A Systematic Review of Game Designs and Outcomes of Serious Games Targeting Different Groups in Language Learning

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ABSTRACT

As technology develops by leaps and bounds, serious games have been widely applied in all walks of life. However, little is known about the differences between serious games oriented to various groups. This current study thus attempted to compare and analyze the differences between serious games in language learning targeting typically developing individuals and those with autism spectrum disorders regarding game design and outcome and to figure out the challenges that individuals might face during the post-pandemic time. Related peer-reviewed papers (n=14) were chosen to utilize the preferred reporting items for systematic review and meta-analysis protocol (PRISMA-P). The findings showed that serious games with differently oriented groups differed in factors, aims, and models. Most of them were conducive to participants. It was also found that education designers should consider the well-being of teachers and learners and elements of COVID-19 while designing games. Implications for future studies were also discussed.

KEYWORDS

Game Design, Individuals With Autism Spectrum Disorders, Language Learning, Outcome, Post-Pandemic Period, Serious Game, Systematic Review, Typically Developing Individuals

INTRODUCTION

As technology grows by leaps and bounds, the concept of serious game has gained increasing popularity among people in different walks of life, such as education (Acquah & Katz, 2020; Yu et al., 2021) and healthcare (Kokol et al., 2020). Most importantly, recent years have witnessed the booming of the serious game. It was argued that a game with specific aims achieves cognitive and affective engagement more than motivating attitudinal or behavioral engagement (Quariachi et al., 2018). As a result, serious game has become a prevalent issue discussed by scholars, and their increasing yearly outcomes are in Figure 1. It was a tendency for publications and citations of the keywords “serious game” searched on the Web of Science (WoS) on October 31, 2022.
Serious games were always conceived as novel learning and teaching tools that combined learning with entertainment. In terms of educational contexts, serious games could bring better performance and more gain of knowledge in the learners when compared with the traditional way of instruction (Giannakos, 2013) in that serious educational games were tools that possessed the ability to better-learning equality, exert positive impacts on behavior, cognition, and emotion of the learners (Daoudi, 2022). In terms of healthcare, a serious game could be applied to deal with people with autism spectrum disorders, which was available to enhance the ability to recognize and show fundamental emotions of people with autism spectrum disorders (Dantas & do Nascimento, 2022). It is thus of great significance to administrate a timely systematic review of serious game to improve the individual ability to language learning.

There are a considerable number of innovative studies on serious games concerning education and healthcare. For instance, a scoping review examined empirical evidence and the influences of digital game-based language learning (Hung et al., 2018). A study on the game-based invention for disorderly developed kids could be searched (Kokol et al., 2020). Some papers focused on the learning outcomes for different study sections (Acquah & Katz, 2020). A scoping review narrowed down its research field on language learning (Xu et al., 2020). However, the two disparate branches were never compared and discussed in the same systematic review together. Therefore, the importance of conducting a systematic review is again demonstrated. To complement this missing link, this study aimed to compare the difference between serious games of the two domains, namely, typically developing individuals and those with autism, in terms of game design and outcome, which differed from the studies mentioned above. The comparison between these studies and the current one is summarized in Table 1.

BACKGROUND

Serious Games in Educational Contexts

Recent years have witnessed a common phenomenon that serious games have been widely adopted in educational contexts (Yu et al., 2021), especially in language learning. Educational games, different from traditional instruction, could bring better performance and more gain of knowledge to the
learners (Giannakos, 2013) because of their game-based nature (Yu, 2018). After questionnaires and experimental evaluation, the game designed by the study was affirmed by students and teachers, and the case achieved good results in implementation. In addition, the game-based teaching method mobilized students’ interest in learning, thus further demonstrating that the effect of educational games was better than the traditional methods (Zheng, 2019). Serious games have been designed in various ways, from websites to innovative device applications.

Educational games were proven to gain acceptance by users on average in education (Yu et al., 2021). From the students’ perspective, they deemed that serious games had hugely contributed to acquiring knowledge and collaborative competence (Calabor et al., 2018). The application of game-based learning positively impacted student engagement (Yu et al., 2021). However, game-based learning was unfairly effective for all students, as girls outperformed boys in terms of engagement and learning outcomes (Khan et al., 2017). Another critical stakeholder within an educational environment could be teachers. Pre-service teachers once reported that educational games played a significant role in facilitating their understanding of the subjects exhibited in a better way (Lacin-Simsek et al., 2022).

