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# A Systematic Review of Digital Games in Second Language Learning Studies

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## ABSTRACT

This systematic review presents a definition for digital games within the second/foreign language (L2) learning research field. This definition is used to identify games used in research in the last five years (2012-2017). Forty-nine studies were identified and then summarized by type of research, game genre employed, age, and size of sample populations, and focus of research (vocabulary acquisition, student perspectives, etc.). Next, the research is synthesized by the L2 aspects investigated in each study. Finally, in the discussion section the L2 gaming research field is evaluated and suggestions for future endeavors are provided.

## KEYWORDS

Digital Game-Based Language Learning, Second Language Learning, Second Languages, Studies, Systematic Review

## INTRODUCTION

The allure of digital games and their potential effect on second language (L2) learning has inspired a myriad of L2 studies over the past 30 years. Researchers have argued that digital games provide a multitude of benefits for L2 learners including making the L2 learning process more enjoyable (Ansteeg, 2015; Becker, 2007; Gee, 2003; Prensky, 2001), motivating students to persist in L2 learning (Hays, 2005; Prensky, 2001; Warschauer & Healey, 1998), providing a highly contextualized and interactive environment (Gee, 2003; Morton, Gunson, & Jack, 2012; Presnky, 2001; Sørensen & Meyer, 2007), affording opportunities for collaboration and meaningful interactions (Dalton & Devitt, 2016; Peterson, 2011; Warschauer & Healey, 1998), and allowing for immediate feedback in context (Cornillie, Clarebout, & Desmet, 2012). Furthermore, these benefits have been shown to promote vocabulary learning (e.g. Ansteeg, 2015; Bytheway, 2014; Yudintseva, 2015), a willingness to communicate (e.g. Reinders & Wattana, 2014), writing skills (e.g. Coleman, 2002; Palaiogiannis, 2014; Suh, Kim, & Kim, 2010), among other L2 skills, while also reducing anxiety associated with learning an L2 (e.g. Hwang, Hsu, Lai, & Hsueh, 2017). Given these aspirations for games, this paper systematically reviews and evaluates the current field of research involving empirical studies that investigate the impact of digital games on L2 development.

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## DEFINING GAMES

### Past Definitions

In the early years of research on games for L2 learning, Hubbard (1991) argued that "within the field of language teaching, game seems to be one of those 'intuitive' concepts which remains undefined even in works specifically devoted to it" (p. 221). This is problematic because without a clear definition, or a set of features that constitute a game, research findings are often associated with games in general, rather than specific design features of games. In a recent review and meta-analysis of digital games used in educational settings, Clarke, Tanner-Smith, and Killingsworth (2016) define games as environments that provide learners with fictive goals constrained by rules, feedback, and fun. The National Science Council (2011) argued that games contain goals and rules and are played for fun in informal settings. Game definitions often support, to some degree, the notion that games have rules, goals, and feedback. However, fun is often not defined. For this review, we argue that a game must have a system of rules that confine and direct a player's action as he/she attempts to accomplish a goal as well as some form of feedback to enforce the rules. In addition, a game must account for the fun factor by adding either one or both of the following features: a balance of skill and randomness in the gameplay and/or a story/narrative. This is to say, in this definition, a system of rules and feedback alone is not considered a game. It is important to note that software relying *solely* on competition as a means of fun are not included in this definition. This was done to make a clear distinction between games and competition-based software. In competition-based software without a narrative or some feature of randomness, success relies solely on one's current skill and/or knowledge level and thus does not allow for the type of universal motivation that is expected out of games. In other words, the highly skilled and knowledgeable always win.

### Previous Reviews of Digital Games in L2 Learning

Previous reviews on digital games and L2 learning have reported positive findings. In an introductory article for a special issue on gaming in L2 learning contexts, Cornillie et al. (2012) conducted a search of articles involving games for L2 learning from 1984 to 2010 and found 82 articles. They coded the articles as either theoretical, experimental, non-experimental, design-oriented (i.e., focusing on conceptual designs and development), and pedagogy-oriented research. The most frequent type of study identified was design, followed by experimental and non-experimental studies, with theory and pedagogy-oriented studies lagging behind. However, the authors do note that the most noticeable trend is the increase in the number of L2 studies published on digital games. In a review investigating digital games in academic settings, Young et al. (2012) identified 39 studies and then separated them into subcategories based on the subject of interest. The authors found 10 studies that focused on L2 learning and claimed that digital games seem to be more beneficial for language learners than for learners of other subjects (e.g., math and science). Finally, Yudintseva (2015) synthesized studies investigating the effect of digital games on L2 learning from 2005 to 2015 and identified 26 studies. This review concluded that a) both commercial and educational games have positive effects on L2 learning outcomes, b) digital games seem to be more beneficial for intermediate to advance learners, and c) more males have been studied than females.

