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Educational smartphone apps for language learning in higher education: Students' choices and perceptions

Fatemeh Nami
Amirkabir University of Technology, Tehran

The popularity and use of smartphone apps for language learning have significantly grown in Iran over the past years. Despite this growth, empirical data on students' choice of such apps, their perception towards them, and the impact of external factors on their attitude remains scant. In an attempt to contribute to this research base, a descriptive survey study was carried out to explore the type of language learning apps commonly used by 381 university students at Amirkabir University of Technology and their perception towards the effectiveness of these apps for developing learning language skills. Dictionary and lexical apps appeared to be the most popular application types amongst participants. While students were generally positive about the use of apps for language learning, they had different viewpoints regarding the potential of apps for developing different language skills. The results of ANOVA indicate that gender did not play a significant role in participants' perception. On the contrary, the type of apps used significantly shaped students' attitudes towards app-based language learning. The findings contribute to research on mobile assisted language learning and educational app design, by shedding more light on students' choice of apps for learning different language skills.

Implications for practice or policy:
- Teacher training courses and programs may need to highlight the educational value of language learning apps for pre-service teachers to increase the likelihood and acceptance of smartphone educational apps by teachers.
- Language learners' knowledge of different language skills can be improved by proper design and use of smartphone educational apps as supplementary materials in language courses.

Keywords: smartphone apps, language learning, student perception, mobile assisted language learning, higher education

Introduction

Smartphone ownership has significantly increased in Iran over the past few years and is predicted to continue to grow. Based on the report from TechRasa (Azali, 2017), smartphone use was beyond 45 million in 2017 compared to the 2 million active smartphones in use in 2014. Today, the majority of students in Iranian universities own and carry smartphones. This fast increasing penetration rate can be attributed to the growing availability of infrastructure across the country, the diversity of smartphones in the market, many of which are accessible at affordable prices, the ubiquity and pervasiveness of these handheld devices, and the growing access to and use of the Internet across the country (see Nami & Vaezi, 2018). As revealed by Internet World Stats (2017), about 70% of Iranians (an estimated 56.7 million out of a total population of about 81 million) use the Internet today, a 22.5% increase since 2000. At this stage, in Iran, people can have access to the Internet by paying a fixed rate for different Internet packages on a monthly or an annual basis.

It is not surprising, then, to observe an increasing interest on the part of local information technology market and start-up companies in designing smartphone applications for a wide range of purposes, including language learning. Over the past few years, this market has witnessed an exponential growth in the take-up of educational applications specifically designed for language learning, particularly within the higher education sector. Mobile technologies have systematically revolutionised different aspects of society, including education, by providing opportunities for moving beyond conventional teaching and learning (see Ganapathy, Shuib, & Azizan, 2016). The growing need for timely access to information and educational resources, along with the increasing capability of mobile devices as platforms for learning

practices, have not only brought mobile learning and related devices under the spotlight in education (Sad & Göktas 2014) but have also enhanced opportunities for interaction (Chung, Chen, & Kuo, 2015) and lifelong, collaborative learning (Hsu, 2013). This potential has led to an increase in the popularity of these educational technologies among learners and educators for learning different subjects – mainly a second or foreign language that requires extensive practice and exposure beyond the confines of the physical classrooms – in Iranian higher education. In other words, although lecture-based teaching with a heavy reliance on textbooks is still the characteristic feature of many courses and programs at Iranian colleges and universities (see Nahrkhalaji, 2012), mobile technologies, namely smartphones and related applications, are finding their way into higher education settings as supplementary sources, especially for language learning (e.g., Dashtestani, 2016).

However, there is no consolidated picture of the language skills and areas addressed in these apps and the way Iranian students perceive language learning by means of such educational technologies. A careful review of mobile learning research in general, and mobile assisted language learning (MALL) studies in particular, reflects a similar gap. As Steel (2012) noted, despite the abundance of teacher-led mobile learning studies, there is still comparatively little research into "students' own use of mobile apps" (p. 875). The literature on MALL is, similarly, filled with intervention studies mostly led by teachers or researchers, with limited attention being dedicated to learners' experience or voice (Ma, 2017). Furthermore, by focusing mainly on projects and mobile use studies, largely initiated by teachers, in which students are asked to practise using a particular app, research on mobile learning has largely overlooked language skills (Ganapathy et al., 2016; also Steel, 2012) and students' preferences in choosing apps for language learning. Hence, "more studies of students' personal use of mobile apps and devices are required for the discipline of language learning" (Steel, 2012, p. 879).