### Serious Games in Healthcare

Nowadays, the technology to address social communication impairment is scarcely adopted because of a shortage of maturity. However, mentally disabled persons, especially autistic children, have gained attention from people worldwide. As a result, the problem of how technological interventions deal with social communication impairments requires meticulous discussion (Wieckowski & White, 2017). In special education, serious games could be seen as an interventional tool for reducing anxiety and disruptive classroom behavior of people (Bossenbroek et al., 2020). To be more specific, autism spectrum disorder is a complicated neurodevelopmental disorder where individuals suffer from impairment in both verbal and nonverbal social communication and interaction. They were restricted to a repetitive and stereotyped pattern of behaviors, with multifaceted factors abounding. The disorder’s illness varied from person to person without any significant reasons. However, its symptoms appear during the first three years of a child’s life and affect later life (Marty & Segal, 2015).

The use of computer technologies was found to enhance the ability to recognize and show fundamental emotions of people with autism (Dantas & do Nascimento, 2022). Furthermore, a computer-based game named JeStiMulE was developed to treat patients with high-functioning autism and low-functioning autism logically (Serret et al., 2014). Emotiplay was a serious game aiming to address high-functioning problems in emotion recognition. It was effective and motivating to cross-culturally teach emotional recognition via several factors (Fridenson-Hayo et al., 2017). The

### Table 1. The comparison between the previous reviews and the current review

<table>
<thead>
<tr>
<th>Study</th>
<th>Database</th>
<th>Time Period</th>
<th>Foci</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Hung et al., 2018)</td>
<td>Ten journals (BJET, C&amp;E, ETRD, ETS, ILE, JCAL, CALL, LLT, ReCALL, and System)</td>
<td>2007-2016</td>
<td>✓</td>
</tr>
<tr>
<td>(Kokol et al., 2020)</td>
<td>MEDLINE and Scopus</td>
<td>before May 5, 2019</td>
<td>✓</td>
</tr>
<tr>
<td>(Xu et al., 2020)</td>
<td>ERIC (EBSCO)</td>
<td>2000-2018</td>
<td>✓</td>
</tr>
<tr>
<td>this study</td>
<td>WoS, EBSCO, Wiley Online, Emerald, SAGE Journals, JSTOR</td>
<td>2013-2022</td>
<td>✓</td>
</tr>
</tbody>
</table>
relationship between emotion recognition and children’s strategy choices seemed unclear (Pacella & Lopez-Perez, 2018). Their behavior was not usually identical to their planning, but they used their perception to action with numerous challenges (Baldassarri et al., 2021). However, young autistic individuals could recruit cognitive abilities to distinguish between different types of spoken emotions but fail to understand subtle emotions (Icht et al., 2022).

**Game Design**

When it comes to the term “design,” its definitions vary. Schön defined it as an improved practice (Schön, 1984). However, it was also deemed as a mangle of practice or science because designers worked as scientists worked with their artificial tools to reach the balance of the background content (Pickering, 1995). In addition, “design” was defined as a process of proactive failure analysis (Petroski, 2008) and of investigating limitations (Gaydos, 2015), as well as the way and reason things work from the perspective of people (Gaydos, 2015).

A growing number of researchers focusing on game design could be searched in online databases. A qualified digital game used for education must balance learning and entertainment without bias toward entertainment or educational contexts (Prensky, 2001). Although educational games were considered a cross-disciplinary concept, the call to attend to game design was intended to help develop educational games (Gaydos, 2015). Youth with autism were keen on the motivating aspects of game design, whereas professionals emphasized underlying factors that improved the acquired skills under a serious game framework (Tang et al., 2019). Therefore, the author aimed to investigate game design in terms of factors, aims, and models.

