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Embracing Representation: Integrating Canoeing and Female Swimming Adapted Sports in a Digital Game Platform

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Abstract. *The representation of individuals from diverse backgrounds in the media is a topic extensively discussed in literature, posing itself as a challenging area for investigation. Such representation can significantly influence whether a person chooses to engage with a particular application or not. Digital games serve as a crucial medium that offers opportunities to both learn various content and bring visibility to individuals from diverse profiles. However, the literature reveals a scarcity of digital games featuring characters with disabilities or special needs as protagonists. Therefore, this article presents a game that not only builds upon the existing modalities explored in previous studies but also introduces two additional modalities of adapted sports: canoeing and female swimming. The aim is to broaden the game's scope, allowing it to reach an audience that has yet to be targeted, while simultaneously contributing to the discourse on representation in digital media. The game can be used to stard discussions about gender stereotypes, disabilities, representation and diversity in line with the the Brazilian "National Common Core Curriculum" (Base Nacional Comum Curricular - BNCC).*

1. Introduction

In 1989, the concept of a 'culture of peace' was formulated during the International Congress on Peace in the Minds of Men[1]. The Culture of Peace and UNESCO's action in Member States, as outlined in the program and meeting document[2], establish fundamental principles that underpin activities promoting a culture of peace. These principles encompass the promotion of intercultural understanding, tolerance, and solidarity, the sharing of knowledge and free flow of information and ideas, a process that emerges from the beliefs and actions of the people themselves rather than being imposed externally, and the full participation and empowerment of women. Building upon Kamberidou's previous study, which highlighted the critical role of peace education in challenging social stereotypes and prejudices [Kamberidou 2008], we argue that approaching diversity can ensure equal representation of people with disabilities aligns with the culture of peace. Such representation has the potential to combat stereotypes, empower women, and promote inclusivity among diverse disability communities.

Approaching diversity encompasses more than just the representation of people with disabilities; it also includes individuals and groups who, due to various reasons, find

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[1]https://unesdoc.unesco.org/ark:/48223/pf0000126398
[2]https://unesdoc.unesco.org/ark:/48223/pf0000113537

themselves in social positions that make them continuously vulnerable and limit their opportunities for human development [Ferreira 2015]. According to Ferreira (2015), the Brazilian "National Common Core Curriculum" (*Base Nacional Comum Curricular - BNCC*) already addresses the concept of diversity and presents arguments emphasizing the need for a clear definition of diversity in educational contexts. In line with this perspective, we propose that diversity should be considered in the representation of individuals across various forms of media.

Representation of individuals with disabilities in multimedia is limited and often subject to biased stigmatization [Kolotouchkina et al. 2020]. The Paralympic Games, on the other hand, serves as a platform that not only fosters competitive spirit but also enhances visibility for people with disabilities. In their study, Kolotouchkina et al. emphasize the significance of promoting visibility for adapted sports and delve into important concepts surrounding stereotypes, technology, and gender in the representation of individuals with disabilities. Their research sheds light on the importance of accurate and inclusive portrayals in challenging societal misconceptions.

The existing literature offers a multitude of studies that underscore the crucial need for representation in various forms of media [Yoo et al. 2022, Hu et al. 2023, Holland et al. 2023b]. These studies shed light on the challenges associated with representing adapted sports, individuals with disabilities, and gender dynamics in sports. However, a notable gap persists in the research landscape when it comes to examining the development of digital games as a means to promote inclusive representation. Games have been applied in different educational contexts from many years not only for entertainment but also to promote opportunities for learning [Pietruchinski et al. 2012, da Silva et al. 2014]. Also, games can be considered tools that can be used for improving gender equality education [Barrera Yañez et al. 2020] and studies in this field may avoid stereotypes [Barrera Yañez et al. 2022, Costanzi et al. 2022]. Despite the acknowledged importance of representation, there is a dearth of studies exploring how digital games can effectively contribute to addressing this issue. Closing this research gap would be invaluable in harnessing the potential of digital games to foster meaningful representation and inclusivity.

Researchers also delve into the representation of disabilities in digital contexts [Mack et al. 2023]. Mack et al. argue that individuals with disabilities prefer being represented in digital environments through avatars that reflect their identities. Additionally, they reference another study [Mott et al. 2019] that indicates how avatar research often overlooks people with disabilities. In their own study, Mack et al. underscore the significance of adequate representation for individuals with disabilities in virtual domains. Specifically, in this research, we focus on characters in digital games, which serve as players' avatars.