## AIM OF CURRENT SYSTEMATIC REVIEW

Past reviews on L2 research on digital games have suggested that the field is growing at a rapid rate and game design features play an important role in the effectiveness of games as learning tools. Given the increase in the number of studies being produced in this area, coupled with the need for research that focuses on the impact of design on L2 learning (Hubbard, 2002; Cornillie et al., 2012), this review synthesizes and evaluates studies from January, 2012 to December, 2017 that investigate the impact of digital games on L2 development. The year 2012 was chosen as a starting point because a)

two of the previous reviews ended around 2012, and b) a special issue of *ReCall* focused on digital gaming and second language learning was published in 2012.

## METHODS

### Search Strategy

This review used a three-phase search. In the initial search, the following library databases were used: *Education Source*, *Psych Info*, *ERIC*, *MLA International Bibliography*, *Linguistics and Language Behavior Abstracts*, and *Google Scholar*. The search strings used in this search can be found in Table 1.

**Table 1. Search terms**

| | |
|---|---|
| "digital game-based learning" or "games" or "serious games" or "game-based learning" or "gaming" or "simulation" or "virtual world"<br>AND | "L2" or "second language" or "language learning" or "language acquisition" or "FL" |

The initial search resulted in 3,813 articles. After limiting the years from 2012-2017 and including only peer-reviewed articles, 559 articles were identified. Next, the abstracts for each of these articles were read to determine if the authors mentioned the use of a *game* in the context of L2 research. At the conclusion of this initial stage 70 articles were retained. In the second phase, several journals, well-known for publishing studies involving technology in L2 research (*Language Learning & Technology*, *CALL, CALICO, ReCall, System, Innovation in LLT, CALL-EJ Online, Computer & Education*), were manually searched to identify articles not found in the first phase. After combing through these journals an additional 23 articles were retained. Finally, in phase three, additional articles were located in a snowball manner by mining reference lists from reviews, meta-analyses, and articles identified for in-depth analysis. This final phase resulted in the discovery of 55 additional articles, which brought the total number of articles retained for in-depth analysis to 148. The inclusion criteria for in-depth analysis is described below.

### Inclusion/Exclusion Criteria

Studies found and evaluated in this literature search were included if they met all of the following criteria:

1. **Language:** The study was written in English;
2. **Time Period:** 2012-2017;
3. **Journal and/or Conference Proceedings:** Peer-Reviewed:
   a. Unpublished studies were excluded;
   b. Dissertations and Theses were excluded;
4. Studies that investigate the impact or effect of playing a specific digital game on L2 learning were included:
   a. Studies that investigated beliefs about all digital games in *general* as a learning tool were excluded. For example, studies that asked if students would like games in their classroom, rather than investigating a specific game were excluded;
5. The digital game used in the study is a game per the definition used in this review.

A final in-depth analysis of the 148 articles was conducted to confirm both the first four inclusion criteria and that each of these studies used a digital game as defined by this review. If a

game description was not provided and no other means of acquiring the description were available, the study was removed. Of the 148 articles, 51 studies were retained. However, two additional studies were removed as the data and analysis were deemed too similar (i.e., same game, participants, and similar analysis) to another study. Thus, the final number of articles analyzed is 49.

### Codes

The articles identified in this review were coded using the following categories: year, language, sample size, age group (e.g., elementary, middle-high school, adult), length of study (e.g., single session, multiple session), study type (e.g., mixed methods, quantitative, qualitative), environment (e.g., laboratory setting, classroom, wild), focus of study (e.g., vocabulary, grammar), game type (e.g., RPG, adventure), gaming genre (e.g., COTS or Edutainment), and player configuration (e.g., solo play vs. multiplayer). Table 2 provides definitions for game type and game genre categories.