Since, according to Sad and Göktas (2014), the type of mobile device does matter when exploring different aspects of learning and user acceptance, empirical data is still needed on smartphone app-based language learning, students' perceptions of this mode of learning, and the skills and language areas that are targeted in mobile phone applications (see Steel, 2012). In an attempt to contribute to this research base, a study was carried out during the winter semester of 2017 in one of the well-established state universities of technology in Tehran, Iran. Drawing on survey data, this article reports on the type of language learning apps commonly used by 381 engineering major students who volunteered to take part in the study, and their use and perception of learning language through these apps. The effect of external factors such as gender and app use on students' attitudes was also taken into consideration.

Literature review

Mobile learning: Theoretical underpinnings

Mobile learning encompasses the use of ubiquitous mobile and portable devices for learning and knowledge construction in different contexts (Sandberg, Maris, & de Geus, 2011) beyond the confines of the physical classrooms. By "emphasizing continuity or spontaneity of access and interaction across different contexts of use" (Kukulska-Hulme & Shield, 2008, p. 273), or anytime any place learning (Sandberg et al., 2011; also Moroz, 2013), mobile devices and related applications promote flexible learning (Ganapathy et al., 2016).

As a fairly recent concept and an extension of e-learning, mobile learning lacks a comprehensive theoretical framework. Its functionalities, however, roughly fit into a number of popular educational paradigms, including personalised learning (Steel, 2012) and constructivist approaches towards learning. Furthermore, by putting students in charge of their own learning process, mobile devices are believed to support student-centred learning (Ganapathy et al., 2016). In a constructivist view of learning, knowledge is believed to be co-constructed by the learner and the teacher, as well as peers. This can be achieved by adding new knowledge to one's already established knowledge base through engagement in real-life meaningful tasks and access to rich learning resources and support (Sandberg et al., 2011). By facilitating anytime any place access to a wide range of learning resources and educational applications, mobile devices encourage a situated self-regulated computer-mediated learning experience and lend themselves well to constructivist approaches to teaching and learning (Cavus & Ibrahim, 2017).

MALL research

While mobile learning might not be considered as an essentially new learning approach in education (Godwin-Jones 2011), the constantly evolving and emerging mobile technologies and devices have turned it into a popular research focus across various disciplines including language learning (see Cavus & Ibrahim, 2017). As a subset of mobile learning and computer assisted language learning, MALL encompasses the use of mobile devices ranging from tablets to smaller handheld devices, such as smartphones and related apps, for learning a language informally or formally (Chen, 2013).

A careful review of MALL studies over the past few decades reveals that research has been concerned mainly with quantitative accounts of mobile devices, systems, and/or course effectiveness, mostly in formal language learning contexts (Ma, 2017). For instance, in a multi-case study on the mediating role of mobile technologies in Hong Kong university students' English language learning, Ma (2017) reported that students utilised a wide range of e-resources for learning a second language using mobile devices. Other research strands include mobile assisted game-based language learning (e.g., Schwabe & Göth, 2005), teacher perceptions of learning through mobile phones and laptops (e.g., Sad & Göktas, 2014), and a user-centred model for mobile learning using a personal digital assistant program (e.g., Ng & Nicholas, 2012). The challenges associated with mobile learning have also been addressed in a number of studies. Screen size, keypad, and battery life, along with pedagogical, environmental, physiological, and cost issues, have been amongst the most widely discussed concerns in this regard (see Sad & Göktas, 2014).

When it comes to MALL research in Iranian educational contexts, a similar focus can be detected. The majority of studies have, by and large, explored the effectiveness of mobile devices for improving different language strategies and skills such as listening comprehension (e.g., Azar & Nasiri, 2014), and grammatical accuracy (e.g., Baleghizadeh & Oladrostam, 2010).). Dashtestani (2016), for instance, explored the way 345 intermediate-level Iranian students of English as a foreign language across 10 language institutes used mobile devices for educational purposes and their perception towards their benefits and limitations. Drawing on questionnaire and interview data, Dashtestani (2016) observed that the majority of the participants used their mobile devices for non-academic purposes. Only 44 students in his study reported using mobile devices for learning, which was restricted to the use of electronic dictionaries. Dashtestani (2016) concluded that "MALL was mainly a complementary material for learners' self-regulated learning rather than a part of the English class" (p. 10).

However, studies that explore learners' perceptions of their personalised mobile language learning experience are not abundant (e.g., Dashtestani, 2016; Ganapathy et al., 2016; Hsu, 2013). In other words, while there is an increasing amount of research about the effectiveness of mobile devices such as laptops, tablets, and iPads for language learning, "there is a lack of research on … students' attitudes towards MALL both in Iran and many other developing countries" (Dashtestani, 2016, p. 4). The same argument applies to research on educational apps, especially those designed for language learning through smartphones. Only recently has the information technology field witnessed the growing popularity of educational applications, namely language learning apps (Begay, 2013). Hence, studies that provide evidence on the use and effectiveness of smartphone language learning applications remain scant (e.g., Butgereit & Botha, 2009; Sandberg et al., 2011; Steel, 2012).

