiency. Besides, language learners are more eager to get in touch with the target language community to

achieve optimal learning experiences. This implies more efforts should be made to improve the quantity and quality of the services in language learning apps. Second, this is the first cross-sectional study to investigate associations between perceived usefulness and continuance intention as well as the mediation roles of integrative motivation and flow in the context of language learning. Our findings indicated that if apps designers can pay more attention to inspiring learners to use social connection functions (satisfy learners' integrative motivation), it will increase learners' engagement in language learning activities. Therefore, language learning apps easily help learners stay engaged in interactive learning, which offers educators a window of opportunity to optimize learning for their students.

6 Conclusion

In summary, the current study extends past research by investigating the serial multiple mediating effects of integrative motivation and flow on the relationship between perceived usefulness and continuance intention in the context of language learning apps. The results in the present study showed that perceived usefulness, integrative motivation, flow, and continuance intention were positively related to each other. With the hypotheses, we demonstrated that the perceived usefulness could directly predict continuance intention to use language learning apps among college students who were learning English as L2, as well as indirectly through the mediating variables of integrative motivation and flow. Therefore, we proposed a novel serial multiple mediation model (i.e., perceived usefulness → integrative motivation → flow → continuance intention) that reveals the mechanisms of how to promote the intention to use language learning apps to facilitate foreign language learning.

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Declarations

Conflict of interests No potential conflict of interest was reported by the authors.

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