**Table 2. Codes used for categorizing games**

| Category | Description |
|---|---|
| Game Genre | *Commercial off the Shelf (COTS):* Designed for entertainment purposes. |
| | *Edutainment*: Designed for educational purposes. |
| Game Type | *Action*: This category includes platform games, first person shooters, fighting games, stealth games, survival games, and rhythm games. The primary game mechanics focuses on some form of action. |
| | *Adventure*: In adventure games, the player is taken on an adventure usually through a narrative. This category includes text adventures, graphic adventures, point and click games. |
| | *Role Playing Games*: Players assume the role of a fictional character in a virtual world and attempt to improve their characters by gaining experience through quest completion, fighting/battling, collecting items, among other activities. The most popular example of this type is World of Warcraft. |
| | *Simulation*: This category includes construction management, life simulations, and vehicle simulations. |
| | *Strategy*: This category includes real-time strategy games, Multiple Online Battle Arena (MOBA) games, and turn-based tactical games. |
| | *Sports*: This category includes games that involve sports. |
| | *Puzzle*: These games require players to solve puzzles to advance through the game. |
| | *Drill & Test*: This category includes gaming elements to make drill and test activities more interesting. |
| | *Location-Based/Augmented Reality (LB_AR)*: This category includes games that use location-based or augmented reality technology. |

## RESULTS

The findings for this systematic review are divided into two sections. In the first section, we summarize the studies by year, study type, age of participants, environment, languages investigated, game genre, sample sizes, and length of study. In addition, percentages of the studies that investigated various L2 aspects (e.g., vocabulary, grammar) are presented. In the second part of the results section, we synthesize the studies identified in this review by the various aspects of L2 development investigated.

## OVERVIEW OF THE STUDIES

Figure 1 shows that L2 research investigating digital games continues to grow rapidly. Most studies in this sample used a mix-methods approach (N = 19) compared to qualitative (N = 16) and/or quantitative (N = 14) methods. In terms of participant ages, more studies investigated adults (N = 38) than K-12 participants (N = 10). Finally, most studies occurred in either a laboratory (lab) (N = 25) or classroom setting (N = 22), with only two studies conducted in the wild.

**Figure 1. Number of studies by year, methods, age, and environment**

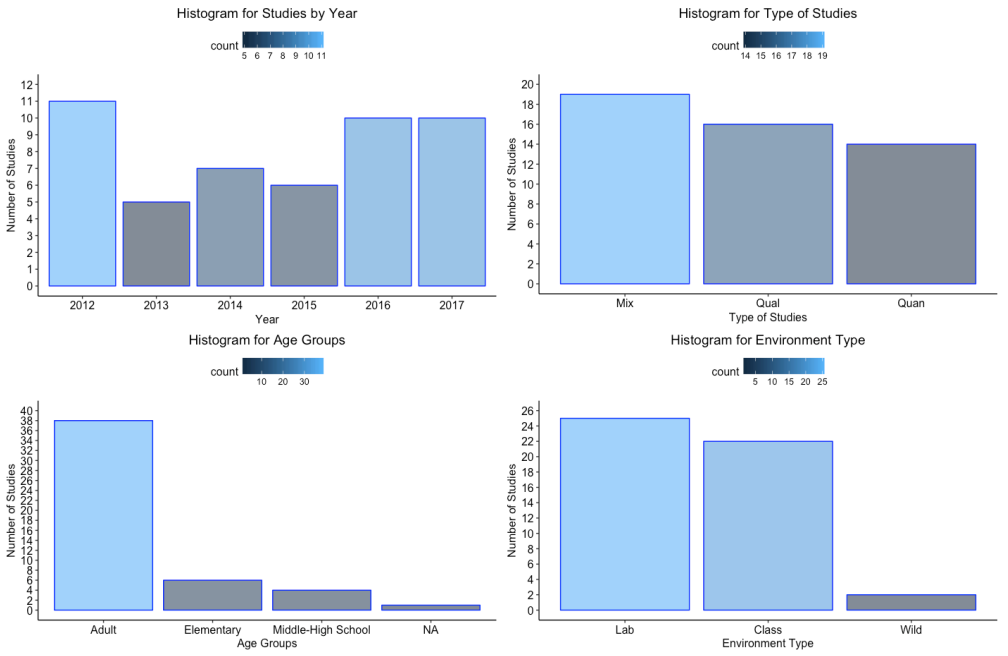



Figure 2 shows most studies investigated participants learning either English as a Foreign Language (EFL) (N = 27) or English as a Second Language (ESL) (N = 8). EFL learners refer to those who study English outside of a country where English is the dominant or official language, whereas ESL refers to learners who study English within a country where English is the dominant or official language. Figure 2 also shows that a majority of the studies included samples of less than 20 students and that few studies had more than 100 participants. Most studies allowed their participants to play the game in multiple sessions, rather than in one session. Finally, Figure 2 illustrates the types of games that were used and found that RPG games were the most popular, followed by drill and test, adventure, and simulation games.