The human factor plays a determining role in the success of any innovation including mobile learning (Cheon, Lee, Crooks, & Song, 2012). As Roy, Brine, and Murasawa (2016) noted, to ensure the effectiveness and success of a learning system, its usability from a user's perspective should be assessed. Sad and Göktas (2014) similarly noted that "the success of m-learning integration requires some degree of awareness and positive attitudes by students" (p. 607). This necessitates addressing students' viewpoints on learning via mobile devices, namely language learning apps.

App-based language learning research

The growing access to and advances in the design and use of wireless networks that support smartphones, and educational apps designed for such platforms, have brought smartphone language learning apps into focus (Kukulska-Hulme & Shield, 2008; Moroz, 2013). A mobile app refers to a "software application developed specifically for use on small, wireless computing devices, such as smartphones and tablets,

rather than desktop or laptop computers" (Rouse, 2013, ¶ 1). In the context of the present study, the term *app* encompasses the applications designed for language learning on smartphones.

As discussed earlier, since app-based language learning research is still in its infancy, there have been relatively few published studies on the use of particular smartphone applications designed for language learning. For example, investigating the use of Hadeda, a language learning mobile phone application for young learners' vocabulary knowledge and spelling proficiency, Butgereit and Botha (2009) found the app useful for creating vocabulary lists in different languages and producing audio word tasks through a text-to-speech feature. Sandberg et al. (2011), in another study, explored the effect of mobile learning on the English as a second language performance of young learners. They focused on the mastery of particular English words among three groups of participants, two of whom had access to a mobile application called EarlyBird with reading and writing lessons on zoo animals and a third group as the control group. One of the treatment groups was also allowed to take the mobile device home. They observed that participants who took the device home significantly outperformed students in the other two groups. In addition, the majority of their participants found the experience enjoyable, and 71.43% rated mobile learning as effective as learning with a teacher.

Steel (2012) investigated French, Japanese, and Spanish language learners' use of mobile apps for out-of-classroom learning at an Australian university. While his participants were generally positive about mobile apps for being convenient and portable and for enabling them to learn on the go, only 23% ranked them as their three most commonly used technologies. One year later, Moroz (2013) used two Kanji apps (KanjiBox and Kotoba), a flashcard-based and a dictionary-based app, to teach Chinese characters to 139 Japanese students in order to identify the features that students preferred to see in the application and examine whether students and teachers were aware of these apps. She observed that students at higher levels of language proficiency were more aware of the apps as they were more interested in the topic they were studying and were more eager to look for additional learning resources. Participants in the lower proficiency group found the app less easy to use, while the intermediate students rated it as well presented and easy. Moroz (2013) concluded that the dictionary app was more popular among the students of higher level, while both groups considered the flash card app useful.

The above review indicates that app-based language learning research has, by and large, been concerned with exploring researcher- and/or teacher-selected apps and their potential for language learning. There is no consolidated picture of the type of apps students prefer when they are free to choose language learning apps; neither is students' perception of the effectiveness of such apps for learning different language skills or the effect of external factors such as gender, type of apps used, and cost issues on their attitude.

Method

Considering the rapid proliferation of smartphones, the growing availability and emergence of locally designed educational applications, namely language learning apps, and the surging interest of university students in using such devices, exploring the potential of these educational technologies for language learning purposes and students' perception of such learning experiences appears to be an important imperative. In an attempt to fill the above-mentioned gaps, the following research questions were addressed in this study:

(1) What type of smartphone language learning apps (in terms of focus and language skills) do university students use?
(2) How do university students perceive learning different language skills through smartphone apps?
(3) Does gender play a significant role in university students' perceptions towards language learning apps?
(4) Do the types of applications used play a significant role in students' perceptions of language learning apps?

A descriptive survey design was used to explore students' preferences and perceptions of language learning apps and the possible effects of the external factors, such as gender and the types of apps used, on such perceptions. What follows offers a detailed account of the research context, participants, survey instrument, and data analysis procedures applied in this study.