In order to address the existing gap in the literature concerning misrepresentation in digital games, this paper presents the development of two mini-games as part of an application that aims to promote inclusivity and representativeness. These mini-games are integral components of the ParaJecripe Game, which has already garnered attention for its efforts in this regard [Brandão et al. 2016, Domingos et al. 2018]. Barrera Yañez et al. [Barrera Yañez et al. 2022] mention that games can be used in classes by teachers to start a discussion about gender stereotypes. In our case, the ParaJecripe game can be used

to stard discussions about gender stereotypes, disabilities, representation and diversity in line with the BNCC. The Parajecripe game should be applied to students in the final years of elementary school and in the first year of high school. The contributions of this paper can be summarized as follows: (i) the introduction of the mini-game featuring adapted canoeing, (ii) the introduction of the mini-game highlighting female adapted swimming, and (iii) a concise survey that emphasizes the lack of representation of individuals with disabilities and adapted sports in digital games. By addressing these key areas, this research seeks to fill the void and advance the discourse on inclusive representation in the realm of digital gaming. The users can freely download versions of the game[3].

This paper is structured as follows: In Section 2, an overview of representation of people with disabilities is provided. Section 3 delves into the description of the initial mini-games developed for the ParaJecripe tool. The characteristics of the two additional mini-games included in this study are presented in Section 4. Lastly, Section 5 offers conclusions and outlines future research directions.

2. Representation of people with disabilities

Games are a common resource for teaching technical and tactical gestures involved in sports in physical education classes [Camacho-Sánchez et al. 2023]. In the educational field in general, the results of a meta-analysis show that the use of serious games has a positive effect on learning, cognition, affect, and the training of basic skills [Lamb et al. 2018]. In the subject of physical education, in recent years, various serious games have been designed and investigated with promising results in relation to motivation, learning, and positive emotions, considering that part of this success may be due to the stimulation achieved thanks to the mechanics of game [Vukicevic et al. 2019].

Besides the educational field, digital technology has significantly influenced how young people participate in and consume sports as part of their leisure activities [Zhong et al. 2022]. Esports (or electronic sports), which are organised around the competitive play of digital games, have seen a rise in popularity in the past decade.

During the COVID-19 pandemic, when physical sports were restricted for safety reasons, esports events were broadcast regularly on television or the internet. The increasing number of viewers and sponsorships generated significant global revenues of $947.1 million in 2020 and this increased by 14.5 per cent to $1084 million in 2021 [NEWZOO 2021]. Esports have had such an impact on youth sports that the International Olympic Committee is aiming to capitalise on its popularity as part of its efforts to make the Olympic Games more appealing to young people [Tjønndal and Skauge 2021].

As stated by the Newzoo report from 2021 [NEWZOO 2021], the number of video game users in the world currently amounts to three billion people [Stasienko et al. 2021]. This multitude of players also comprises representatives of minorities and excluded groups, such as people with disabilities.These groups demand not only greater access to digital entertainment through, for example, dedicated controllers, functionalities, and interfaces, but also proper representation in games. Underrepresentation appears to be a significant problem.

An estimated 1.3 billion people experience significant disability [WHO 2023].

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[3]Downloads for Windows, Mac, Linux and Android – https://jecripe.wordpress.com/parajecripe/

This represents 16% of the world's population, or 1 in 6 of us. Although that, media representation of people with disabilities is still scarce and often anchored in stereotypes and social stigma [Silva and Howe 2012]. Despite advances in political and social capital, disabled individuals continue to be portrayed as either greater than or less than human, rarely seen as equals, through the way that media depicts and describes disabled people [Holland et al. 2023a], [Oliver and Barnes 2012]. [Garland-Thomson et al. 2002] identified the four most common ways in which disabled individuals are photographically represented in media contexts, each having the potential to further oppress and marginalize an already disadvantaged population. The four types of representations that Garland-Thomson identified were: wondrous, sentimental, realistic, and exotic.

Sport media is not only nonimmune to these trends, but rather have been found to perpetuate stereotyped images of disability [Silva and Howe 2012] if, and when, disability appears in the media at all. To date, a rich body of research focused on the representation of disability sport, and more specifically Paralympic sport, exists [Holland et al. 2023a]. This literature has largely explored and examined disability representation in traditional media sources, such as newspaper, magazines, websites, and television ads [Beacom et al. 2016], [Brittain 2017], [McGillivray et al. 2021], [Silva and Howe 2012].

In these studies, it is evident that disability sport, Paralympic sport, and recreation for disabled individuals is reported upon significantly less frequently, and with significantly lower quality than nondisabled sport [Bertschy and Reinhardt 2012]. According to [Brittain 2017], when the available media coverage is of good quality, it may potentially introduce people to concepts and ideas they are unfamiliar with and go against what society has socialized individuals to believe about disability. However, what is reported often propagates misconceptions of disability [Pardun 2005], such as those identified in [Garland-Thomson et al. 2002], or the more commonly used typologies in sport media, such as supercrips [Cherney et al. 2015]. That is, when disability sport does appear in the media, the emphasis is commonly on a contrived narrative about disabled individuals overcoming extremely difficult circumstances in order to achieve athletic success [McPherson et al. 2016] rather than on the athletic success itself [Hardin and Hardin 2003].