L2 aspects that researchers focused on were also examined in this review. Figure 3 shows that most studies, either as a primary or secondary interest, investigated student perspectives of a specific game. These perspectives ranged from whether they believed the game was fun to their perceptions of L2 benefits associated with the game.

Another area of interest for L2 researchers is how digital games promote vocabulary acquisition. Several studies compared vocabulary gains between gaming and non-gaming environments. Identifying linguistic and social affordances of digital games was also a common focus for studies that were interested in illustrating the ecological value (van Lier, 2004) of gaming environments and how they

**Figure 2. Number of studies by language, game type, sample size, and length of study**

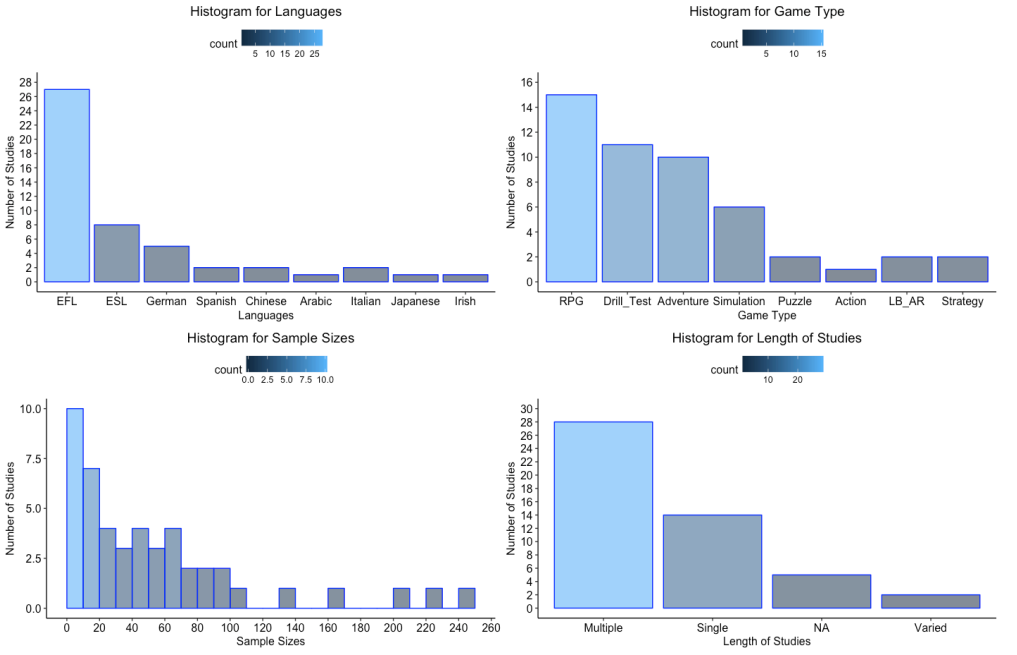
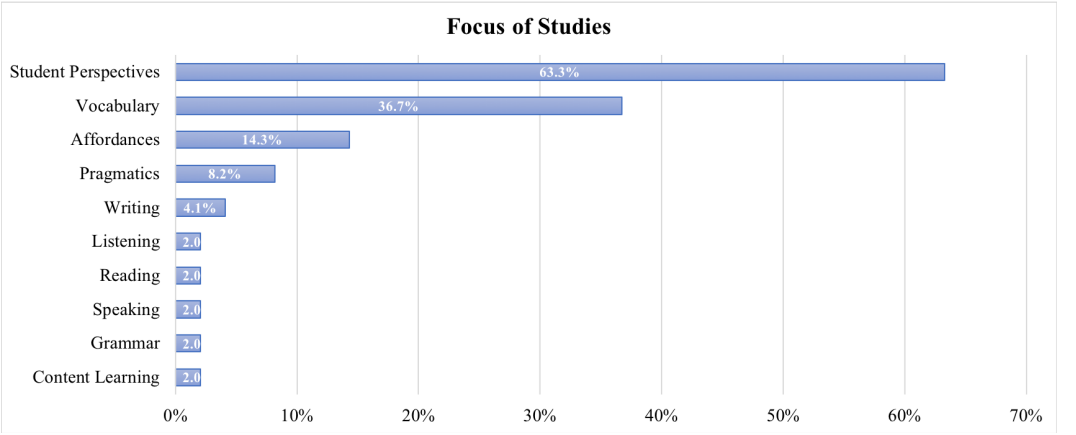