**Outcomes of Serious Games**

Implementing educational games could enhance students’ learning outcomes (Franciosi, 2017; Patmanthara et al., 2019). Therefore, the learning outcome could be utilized as a test tool to examine the feasibility and usability of a serious game (Rusman et al., 2018). Storyline-based videogames in the foreign language classroom were proven to facilitate students’ learning process and the outcomes of their communication through interactive and engaging tasks that might raise their motivation (Casan-Pitarch, 2017). Furthermore, a game-like educational app, Duolingo, was designed to enhance learner motivation, thus contributing to better learning outcomes (James & Mayer, 2019). Regarding the actual outcomes, there was also evidence for the development and exercise of autonomy of the learners. Improved confidence and gains in vocabulary acquisition, listening, and oral fluency were also reported (Li et al., 2022).

Some factors were influential in learners’ outcomes in a serious game. For instance, self-efficacy was highly relevant to better outcomes (Topping et al., 2022). Apart from that, six key game features that impacted the outcomes were highlighted, i.e., ease of use, challenge (at one’s zone of proximal development), rewards and feedback, control or autonomy, goal orientation, and interactivity (Acquah & Katz, 2020). In an educational game, students’ understanding and learning outcomes could be affected by their perceptions of instruction (Vandercruysse et al., 2013). In terms of learning outcomes, blended learning was considerably better than online learning, with computer-assisted instruction being the most effective (Topping et al., 2022). However, not all learners could benefit from game-based learning similarly. Some individuals improved their language competencies through more conventional pedagogical approaches (Palomo-Duarte et al., 2019).

The author attempted to classify the related articles with unique ideas by comparing considerable studies on serious games. They previously found four reviews focusing on the research on serious games with different goals on language learning. Nevertheless, the previous studies focused on something other than the comparison between serious games applied in different domains. To address the problem, this review aimed to provide a better understanding of how serious games targeting autistic individuals and typically developing individuals differ from each other in terms of several aspects. The study thus proposed the following research questions:
RQ1: Who are the main users of serious games in language learning?
RQ2: How do serious games in language learning targeting different individuals vary in game design?
RQ3: How do serious games in language learning targeting different individuals vary in the outcome?
RQ4: What challenges are learners, educators, and game designers facing post-pandemic?

RESEARCH METHODS

The researchers followed the principles of the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocol (PRISMA-P) (Page et al., 2021). It was initially utilized in medicine but is now available in systematic reviews and meta-analyses. The researcher did not register for the review because this study did not involve human or animal participants. The process of PRISMA encompassed the following parts: typing keywords in the online search engine, screening the literature obtained based on inclusion and exclusion criteria, evaluating eligibility, a second round checking, and combining the previous version of reviews with the selected works.

Literature Search

The author obtained the previous studies by extensively searching in Web of Science (WoS), the digital database containing many high-quality publications. WoS was regarded as a tool for minimizing selection bias and enhancing the representativeness of studies (Yu et al., 2022). On October 23, 2022, the author firstly keyed in “serious game*” OR “educational game*” OR “game-base*” OR “digital game-base*” (topic) and “learn*” OR “teach*” OR “study*” OR “educat*” OR “student*” (topic) and “language learn*” OR “language learn*” OR “second language learn*” OR “foreign language*” OR “vocabulary?” (topic) in WoS Core Collection to grasp an overview of serious games applied in language learning. After addressing RQ1, the author utilized the original search strategy for careful analysis and refined the research field to Autism to check studies on serious games targeting autistic individuals. Therefore, 256 results were searched in WoS and imported to EndNote as a form of RIS to be further selected based on inclusion and exclusion criteria. They also searched literature from Emerald, EBSCO (Academica Search Premier and Business Source Premier), JSTOR, Sage, and Wiley on November 2, 2022.

Inclusion and Exclusion Criteria

The author further selected the publications searched by proposing the inclusion and exclusion criteria. Studies would be included if (1) the citation topics pertained to education and educational research; (2) they provided enough information about the full text; (3) they were published in recent ten years in order to avoid outdated results and conclusions; (4) they were relevant to the research questions. Studies would be excluded if they (1) did not focus on the application of a serious game; (2) were irrelevant to the research questions; (3) were out of the scope of education and educational research; (4) were not peer-reviewed articles. Therefore, together with the studies included in the previous sections of the review, the selected 14 papers were categorized, reviewed, and analyzed carefully.