Participants and research context

The study was carried out at Amirkabir University of Technology in Iran. The participants consisted of 447 Bachelor of Science from 19 majors who volunteered to take part in the study. The announcement for participation was made by the instructors of the Department of Foreign Languages to all of the students taking part in the general English (GE) courses of the winter semester of 2017. The overall focus of the study was orally explained by the instructors to the students in all 15 GE courses. Each GE course in this university includes 30 Bachelor of Science students from different majors. Hence, the expectation was that the participants were representative of the overall population of students in the university. Only the students who confirmed that they had at least one language learning app in their smartphones and were using it for at least one semester were asked to take part in the study. A language learning app was defined as a free or paid application installed on a smartphone and used for learning or teaching one or all of the language skills (i.e., reading, writing, listening, speaking, pronunciation, vocabulary, and grammar).

Of the 450 students in the 15 GE courses, 447 within the age range of 17 to 25 agreed to take part in the study. The type and focus of language learning apps were not controlled, in an attempt to obtain a comprehensive picture of students' preferences in app use and the language skills that were addressed in these apps. The controlled use of smartphones and related apps for language learning during classroom meetings is generally welcomed by the instructors in the Department of Foreign Languages in the university under study. During pair or group work on course book exercises or classroom discussions on readings, students are allowed to use their smartphone dictionaries and/or other apps (if applicable), mostly to check the meaning, pronunciation, collocation, and usage of unknown words or concepts.

Survey

The researcher created a survey instrument, that is, Perceptions towards Language Learning Apps Survey, for data collection. Survey items were written and/or adapted from relevant surveys available in the literature. Once the initial item pool was finalised, the statements were translated into Persian (the participants' native language). Expert panel viewpoints from three academics from the Department of Foreign Languages were obtained to ensure clarity and face validity of the survey instrument. The survey contains three sections. The first section collected demographic data on participants' gender, age, and study major. In the second section, application type, respondents listed their smartphone language learning apps under two columns: Free Apps and Non-Free (Paid for) Apps. The final section presented 11 items in a 5-point Likert scale (1 = *strongly disagree*, 2 = *disagree*, 3 = *uncertain*, 4 = *agree*, and 5 = *strongly agree*) (see Table 1), which aimed at eliciting students' viewpoints regarding the effectiveness of smartphone apps for learning English language skills (with six items: 2, 3, 4, 7, 9, & 10). It also sought students' viewpoint on free and non-free apps with respect to their quality, availability, and effectiveness along with the effect of peer experience on their choice of apps (with five items: 1, 5, 6, 8, & 11).

Table 1
Survey items' descriptive statistics

Survey items	Factors extracted	*M*	*SD*	Factor loading	Strongly agree + Agree	Uncertain	Strongly disagree + Disagree
1. I prefer using free language learning apps for learning English.	F2[a]	4.10	0.896	0.805	76.4%	19.7%	3.9%
2. Language learning apps can be effective for learning and improving my knowledge of English vocabulary.	F1[b]	4.18	0.749	0.621	86.3%	10.5%	3.2%
3. Language learning apps can be effective for learning and improving my knowledge of English grammar and writing.	F1	3.39	0.976	0.709	46.7%	34.9%	18.4%
4. I don't think language learning apps can be effective for improving my listening skill.	F1	3.32	1.247	0.730	52.7%	18.9%	28.3%
5. If I find a non-free app which is effective for language learning, I will buy it for sure.	F2	2.90	1.170	0.660	27.8%	34.1%	38.1%
6. I draw on my friends' knowledge and experience when choosing and/or buying language learning apps.	F2	3.77	0.911	0.672	68.3%	23.1%	8.7%
7. Language learning apps can be effective for improving my reading comprehension skill.	F1	3.64	0.874	0.637	63.3%	25.2%	11.5%
8. The language learning apps available in the market can effectively satisfy my language learning needs to a great extent.	F2	2.93	0.942	0.741	26.8%	38.6%	34.6%
9. Language learning apps cannot be effective for learning correct pronunciation of English words.	F1	3.61	1.087	0.823	66.9%	16.0%	17.1%
10. Language learning apps can be effective for improving my speaking skill.	F1	3.27	1.044	0.569	46.1%	30.7%	23.1%
11. The free language learning apps are not as effective as the non-free ones.	F2	3.05	1.218	0.490	33.1%	47.0%	19.9%
Total		38.14	4.431				

[a]F2 = cost, availability, and choice of apps. [b]F1 = language skills.