**Figure 3. Focus of studies**




support L2 development. The findings highlighted in this first section and their implications will be further considered in the discussion section.

## Synthesizing the Literature

In the previous section we provided a broad overview of the research being conducted on digital games for L2 learning. In this next section, we synthesize the research first by the focus of the study (e.g. student perspectives, vocabulary) and then by type of game (e.g. COTS vs Edutainment). We believe that distinguishing between COTS and Edutainment games is important because Edutainment

games are designed with specific vocabulary, grammar, and pedagogical goals in mind. We review the implications of the synthesis in the discussion section.

### *Student Perspectives*

Of the 49 studies identified in this review, 30 investigated student perspectives of a digital game that were played for L2 learning. Sixteen of these studies investigated student perceptions of edutainment games, of which ten specifically examined student interest in the edutainment game and found that participants enjoyed playing the game. (e.g. Ming, Ruan, & Gao, 2013; Müller, 2012; Richardson, 2016).

Some studies investigated participant perceptions of benefits of edutainment games for L2 learning. In a study investigating an adventure game, 86.5% (N=52) of pre-service teachers reported that they would use the game in future coursework and believed the game to be beneficial to L2 learning (Alyaz & Genc, 2016). In another study that investigated a location-based game, Holden and Sykes (2012) found that students valued the authenticity of tasks and content in the game. In Calvo-Ferrer's (2017) study using a game where players take on the role of an interpreter, participants reported higher levels of perceived vocabulary and listening gains than other L2 skills.

In addition to perceived benefits and enjoyment, researchers also investigated the effect of edutainment games on L2 learning anxiety. Hwang et. al, (2017) found that students with higher levels of anxiety experienced significantly higher L2 listening gains after playing a game than those with lower levels of anxiety. In another study comparing a board game and a digital game, Wu, Chen, and Huang (2014) found that those playing the digital game, without a teacher, experienced lower levels of anxiety compared to those playing a board game.

Of the studies that investigated participant perceptions of digital games using a COTS game (n=14), only four examined interest (Chen & Yang, 2013; Ebrahimzadeh & Alavi, 2016; Palaiogiannis, 2014; Peterson, 2012), and they all reported that students enjoyed the game. One study also found that participant enjoyment was positively associated with vocabulary gains (Ebrahimzadeh & Alavi, 2016). It should be noted here that one game compared a COTS game with two edutainment games and found that enjoyment of the game was determined by the participants' status as a game or non-gamer.

Three studies focused on participant perceptions of L2 learning benefits in COTS games (Goh, 2016; Palaiogiannis, 2014; Wu, Richards, & Saw, 2014). All three studies reported that students believed they improved their L2 proficiency as a result of playing the game. One study noted that learning occurred as a result of exposing learners to new vocabulary (Goh, 2016) while participants in another study noted the interactions with other players as the source of learning in the game (Wu et al., 2014).

In addition to benefits and interest, three studies investigated how digital games affected participant perceptions of motivation to learn the L2. Ebrahimzadeh and Alavi (2017) compared perceptions of motivation by learners who played the game, watched the game, and those who read a script similar to the game content. They found that those who watched the game reported higher gains in motivation to learn the L2 than those who read the text, which they argued was a result of allowing participants to engage in an interesting activity without having the stress of actually playing. Vahdat and Behbahani (2013) found that 95% of their participants agreed that the game increased their motivation to learn the L2. Vandercruysse et. al (2013) found that adding competition elements to a game did not influence learners' motivation when playing a game.

Finally, a few studies examined the influence of games on learner L2 self-efficacy. Reinders and Wattana (2014) reported that playing a digital game promoted participants willingness to communicate in English and confidence to speak English in the classroom. Although Vandercruysse et al. (2013) did not see a difference in motivation when comparing in-game conditions (competition vs. no competition), they did find that those in the competition condition had higher levels of L2 confidence, task value, and investment in the game after playing when compared to a collaborative condition.