Study Selection

The selection process for retrieving the studies is also shown in Figure 2. The researcher initially got a total of 1405 results from various online databases. After duplications were excluded, 1303 publications were independently screened with the included and excluded criteria. Then, the author invited a distinguished professor in education to take part in scoring the selected papers. 484 papers were evaluated for eligibility, and the quality assessment was adapted from (Kmet et al., 2004) for a better-refined analysis. The Cohen’s Kappa value was 0.729, demonstrating good inter-rater reliability between them. Inspired by (Deng & Yu, 2022), the author conducted a second round of checking of these papers, and one passage was added. With the previous studies, the author finally included 14 publications for this review.
RESULTS

RQ1: Who Are the Main Users of Serious Games in Language Learning?

The author got an overview of users of serious games applied in language learning by checking the Citation Topics Meso and Micro in Analyze Results of WoS. The author downloaded the visualization of the two items in bar charts from WoS Core Collection, the database including several high-quality works (Yu & Li, 2022). As Figure 3 vividly depicted, apart from language and linguistics, most of the beneficiaries are in education and educational research. Figure 4 showcased the citation topics from a micro level that the first four entries all concerned with typically developing learners. It is noteworthy that autism and development disorders also account for a part of the studies in both two bar charts. Thus, it could be concluded that typically developed individuals and autistic persons are the primary users of serious games in language learning.
RQ2: How Do Serious Games Targeting Typically Developing Individuals and Those with Autism Spectrum Disorders Vary in Game Design?

Serious games were developed in various countries, and their basic information is summarized in Table 2. The majority of serious games for average students were conducted by scholars in the Taiwan area in the last five years, revealing that they were heatedly discussed in Taiwan area. In addition, the rest of the articles were administrated by developed and developing countries. Regardless of their economic situation, people all attached great importance to the application of educational games. Furthermore, the effectiveness of most of these games was examined with a quasi-experiment. Due to limited resources, the author only got two serious games targeting autistic individuals. These games were designed by scholars in Britain and France, respectively.
Some serious games were developed with novel factors. The combo mechanism in \textit{SAVING ALICE} was such a kind of design. It referred to digital feedback, showing the successive beating with more reward, thus facilitating the learners to memorize the English vocabulary (Yang et al., 2020). Teachers in \textit{BETHE1CHALLENGE} were equipped with a dashboard. The dashboard could conduct learning analytics monitoring and analyzing process, performance, and participation of the students, thus facilitating the teaching process during the pandemic (Aguilar-Cruz & Guayara, 2021). \textit{GELS} was designed with a combination of English learning components and game tasks. Three game design features were involved, namely, time to master challenges to promoting and play to gain (Yang et al., 2018). Different mechanisms were utilized in \textit{LEGENDARY BEAST RESCUE I AND II}. A performance-contingent reward and a completion-contingent reward mechanism were involved in encouraging the students, with the second pattern providing a feedback mechanism (Roohani & Vincheh, 2021).

\textit{PHONE WORDS} and \textit{PHRASAL NERDS: PHRASAL VERBS} were serious games designed to improve learners’ vocabulary and literacy skills. The \textit{PHONE WORDS} app would perform six main functions, i.e., the word list, customized word list, pre-established learning path, traditional assessment, gamified assessment, and ranking among learning peers. Coupled with traditional assessment and gamified assessment, it aimed to improve the vocabulary acquisition of students with a peer competition bases on learners’ performance, thus encouraging them to be more passionate about vocabulary learning (Chen et al., 2019). \textit{PHRASAL NERDS: PHRASAL VERBS} was developed to learn phrasal verbs better. The game consisted of 14 phases, each with two modes, i.e., the study mode and the quiz mode. It was played by the users offline (Roohani & Vincheh, 2021).