The sum of responses to all 11 items was taken as an indication of students' perception towards language learning apps, which could range from 11 (if *strongly disagree* was picked for all of the items) to 55 (if the respondent chose *strongly agree* for all items). To avoid the possibility of receiving biased responses, four items were negatively worded and recoded for data analysis. The survey was administered in the last session of the GE courses. Taking the survey was voluntary, and no time limitation was set to let students respond at their convenience. To consider the ethical issues, the survey began with a consent paragraph highlighting the research focus, anonymity, and confidentiality. Verbal instructions were also provided on filling out the survey, and students were briefed about the purpose of the study. Of the 447 distributed surveys, all were returned, demonstrating a 100% response rate. After discarding surveys containing missing data and/or duplicated responses, 381 surveys (from 151 females and 230 males) were retained for the analysis. The number of female and male respondents roughly matched with the overall gender distribution in the university under study.

Data analysis

The survey data was analysed descriptively using Statistical Package for Social Sciences software version 18.0. The validity of the instrument was checked conducting factor analysis. The Kaiser–Meyer–Olkin (KMO) coefficient for the 11-item survey was 0.697, with a significant Barlett's sphericity value (487.672; $p < 0.000$) showing the sampling adequacy (lack of multicollinearity) and linearity of variables' correlations and thus the factorability of data (see Hinton, Brownlow, McMurray, & Cozens, 2004). Since all 11 items yielded a correlation between 0.3 and 0.8, no item was screened out of the survey. Considering the point of inflection on the scree plot and a minimum factor loading of 0.490, the principal component analysis extracted two factors, which together explained 56.602% of the total variance of these 11 items. Both factors were kept for analysis given that each contained more than two items. The first factor (F1) with seven items was labelled "language skills" and the second (F2) was named "cost, availability, and choice of apps" embracing four items (see Table 1). The obtained factor loading values indicated that the survey was in line with the objectives of validity. A Cronbach's alpha coefficient of 0.630 demonstrated a moderately reliable scale.

To explore the first research question, the frequency and percentage of different types of language learning apps reported as being used by the participants were obtained using SPPS software. Afterwards, the mean score, standard deviation, and the percentage of responses under three main scales (*strongly agree*, *agree*, *uncertain*, *disagree*, and *strongly disagree*) for each item were calculated to investigate students' perceptions of the use of smartphone applications for learning different language skills and the role of cost issue, peer experience, and availability in their choice of apps. Furthermore, a two-way analysis of variance (ANOVA) was applied to examine the possible effect of independent variables on participants' perceptions: students' gender (with two levels: male and female) and their use of language learning apps other than dictionaries (with two levels: non-dictionary app users and non-users) as all participants had at least one dictionary app in their smartphones. Given that the presence of a main effect was detected only for one independent variable (i.e., students' use of non-dictionary apps), an independent samples *t* test was conducted to compare the mean differences of the two groups of participants, that is, students who used language learning apps in addition to dictionaries (Group 1), and those who only had the experience of using dictionary apps (Group 2).

Results

The type of language learning apps used

In analysing participants' responses to the question in the second part of the survey (i.e., application type, see Table 2), regarding the type of language learning apps they had and used in their smartphones, it was observed that dictionary and lexical apps were the most widely used app type. Of the 381 respondents, all had at least one dictionary app in their smartphones. Participants named 53 different dictionary apps, the 10 most frequent of which are listed in Table 2. Only 29.3% of participants had apps other than dictionaries in their smartphones. Of these apps, only two (i.e., English Phrases and Seven Tick) were paid-for, indicating that students preferred using free language learning apps.

Table 2
Application types used by students

Application type	No. of users	Freq.	Variety of app types	The first 10 most frequently used apps
Dictionary apps	381	100%	53	1. Fastdic (168 users) 2. LDOCE5 (67 users) 3. Google Translate (59 users) 4. Oxford Dictionary (30 users) 5. Dict Box Persian (24 users) 6. Merriam-Webster English Dictionary 7. Tahlilgaran 8. Dict Plus 9. Persian Dic 10. PICO Dic
Non-dictionary apps	112	29.3%	26	1. 504 Words (15 users) 2. Memrise (9 users) 3. Duolingo (6 users) 4. Rosetta Stone (3 users) 5. BBC Learning English (3 users) 6. Tick 8 7. Learn English Vocabulary 8. Busuu 9. 601 Words 10. The English Club

A careful analysis of the language skills that was a focus in each of the non-dictionary apps used by students in this study indicates that vocabulary learning apps were the most dominant ones being used by the participants, with 11 out of the 23 apps listed falling into the category of lexical apps and the remaining 12 addressing two or more language skills such as reading, listening, and speaking.