### *Vocabulary*

Eighteen studies in this review focused on L2 vocabulary development. Ten of these studies used an edutainment game, and six of those ten used a drill and test game. Four studies compared experimental (i.e. game) and control groups (i.e. non-game) for teaching vocabulary (Ansteeg, 2015; Calvo-Ferrer, 2017; Hung, Young, & Lin, 2015; Wu & Huang, 2017). Of those studies, one found similar gains between the two groups but noted that the gaming group enjoyed the intervention more (Ansteeg, 2015). The other three studies reported larger gains for gaming groups than non-gaming groups (Calvo-Ferrer, 2017; Hung et al., 2015; Wu & Huang, 2017). It should be noted that Hung et al. (2015) further found that the difference between gaming and non-gaming conditions was only significant for low achieving students.

Of the studies using Edutainment games to develop L2 vocabulary knowledge, two studies compared learning gains by participants who were exposed to vocabulary both in a game and outside of a game via flashcards or textbook (Hitosugi, Schmidt, & Hayashi, 2014; Müller, 2012). Hitosugi et al. (2014) found that vocabulary learned via digital game was retained better in the long-term than vocabulary learned via textbook. Müller (2012) reported that vocabulary learned in the game was recalled faster and more accurately than vocabulary learned outside of the game.

Two studies also compared vocabulary gains between different conditions within Edutainment games (Franciosi et. al, 2016; Peng et. al, 2016). Franciosi et. al (2016) compared vocabulary gains among participants who used *Quizlet* (a flashcard system) while playing a game and those who did not. They found that those who used *Quizlet* reported better vocabulary gains. Peng et al. (2016) compared vocabulary gains among different group orientations, specifically competitive, cooperative, and conjunctive. The authors define conjunctive groups as those whose results are determined by the lowest performing member of the group. They found that for low achieving students, the conjunctive group lead to the highest gains in vocabulary. Finally, two studies examined in-game vocabulary development without a comparison group or condition (Alyaz & Genc, 2016; Dourda et al., 2014). Alyaz and Genc (2016) found that participants scored significantly higher on a post-vocabulary test after playing an edutainment game. Dourda et al. (2014) found that 45% of the words used in a reflection journal after playing a digital game were previously unknown vocabulary words.

Eight studies investigating the effect of digital games on L2 vocabulary development used a COTS game. Of these studies, two identified vocabulary learning strategies that language learners used in the games (Bytheway, 2014; Palaiogiannis, 2014). Two studies compared vocabulary gains between different conditions within the game (Chen & Yang, 2013; Ebrahimzadeh & Alavi, 2016). While Chen and Yang (2013) did find significant gains in vocabulary development, they did not find a significant difference between players who took notes and those who did not. Similarly, Ebrahimzadeh and Alavi (2016) did not find a difference between watching and playing a game conditions but did note that vocabulary gains were positively correlated with knowledge gains and autonomy.

Similar to studies investigating vocabulary gains in Edutainment games, two studies using COTS games compared gaming vs non-gaming conditions. These two studies found that gaming conditions resulted in significantly higher vocabulary gains (Urun, Aksoy, & Comez, 2017; Vahdat & Behbahani, 2013). One study investigated the effect of a digital game on vocabulary usage during a writing assignment (Franciosi, 2016) and found that after playing a game, students used more newly learned vocabulary in the writing assignment than those who learned via *Quizlet*. Finally, one study explored how environmental characteristics assisted vocabulary learning in an MMORPG (Zheng et al., 2015). The authors illustrate how a player relied on other players and the gaming environment to learn new words.

### *Affordances*

Seven studies investigated the affordances of digital games for L2 learning (Ibrahim, 2017; Newgarden & Zheng, 2016; Newgarden, Zheng, & Liu, 2015; Rama et al., 2012; Zheng, 2012; Zheng et al., 2012; Zheng et al. 2015). These studies draw from ecological psychology frameworks which argue that