\textit{DIVINE DIVINITY} was the earliest game among all of the serious games searched. Thus its image quality and design rationale could have been better than others. It was a single-player fantasy role-playing video educational game to improve students’ writing in business English. It adopted the Four-Component Instructional Design model \textit{(4C/ID)}, including learning tasks, supportive information, procedural or procedural or procedural or just-in-time information, and part-task practice in the environment. This game was developed by combining competitive factors through feedback. Explicitly speaking, scores of virtual opponents would be shown after a level to encourage the users to be more competitive. The opponents’ scores changed according to the player’s scores (Vandercruysse et al., 2013).

Serious games targeting autistic persons were designed with particular elements. A virtual agent, Andy, served as a peer partner and a social communicator to support the social competencies of players in \textit{ECHOES}. Considering the peculiarity of autistic individuals, the agent Andy was based on the Social Communion, Emotional Regulation, and Transactional Support \textit{(SCERTS)} and FAtiMA \textit{(a computational model for emotional research)} model. Unlike traditional approaches with a repetitive task-based style, goal-oriented activities, and cooperative turn-taking activities were designed in the game functioning. The adoption of synthetic voice in \textit{SEMA-TIC} was to serve as a companion for the users. Its design could be explored with a trial and error strategy with a trained caregiver. In the beginning, a menu was shown for users to understand the organization of the game better. Apart from the learning context, a dictionary and a monitor for the caregiver were also provided.

\textbf{Games Differed in Factors}

Considering the game design, the two types of serious games firstly varied in factors involved. When the designers develop various serious games targeting different groups of users, different factors and their unique characteristics would be considered by them. For typically developing individuals, factors like peer competition (Chen et al., 2019) and cooperation were always taken into consideration to keep students absorbed in the educational context. The players were in a virtual background, where they had to finish the task of each level to achieve success. This mechanism bore a resemblance to the rationale of task-based learning. Due to the peculiarities of autistic individuals who suffer from
different extents of social communication disorders, more elements were allowed in designing the game. Thus, a virtual agent (Bernardini et al., 2014), and an artificial voice (Serret et al., 2017), which played the partner role, were commonly used in serious games for autistic individuals.

Table 2. Basic information on the ten serious games

<table>
<thead>
<tr>
<th>Article</th>
<th>Name</th>
<th>Participants</th>
<th>Country/Area</th>
<th>Method</th>
<th>Game Design</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Aguilar-Cruz &amp; Guayara, 2021)</td>
<td>BETHE1CHALLENGE</td>
<td>high school students</td>
<td>Colombia</td>
<td>qualitative</td>
<td>Seven missions on English language learning</td>
<td>positive</td>
</tr>
<tr>
<td>(Chen &amp; Yeh, 2019)</td>
<td>KAHOOT!</td>
<td>engineering university students</td>
<td>Taiwan</td>
<td>quasi-experimental</td>
<td>Not available</td>
<td>positive</td>
</tr>
<tr>
<td>(Chen et al., 2019)</td>
<td>PHONE WORDS</td>
<td>sophomore</td>
<td>Taiwan</td>
<td>quantitative and qualitative</td>
<td>Six functions for learning English with competitive factors</td>
<td>positive</td>
</tr>
<tr>
<td>(Roohani &amp; Vincheh, 2021)</td>
<td>PHRASAL NERDS: PHRASAL VERBS</td>
<td>learners in institute</td>
<td>Iran</td>
<td>quasi-experimental</td>
<td>Two modes, study, and quiz modes were involved</td>
<td>positive</td>
</tr>
<tr>
<td>(Yu &amp; Tsuei, 2022)</td>
<td>LEGENDARY BEAST RESCUE I AND II</td>
<td>fourth-graders</td>
<td>Taiwan</td>
<td>quasi-experimental</td>
<td>Performance-contingent rewards and completion-contingent rewards were included.</td>
<td>positive</td>
</tr>
<tr>
<td>(Yang et al., 2018)</td>
<td>GELS</td>
<td>fourth-graders</td>
<td>Taiwan</td>
<td>quasi-experimental</td>
<td>Star coins and digital badges were set as a reward mechanism to motivate the learners</td>
<td>positive</td>
</tr>
<tr>
<td>(Yang et al., 2020)</td>
<td>SAVING ALICE</td>
<td>learners in an institute</td>
<td>Taiwan</td>
<td>quantitative and qualitative</td>
<td>several well-established theoretical frameworks</td>
<td>positive</td>
</tr>
<tr>
<td>(Vandercruysse et al., 2013)</td>
<td>DIVINE DIVINITY</td>
<td>university and last-grade high school students</td>
<td>Belgium</td>
<td>quantitative</td>
<td>Designed for leisure with competitiveness.</td>
<td>positive</td>
</tr>
<tr>
<td>(Bernardini et al., 2014)</td>
<td>ECHOES</td>
<td>autistic children</td>
<td>Britain</td>
<td>qualitative</td>
<td>Intervention guidelines, recommendations, and a virtual social partner were designed.</td>
<td>negative</td>
</tr>
<tr>
<td>(Serret et al., 2017)</td>
<td>SEMA-TIC</td>
<td>autistic children</td>
<td>France</td>
<td>quasi-experimental</td>
<td>A synthetic voice was applied. A caregiver accompanied the player.</td>
<td>positive</td>
</tr>
</tbody>
</table>
Games Differed in Aims