Students' perceptions of language learning apps

While the percentage of *strongly agree* and *agree* responses for all 11 items in the survey ranged from 46.7% to 86.3%, illustrating an overall agreement with the potential of applications for learning different language skills, students' perceptions of the effectiveness of smartphone apps for learning different language skills widely varied from one skill to another. The highest mean value (*mean* = 4.18), and the closest to the scale *strongly agree*, belonged to item 2, suggesting that participants mostly (86.3%) agreed on the potential of apps for learning and improving their knowledge of English vocabulary. Due to the emphasis in GE courses in this university on the mastery of technical English vocabulary and considering the fact that all participants had and were using at least one dictionary app in their smartphones, this finding was anticipated. Participants in Ma's (2017) study similarly considered mobile devices useful for learning English through providing access to the meaning of unknown vocabularies.

When asked if mobile learning apps can be useful for improving reading comprehension skills (item 7: *mean* = 3.46), students' responses were mostly positive (63.3%). Students were also positive about the effect of apps on learning the correct pronunciation of English words (item 9: *mean* = 3.61). The mean values of items 4, 3, and 10 indicated a moderately positive agreement with the effectiveness of apps for improving listening (*mean* = 3.32), writing and grammar (*mean* = 3.39), and speaking (mean = 3.27) skills. However, a closer look into the percentage of *strongly agree* and *agree* responses for these three items revealed that students' responses to item 4 (listening) was not exceedingly positive but significantly more positive than their responses to items 3 and 10. While more than half of the respondents (52.7%) found apps useful for improving listening, they appeared less positive about the potential of apps for grammar, writing, and speaking development. With a significant increase in the percentage of the respondents who picked the *uncertain* scale for items 3 (writing and grammar) and 10 (speaking), only 46.7% chose *strongly agree* and *agree* with regard to the effectiveness of language learning apps for writing and grammar practice. This percentage was 46.1% for the role of apps in improving speaking skills (see Table 1).

The highest mean value (4.10) in the second category of the survey (i.e., cost, availability, and choice of apps) belonged to item 1, which showed the majority of students (76.4%) preferred to use free language learning apps. This was consistent with the responses to item 5 in which only 27.8% of the participants (*mean* = 2.90) noted that they would pay for a non-free app if they found it useful for language learning. When asked to make decisions about the effectiveness of free versus paid-for apps, students mostly appeared uncertain. This is an indication that students were concerned about the cost issue when choosing language learning apps more than their sophistication or effectiveness. Only 33.1% of the respondents valued non-free apps as more effective in item 11, while 47.0% (*mean* = 3.05) were uncertain. With a mean value very close to the *agree* scale (*mean* = 3.77), responses to item 6 revealed that students mostly (68.3%) drew on the experience and knowledge of their friends to choose (and/or buy) language learning apps. As only two out of a total of 79 language learning apps listed by participants were paid-for, students' uncertainty about the effectiveness of non-free apps can be related to their lack of experience in using such apps. The item with the lowest mean value in this group was item 8 (*mean* = 2.93), suggesting that only 26.8% of the respondents found the available language learning apps in the market satisfying. The majority, however, either disagreed (34.6%) or appeared uncertain (38.6%) about the adequacy of effective language learning in the market.

The impact of students' gender and type of apps used on their perceptions

The existence of significant main effects for the two independent variables, and a possible interaction between them, were checked by exploring the result of a two-factor independent measures ANOVA. As indicated in Table 3, for the *gender* factor, no significant main effect was found, $F(1, 377) = 2.348$, $p > 0.05$. However, the second factor (i.e., app type used) significantly affected students' perceptions of language learning through smartphone apps, $F(1,377) = 15.142$, $p < 0.001$. No significant interaction effect was detected between the two independent variables. To control for the possible effect of unequal sample size in each group on the results, 90 survey responses were randomly selected from each of the two main groups, that is, males and females. Within each group, survey responses were randomly selected from participants who had experience in using language learning apps in addition to dictionary apps and those who only used a dictionary (45 in each group). After making the groups randomly equal, ANOVA was repeated. Similarly, it was observed that while gender did not play a significant role in students' perceptions of language learning apps ($F(1, 176) = 1.860$, $p > 0.05$), the use of apps other than dictionaries significantly shaped their attitudes ($F(1, 176) = 13.742$, $p < 0.001$).

Table 3
Tests of between-subjects effects (ANOVA)

Source	Type III sum of squares	df	Mean square	F	Sig.	Partial Eta squared
Corrected model	357.458[a]	3	119.153	6.325	.000	.048
Intercept	448569.722	1	448569.722	23811.144	.000	.984
Gender	44.224	1	44.224	2.348	.126	.006
apps	285.249	1	285.249	15.142	.000	.039
Gender * apps	8.596	1	8.596	.456	.500	.001
Error	7102.170	377	18.839			
Total	561659.000	381				
Corrected total	7459.627	380				

[a]R squared = .048 (adjusted R squared = .040).