learners perceive and act on affordances that are noticed in an environment (see Gibson, 1979; van Lier, 2004). Ibrahim (2017) explored how gaming ecology factors such as L2 proficiency, gaming experience, and L2-learner identity influenced the amount and type of player to game interaction that occurred. They found that players with high L2 proficiency and extensive gaming experience were able to play the game smoothly but did not explore learning opportunities within the game as they were able to rely on past gaming experiences and L2 ability to make inferences about how to progress through the game. Rama et al. (2012) examined World of Warcraft (WoW) gameplay by two L2 learners of Spanish. They were interested in exploring how game designs, cultural norms, and players unique behaviors afforded unique learning opportunities. They found that WoW afforded learners a safe L2 learning environment, opportunities to communicate, and collaboration. Similarly, in a series of studies investigating the affordances of a digital world from a dialogical perspective in which languaging is seen as an act of value realizing (Zheng, 2012), several studies have illustrated how language learning in digital games with highly contextualized environments and expressive avatars allow for both verbal and physical communication (Newgarden & Zheng, 2016; Newgarden et al., 2015; Zheng, 2012; Zheng et al., 2012; Zheng et al. 2015). Zheng et al. (2015) provide detailed examples of how such environments provide learners with opportunities to learn vocabulary in natural contexts through the aid of a co-quester. Newgarden and Zheng (2016) show that by using voice chat instead text, learners can simultaneously communicate and carry out goal-directed actions. Finally, Zheng et al. (2012) demonstrate a variety of communicative actions that are afforded from cooperative gameplay in WoW. They argue that such affordances allow for social capital building opportunities and experimentation with the L2.

### *Specific L2 Aspects*

Ten studies investigated the effect of digital games on specific L2 learning aspects (pragmatics, writing, reading, etc.). Of those 10 studies, four examined how digital games can be used to improve L2 learners' understanding and use of pragmatics in the target language (Cornillie et al., 2012; Hong et al., 2017; Shirazi, Ahmadi & Mehrdad, 2016; Vandercruysse, Vandewaetere, Cornillie, & Clarebout, 2013). Cornillie, et al. (2012) investigated the perceived usefulness and preferences of support in the form of explicit and implicit corrective feedback (CF) in an educational game designed to improve players' understanding of English pragmatics. They found that participants believed that CF was useful, and they preferred explicit CF. Hong et al. (2017) used brain scans and post-gameplay surveys to investigate the impact of learning English via digital game on brain functional connectivity. They found a connection between learning English pragmatics and changes in the brain scans. Shirazi et al. (2016) used the game *The Walking Dead* to teach apology and requests in English. They found that when compared to a non-gaming group, the gaming group had significantly higher scores on an English pragmatics post-test. Finally, Vandercruysse et al. (2013) compared students' gains in knowledge of business English between competition and non-competition groups. They found no differences between competition and non-competition groups and did not find a significant increase in knowledge gain for the gaming groups overall.

Two studies investigated effect of digital games on writing. Palaiogiannis (2014) reported on student perceptions of a story-driven COTS game and found that students believed it benefited their writing. Neville (2015) compared two classes studying German words related to waste management and their ability to produce a narrative. They found that participants who played the game used more textual indicators referencing the activities involved in waste management and other aspects about recycling more than those in the control group.

In terms of L2 skills (e.g. listening, speaking) only a few studies examined these topics. One study compared L2 listening gains between a gaming and non-gaming group and found that the gaming group achieved higher post-test scores (Hwang et al., 2017). In a study that examined reading strategies used in a digital game, Dourda et al. (2014) found that students enjoyed the game, received opportunities to learn vocabulary, and employed several reading strategies. Wu et al. (2014)

compared a board game, digital game, and teaching instruction on the ability to increase motivation and English-speaking skills. They found that the participants who played the digital game had higher gains in English speaking. Erhel and Jamet (2016) compared student gains in understanding French present perfect tense between two instructional strategies in a digital game: mastery-goal instruction and performance-goal instruction. Mastery-goal instruction emphasizes the need to learn new skills compared to performance-goal instruction which simply emphasizes task completion. They found that students in the mastery-goal instruction did significantly better on a knowledge transfer questionnaire. In the next section, we will discuss the implications of these findings.

## DISCUSSION

This systematic review set out to provide both a broad summary of L2 research on digital games in the last five years as well as a detailed synthesis of the findings. Looking at the field broadly, a few trends stand out. First, most studies (N=38) investigated adult learners. While this is likely due to the convenience of adult participants (e.g. university students), more research should target K-12 learners. The emergence of dual language immersion programs in states like Utah, Oregon, and California means that more youth will be exposed to a L2 at earlier ages. This not only creates an opportunity for research with younger learners but also a need for evaluating the effectiveness of digital games for developing both content knowledge and language skills simultaneously. In this review only one study was found that attempted to teach both content and language skills to elementary learners in a digital environment (Dourda et al., 2014).