In addition, the two types of serious games varied from the perspective of design aims involved. The design purposes of these educational games targeting typically developing individuals were to upgrade the personal ability to grasp linguistic skills. As is universally acknowledged, autistic individuals behave disorderly in their social communication. Therefore, related serious games attempted to improve their social skills and to correct their language use, with the former enjoying priority.

Games Differed in Models

Furthermore, the two types of serious games varied from the perspective of the models applied. They correlated with the aim and the group’s characters to an extent. For instance, the Four-Component Instructional Design model (4C/ID) was involved in the game (Vandercruysse et al., 2013). As for serious games for autistic users, models on emotion, SCERTS and FAiMA, were also applied in the design features of the games to render a friendly and comfortable atmosphere to the users.

RQ3: How Do Serious Games Targeting Typically Developing Individuals and Those with Autism Spectrum Disorders Vary in the Outcome?

Serious games in Table 2 with positive outcomes accounted for a large proportion. In PHRASAL NERDS, results showed that among the three types of learning means (game-based learning, learning with social media, and traditional instruction), students with the assistance of game-based learning improved the most. SAVING ALICE significantly improved the learners’ vocabulary knowledge (Yang et al., 2020). Learning and game performance showed a more optimistic correlation in learners with high anxiety in GELS. Thus students with high anxiety could foster learning performance during serious games (Yang et al., 2018). The role-playing game LEGENDARY BEAST RESCUE I was a significant factor in positively influencing Chinese language arts learning. Spending more time answering questions and watching instructional videos was conducive to better scores (Roohani & Vincheh, 2021). However, the learning outcome of DIVINE DIVINITY could have been more encouraging than others. With a competitive environment provided by the game, students were able to perform better during the interaction. Nevertheless, no interaction effect was found between competition and instruction (Vandercruysse et al., 2013).

Optimistic achievements were also presented in serious games targeting individuals with ASD. The intelligent agent, Andy, in ECHOES, might benefit autistic children. The number of initiations to the human practitioners increased through the three ECHOES sessions, but only half of the children increased their initiation to Andy. After playing in the ever-increasingly complex learning activities of the serious game ECHOES, children were found to be gradually disinterested in the agent. However, their response rate to the agent initiation remained stable (Bernardini et al., 2014). After playing SEMA-TIC, children with autism performed significantly better than those without participating in the game. In the segmental tasks, they still performed better. A fourth of children developed better decoding skills, thus quickly understanding certain irregular words and pseudo-words (Serret et al., 2017). Although clinical evidence was lacking (Kokol et al., 2020), these children benefited from serious games. Therefore, this promoted further investigation into the effectiveness of serious game-based, or immersive virtual reality technology-based education, in a meta-analysis.

The majority of these serious games shown in Table 2 had a positive outcome with different levels of achievement. The student’s ability language learning, including the application of phrasal verbs, vocabulary acquisition of the TOEIC, and literacy skills, was variously enhanced other than the last game of the first group developed in 2014, which was nearly ten years away and could be deemed as a period without mature ideology and advanced technology. In addition to the outcomes of these studies, aspects of other problems encompassing anxiety and competition were also addressed. Figure 5 reported an outline of the answers to RQ2 and RQ3.
RQ4: What Challenges Are Learners, Educators, and Game Designers Facing Post-Pandemic?