Once the presence of a main effect was detected, an independent samples *t* test was conducted to compare the mean differences between the two groups of participants: students who used language learning apps in addition to dictionaries (Group 1), and those who only had the experience of using dictionary apps (Group 2). As shown in Table 4, Levene's test for equality of variances was not significant ($F = 0.018$, $p > 0.05$). A non-significant *F* value indicates an equality of variance assumption and that top line values in the table must be considered (Hinton et al., 2004). Since it was predicted that students who used language learning apps were more likely to demonstrate positive attitudes towards smartphone language learning apps, compared to those who just used dictionary applications, the sig. (two-tailed) *p* value was divided in half to account for this one-tailed prediction. The mean difference (1.864 (95% confidence interval (CI):

0.902 to 2.827)) is 3.80 times larger than the standard error of difference (0.490); large enough to be considered significant at $p < 0.000$.

Table 4
Independent samples test

Perception	Levene's test for equality of variances		*t* test for equality of means						
	F	Sig.	*t*	*df*	Sig. (2-tailed)	MD[a]	Std. ED[b]	95% CI of the difference	
								Lower	Upper
Equal variances assumed			3.808	379	.000	1.864	.490	.902	2.827
Equal variances not assumed	.018	.895	3.789	205.538	.000	1.864	.492	.894	2.834

[a]MD: mean difference. [b]ED: error difference.

Discussion

Moroz (2013) related the widespread use of dictionary apps to their lower cost compared to paper or electronic dictionaries. While ease of use and access can be considered underlying reasons behind students' interest in using dictionary apps, the cost issue cannot be taken as a determining factor in the context of this study, given that all of the reported dictionary apps were available for free. This preference towards free applications can be attributed to the restrictions that Iranian users face when trying to buy apps from App Store and Google Play. Since payments are not accepted from clients based in Iran due to the sanctions, Iranian users prefer to either pick up free apps from such international stores or buy or download applications from well-known local app stores such as Café Bazaar (for Android devices) and Sibche (for IOS tools). A careful analysis of the online sources students used for downloading apps confirms this claim. It was observed that 13 out of 23 non-dictionary apps were available at and downloaded from Café Bazaar, and 10 were the free apps from Google Play, with no language learning apps downloaded from App Store.

The popularity of lexical (dictionary and vocabulary) apps can be related to the educational culture of the research context. The English courses offered in the university under study aim at enhancing non-English major students' knowledge of technical terms and vocabularies, along with their reading comprehension skills, to enable them to read and understand technical texts in English. Other language skills such as listening, speaking, and writing are usually attended to peripherally in GE and technical English courses. Hence, it appears natural for students to pick up and use apps in line with their educational needs. In addition, while mobile learning, including app-based language learning, lends itself to constructivist approaches, consistent with Hsu's (2013) study, Iranian students at different grade levels are mostly accustomed to teacher-centred modes of instruction in which knowledge is transmitted to the learner directly through teaching, preferably in face-to-face classrooms. Students, for instance, prefer grammatical rules to be taught explicitly by the instructor. Their less positive attitudes towards the effectiveness of apps for learning skills such as grammar can be attributed to this dominant culture.

Unlike vocabulary practice through smartphone dictionary apps, which was a shared experienced for all participants and was also supported in their GE courses, the amount of exposure to, knowledge of, and experience in using different apps for learning skills other than vocabulary varied from one individual to another. Lack of adequate knowledge on mobile devices and related apps limit students' use of such devices for language learning purposes (Dashtestani, 2016). Although the use of language learning apps, mostly for vocabulary learning and checking, was welcomed and accepted by the instructors in the Department of Foreign Languages, such usage did not comprise a part of students' course requirements. Instructors in this study did not recommend particular language learning apps to avoid guiding students' choice of apps. Hence, the restricted use of apps for learning skills other than vocabulary might be

indicative of the lack of adequate guidance and instruction on which mobile apps to select for language learning and how best to use them. As noted by Dashtestani (2016), students should be provided with guidance and training on choosing and using mobile devices to facilitate the process of mobile integration for language learning.

Additionally, the use of non-dictionary apps as main or supplementary learning tools for learning other language skills was not introduced and/or supported in their language classroom settings. Only 112 out of 381 participants had experienced using apps other than dictionaries. According to Kim, Rueckert, Kim, and Seo (2013), to feel comfortable with mobile technologies, students need to spend time using that technology in designated learning projects. In other words, given that the amount of use largely affects users' desire to apply the app, and in effect shapes their perception towards that technology, it appears natural for students' perceptions not to be as positive for other language skills as they were for vocabulary and reading comprehension. That participants either disagreed or were uncertain about the adequacy of the apps in the market for effective language learning reflects the apparent mismatch between the applications' content and users' course content. That is, to give users a feeling of usability and effectiveness, special learning content must be developed and planned that fruitfully integrates smartphones' potential into the curriculum.