Another notable trend is the lack of research with languages other than English. Only 18 studies were identified that investigated the use of digital games for a language other than English. However, with the emergence of game development software that allows small teams to create games, along with the rise and speed of crowdsourcing translations for COTS games (Dellepiane, 2012, October 16), a growing number of games with multiple language options have become available. Future research should take advantage of these opportunities to explore the effect of digital games on learning other languages.

Another important finding was that only six studies investigated sample populations larger than 100. This is likely because using multimodal analytics in gaming research can be very time consuming and complex. One solution is to start using log data to develop streamline analytics for L2 development. In a follow-up investigation, this study found that only 28.5% of the studies in this review used log data to record in-game choices, track learning behaviors and/or as evidence for learning. Log data can provide both researchers and educators with real-time assessment of player performance and it has the potential to provide players with personalized feedback during gameplay.

In terms of research focus, most of the studies (63.3%) examined student perspectives of the game. The synthesis revealed that these studies found that participants a) enjoy both COTS and Edutainment games which was similar to Yudintseva's (2015) findings, b) believed the game to be valuable to their learning (e.g. Calvo-Ferrers, 2017; Goh, 2016), c) experienced less anxiety (Hwang et al., 2017; Wu et al., 2014), d) improved motivation (e.g. Vahdat & Behbahani, 2013), and e) an increase in willingness to communicate (Reinders & Wattanna, 2014). While these findings are undoubtedly promising, more studies will need to explore the impact of playing these games long-term. In other words, are these findings simply due to the novelty of playing a digital game in the classroom, or will they continue to affect learners' attitudes in a positive manner after playing the game over longer periods of time.

Vocabulary was the second most researched topic and studies found larger vocabulary gains for gaming conditions when compared against non-game conditions for both COTS and edutainment games (Calvo-Ferrer, 2017; Hung et al., 2015; Urun et al., 2017; Vahdat & Behbahani, 2013; Wu & Huang, 2017). Some studies have begun to explore different conditions within games (notetaking, using Quizlet, group orientation, etc.) and have found mixed result (Chen & Yang, 2013; Ebrahimzadeh & Alavi, 2016). As other researchers have argued, it is important to

continue this line of research to explore how different gaming conditions affect learning outcomes (Hubbard, 2002; Cornillie et al., 2012).

Research examining affordances of digital games has focused on MMORPGs, with the exception of one study (Ibrahim, 2017). Studies focusing on MMORPGs such as WoW, have found that learners are afforded opportunities for value realizing by using both verbal and physical means of communication (e.g. Zheng, 2012), a safe environment for experimenting with and communicating in the L2 (Rama et al., 2012), and opportunities to use the L2 in a wide diversity of communicative activities that emerge from collaboration (e.g. Zheng et al., 2015). This research has been done with more advanced speakers. More research should explore how providing support to less proficient L2 speakers affects the previously identified affordances in these games.

Finally, research on outcomes on L2 skills is lacking. Early studies show promising results, however before making claims about the effectiveness of digital games in these areas more research is needed.

## CONCLUSION

In this review, we first presented an argument for defining games. This definition was then used to identify digital games used in L2 research in the last 5 years. A broad overview of these studies showed that while the field continues to grow there are still areas that are under researched, specifically the impact of digital games on L2 learners of languages other than English, younger learners, and with larger populations. Furthermore, these findings illustrate that focus of research should shift from studies that compare gaming and non-gaming conditions to studies that investigate ways of making digital gaming environments more efficient (Cornillie et al. 2012). In addition, research should move away from simply investigating vocabulary gains after playing digital games and explore how other L2 aspects are affected by digital games. Finally, the synthesis section of this paper found that while researchers have focused on student perspectives and vocabulary, there is a growing number of studies exploring the impact of group dynamics on L2 learning outcomes.

### Limitations

This review has a few limitations that should be addressed. First, only one coder was used to identify and code the studies located in this study. This may have led to some biases and additionally there may have been some studies missed or miscoded by accident. Secondly, some studies were removed from this paper because they did not provide a description of the game used in their study and they did not respond to inquiries when contacted by email. These studies may have changed the analysis and findings.

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