As is widely known, the COVID-19 pandemic has led to a radical challenge to the educational system worldwide. As a result, e-learning has been growing in popularity in education (Yu, 2021b). It was predicted that coupled with other fields in our daily life, post-pandemic education would be influenced by spatial and technological shockwaves, and it was true. Challenges that the learners, educators, and game designers confront in the post-pandemic era are listed as follows.

The Well-Being of Learners

The learners required close attention after the pandemic, whose occurrence was detrimental to the users’ well-being. The epidemic negatively impacted autistic children and their family members because, amid the lockdown time, support and access to medical services were not available (AlQhtani et al., 2021). Several aspects of the learners’ motivation to learn, and their acceptance of the video game, the commercial video game was valuable as an object of reflection for educational purposes (Rüth & Kaspar, 2021). Learners’ attitude was linked to the processing and final results of knowledge acquisition in serious games (Giannakos, 2013). A student-centered atmosphere was crucial to a successful learning activity, and the inciting or stimulating effect of educational interventions on learners’ emotions should be considered by educational designers (Brom et al., 2016).

The Well-Being of Educators

The well-being of educators in the post-pandemic period should also be a concern in that it was reported that the psychological situation of teachers was badly influenced, especially during the pandemic crisis, with numerous uncertain factors, such as the lack of administrative support, different levels of students’ proficiency, and emotional and physical effects (Wong et al., 2022). Misconceptions related to online learning, the shortage in educators’ abilities to utilize technology in school settings, and obstacles imposed by the structure and management of the original educational system were revealed (Alhashem et al., 2022). Teachers, together with students, are all the stakeholders in the process of
learning. As a result, the message that teachers’ well-being should be on the agenda of educational designers should be highlighted.

**New Elements Designed by Game Designers**

As is acknowledged, an interesting and engaging medium is essential to educating different types of learners (Pistoljevic & Hulusic, 2019). Therefore, new teaching activities can be developed to overcome the difficulties brought about and the fear of illness in the past. Videos with teacher presence were said to measurably improve students’ achievements and increase their intrinsic cognitive loads (Yu, 2021a). Game elements involving current affairs and teachers could make the learners better absorbed in the learning process. Suppose a serious game manages to modify the learners’ behavior or attitude, which they must change by enhancing their effectiveness in their current education environment. In that case, it is a successful gamification. Furthermore, models of acquiring could be refined considering individuals’ mental characteristics in the post-pandemic time. An incorporated model of effect and learning for intelligent tutoring significantly improved learning (Hernandez et al., 2015).

**DISCUSSION**

This review systematically searched previous publications on the effectiveness of serious games for different types of learners. RQ1 figured out the main beneficiaries of serious games aiming at language learning, including normal individuals and individuals with autism. RQ2 and RQ3 aimed to examine and analyze the difference between the two types of serious games from different perspectives. RQ4 discussed the challenges the individuals face post-pandemic.

RQ1 aimed to explore the main users of serious games applied in language learning. Thanks to the “Analyze Results” function of WOS, it was easy for the researcher to figure out and visualize all the scopes of serious games for language learning based on the existing publications. Except for the aforementioned scopes, serious games were utilized in another field. However, the following research questions failed to focus on their application due to the limited number of issued papers. This research question gave readers an overview of serious games and promoted the following research questions.

RQ2 identified that these selected serious games vary in factors, aims, and models. Regarding serious games oriented to typically developing individuals, they were more likely to involve competitive and cooperative factors (Chen et al., 2019; Vandercruysse et al., 2013) to enhance learners’ literacy skills. Sometimes learning models were adopted. Cooperative and competitive gaming provoked a sense of personal responsibility for the environment among users. It promoted cognitive, emotional, and behavioral engagement among players (Vazquez-Vilchez et al., 2021) in such interactive environments, which were consistent with the previous study (Zhang & Yu, 2021). These elements also imperceptibly promoted learners’ motivation to learn the knowledge.