In sum, participants' general agreement with the potential of smartphone apps for learning different language skills appeared to be consistent with research on user attitudes towards mobile learning (e.g., Dashtestani, 2016; Ma, 2017). The present findings add to previous research by pinpointing different language skills and the way students perceive each of them. In line with participants in Hsu's (2013) study, reflecting on the possibility of addressing all language skills using mobile phones, the students in this study shared the viewpoint that not all language skills could be equally addressed and worked on when using educational apps.

While gender was not a determining factor, the type of application used significantly impacted on their attitudes. This finding can be related to the differences in students' level of familiarity and skills in using particular language learning applications. As noted by Ganapathy et al. (2016), students who are more skilful in using smartphones appear to have more positive perceptions of them and find applications more usable. Simply put, the findings suggest that students who have the experience of using different language learning apps rather than using only one type of app are more likely to gain an understanding of different apps and their possible pedagogical merits for learning different language skills. That is, the usability perception is widely shaped by the possible challenges and applications that a user might have encountered while using the tool.

Limitations

There are a number of limitations in this study that should be acknowledged. The main limitation relates to the reliance on self-reported data obtained from a perception survey. However, as Ma (2017) acknowledged, what is still lacking in this field is research that offers a more comprehensive picture of mobile-based language learning apps by collecting evidence from multiple resources. Furthermore, it is possible that the developed survey does not comprehensively address and reflect the construct under study. The findings also indicate the attitudes of a convenient sample of students from one university with unequal gender distribution. Additionally, while all of the participants were users of different language learning apps, the impact of the possible differences in the quality and quantity of students' prior experiences with language learning apps were not controlled. Given that each participant's viewpoint on smartphone language learning apps is probably shaped by their experience using different applications, it is possible that different results would have been obtained if the participants shared the experience of using similar apps.

Implications and conclusion

While research on the educational potential of mobile devices is burgeoning, few studies have explored their effectiveness for language learning. Furthermore, studies that explore students' use of and attitude towards smartphone apps for language learning still remain scant. The results of this study contribute to the existing body of research on educational apps by highlighting the application types that were more

commonly used by university students. Providing insights into students' perception of language learning apps and the determining role of experience and use on this perception, the findings suggest that students need to develop positive perceptions of the apps they are using and feel at ease with them to consider their pedagogical value and contribution to learning (see Ng & Nicholas, 2012).

If smartphones apps are to be used to their full potential for educational purposes, including language learning, app content should address and reflect course content and the pedagogical needs of students. Hence, educators, apps designers, and curriculum developers in any discipline, including language learning, should interact to design app content that is aligned with course content and its pedagogical objectives to enhance the appeal of mobile learning tools for students. Furthermore, considering the fact that different technologies require particular types of literacy, it appears essential to provide students with the relevant knowledge and skills for the effective use of appropriate smartphone apps. This objective cannot be fully achieved without the contribution of instructors and teachers. Considering the pivotal role of teachers' know-how and resistance in the success and/or failure of any educational attempt, future research should address teachers' perceptions of and proficiency in smartphone apps and their pedagogical value (see Steel, 2012).

Professional development programs and courses should be aimed at enhancing teachers' proficiency in and understanding of the pedagogical potential of mobile technologies including smartphone applications. The essence of such training is more vividly felt in contexts similar to Iranian higher education where students' use of smartphones is usually not welcomed, and instead discouraged, by teachers as the main or supplementary source of learning. As Chun et al. (2015) noted, "it might be interesting to compare teachers' and students' behavioral intention on mobile learning and teaching" (p. 338).

As Ng and Nicholas (2012) acknowledged, research that addresses sustainable learning through mobile devices is still scant. Thus, future studies would also need to explore how the use of smartphone apps, designed for learning different language skills, might shape students' knowledge of those skills, by drawing on multiple sources of data. Focus group discussions, for example, could be included in future studies on the same theme to obtain a more comprehensive picture of learners' viewpoints (Huang, Jang, Machtmes, & Deggs, 2012). Additionally, the possible impact of prior successful or unsuccessful experiences with language learning apps on students' attitudes should be investigated. Further experimental studies are needed to shed light on the possible impact of cultural and social factors in shaping students' acceptance of mobile technology (Chung et al., 2015). The way personal learning styles and strategies might shape student learning via smartphone apps could be another potential research strand in the future.

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Corresponding author: Fatemeh Nami, f.nami@aut.ac.ir