The uniqueness of autistic children accounted for the difference between the designs of these two types of educational games. They attempted to improve the students’ social communication capacity and enhance their ability to learn languages well (Serret et al., 2017). It is because autistic children require more motor skills (Kokol et al., 2020) to support that partners were thus designed to accompany the player. The research results corroborated the previous conclusions (Dantas & do Nascimento, 2022). The number of related publications that were available also demonstrated a lack of research on autistic individuals in recent years.

Through RQ3, the researcher found that most these serious games positively influenced the participants to an extent, which was in line with previous studies (Li et al., 2022; Zhang & Yu, 2022). The student’s language learning ability, including applying phrasal verbs, vocabulary acquisition of the TOEIC, and literacy skills, was indeed upgraded except for a serious game developed for autistic users (Bernardini et al., 2014). That was because the topic was not heatedly discussed, and technology did not grow by leaps and bounds then. Nevertheless, adverse outcomes should not be ignored for descriptive aims. They also contributed to the further enhancement of serious games’ settings.
RQ4 attempted to identify the challenges the educational designers and users will face post-pandemic. The researcher concluded that factors, including the well-being of educators and students, should be carefully considered. The administrators or the educators should modify the pattern of the educational system, educational activities, and serious games to adapt to the current situation, which could better assist the learners in obtaining knowledge with a positive attitude better. Improving the quality and dynamic of online content should be considered (Yu, 2021b). New elements involved and the interactivity of the game-based learning could be a blessing to learners’ outcomes (Zhang & Yu, 2021). Engagement and performance during the game provide essential information that can be used to develop the game further to meet the demands of learners with severe difficulties (Ronimus et al., 2019).

CONCLUSION

Major Findings
This current study attempted to compare and analyze the difference between serious games oriented to typically developing individuals and individuals with autism regarding game design and outcome and to figure out the challenges educators might face during the post-pandemic period. The findings revealed that serious games with differently oriented groups differed in their factors, aims, and models applied. The majority of these educational games were somewhat conducive to the participants. Education designers should take the well-being of teachers and learners and the elements of COVID-19 beyond the outbreak of COVID-19.

Limitations
The author conceded that the study had limitations. In the first place, due to the limitation of library resources, not all related publications can be available for us to review and summarize. In the second place, the term “design” was defined variously by previous scholars. Thus, the game design discussed in this study might need to be clarified for readers in different careers. In third place, the articles selected were all administrated as a way of case study, which could not be on behalf of all serious games.

Implications for Future Research
Future researchers could pay attention to the personalized design of serious games. A game designer should contemplate various characteristics of the oriented individuals. For typically developing individuals, their original language proficiencies vary from each other. Autistic individuals, each person shares different levels of disorder in social interaction, communication, and imagination. Multiple serious game platforms failed to provide accurate feedback to assist children with autism in studying items on facial expressions (Dapogny et al., 2019). Thus, even in the same game, the degree of difficulty should be adapted to different users. We should attach great importance to the pre-test before the adoption and monitor the game’s system during the game playing to perform the game’s functions best.

In addition, future research could consider the broad application of games that could improve the mental situation of the users. Nowadays, several individuals, especially young students, are suffering from mental illness, which is called intangible killers. It was demonstrated that learners’ anxiety levels decreased after using a mobile-based scaffolding board game (Hou et al., 2022). Further studies could focus on applying serious games to better cope with the learners’ emotional problems during their learning.

The study also sheds further light on broader conclusions for interventions in autism. In the future, people will have easier access to technology concerning information and robots to deal with autistic individuals (Cohen et al., 2017). For educators of individuals with autism, using information and communication technologies of serious games now can be exciting and promising as a tool to
handle individual problems with autism (Grossard et al., 2018). Individuals with autism indeed account for a large proportion of the population all over the world. Thus, the users’ perception should be investigated as an element when considering the development of a serious game. In addition to the users themselves, their parents’ perspectives should also be considered to modify the model of serious games and enhance the game’s quality. It could be seen as progress in the development of serious games dealing with children with autism because of the improvement in user-friendliness of launching the system (Ghanouni et al., 2021).

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COMPETING INTERESTS

The author of this article declares there are no competing interests.

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