Sporting events, and the media spectacles that often follow, can provide a powerful platform to disseminate messages about the disabling effects of an oppressive society [McPherson et al. 2016]. The International Paralympic Committee (IPC), organization that regulates Paralympic sports worldwide, as well as some authors and organizations linked to Paralympic sports, claim that contact with the image and sporting achievements of Paralympic athletes can help in the sense of reducing prejudice against people with disabilities (PWD) [de Souza et al. 2020]. According to the IPC, athletes with disabilities "challenge stereotypes and transform attitudes, helping to increase inclusion by breaking down social barriers and discrimination towards people with an impairment" [de Souza et al. 2020].

Studies using modern forms of sports media (i.e. social media) have focused on a variety of aspects including the self-presentation of disabled athletes on Instagram [Mitchell et al. 2021], disability discourse centered around a specific hashtag, or topic, (e.g., #amputeefitness; [Mitchell et al. 2019]), and how 'diversity agen-

das' are represented on Twitter by various European public service media companies [Rojas-Torrijos and Ramon 2021], [Ramon and Rojas-Torrijos 2022].

It is important to ensure visibility of disabled athletes to reduce stigma and remove stereotypes about disabled people [Kolotouchkina et al. 2020]. Otherwise, resulting perceptions of incapability between disabled people and sport participation can have a number of deleterious impacts [Holland et al. 2023a], including reinforcing notions that disabled persons are incapable of physical endeavors and communicating to parents of disabled youth that sport and physical activity is not something for them to consider or engage in [Shields et al. 2012]. These deleterious impacts impose barriers and keep disabled people out of sport in a multi-pronged manner [Brittain 2004].

3. The ParaJecripe Game

The 2016 Paralympic Games held in Rio de Janeiro followed the Olympic Games of that year. While numerous digital games revolve around sports themes, there is a scarcity of games that focus on Paralympic sports. Moreover, the absence of Portuguese-language digital games covering multiple Paralympic sports limits the availability of resources for understanding sports tailored to individuals with special needs. To bridge this gap, our study enlisted the support of various Brazilian athletes involved in adapted sports, who not only shared valuable insights into their respective sports modalities but also graciously agreed to be portrayed as the principal characters within the digital game.

The game ParaJecripe is the result of a university extension project at the Federal University of ABC, designed to promote visibility for adapted sports modalities and athletes. This game has been previously featured in academic papers [Brandão et al. 2016, Domingos et al. 2017]. Initially, the game encompassed the following scenarios: athletics, swimming, tennis, quiz, and a store.

ParaJecripe features track events, including the 400-meter race and long jump. In the 400 meters event, the athlete character is represented by Terezinha Guilhermina, accompanied by her guide Rafael Lazarini. Terezinha competes in the T11 category, which is designated for athletes with complete visual impairment in track events [Mello and Winckler 2012]. Another athletics mini-game featured in ParaJecripe is the long jump, where the main character is Veronica Hipólito, a track athlete competing in the T38 category for individuals with cerebral palsy [Mello and Winckler 2012].

Clodoaldo Silva is the swimmer character in ParaJecripe, representing the S5 category, which primarily includes athletes with spinal cord injuries [Mello and Winckler 2012]. In this mini-game, players will notice a user interface element located in the upper left corner, indicating the available oxygen level at any given moment. After a few strokes, the oxygen level decreases, and the player must make the character breathe.

The character Marcos Vasconcelos represents ParaJecripe in wheelchair tennis. Marcos has consistently ranked among the top ten in the Brazilian rankings for the sport since 2012. The player competes against an opponent controlled by an algorithm. The match is determined by the character who wins two tennis games.

In all modalities, ParaJecripe provides information about the athletes, intriguing facts, and the history of the games. These contents are presented through interactive

quizzes. As players engage in the mini-games for each sport, they stay connected with pertinent information that can be utilized to answer the quiz questions. With each mini-game practice, players earn coins, but accessing the quiz section allows them to accumulate even more coins by correctly answering the questions. This incentivizes players to deepen their knowledge while enjoying the immersive sports experience.

As the player engages in the mini-games (sports and Quiz), they earn coins as rewards. These coins can then be used to access the Equipment Store, where various gadgets are available for purchase to customize the main athletes in the game. The Store offers a range of items tailored to each sports modality. Each purchase allows for specific customizations of the athletes. Consequently, the next time the player enters a particular mode, the character representing the sport will reflect the changes made through one or more store purchases. This adds a personalized touch to the gameplay experience, enhancing immersion and player engagement.

Figure 1. Curiosities of Adapted Canoeing

4. Adding mini-games: canoeing and female swimming

The ongoing effort to include two additional adapted sports in the ParaJecripe game demonstrates a commitment to expanding representation. This stage will continue until a comprehensive range of adapted sports disciplines are adequately represented in digital games, addressing the growing demand for inclusivity and diversity in gaming experiences. In this study, we introduce Adapted Canoeing and Female Adapted Swimming as valuable additions to the game's inclusive roster.

We carefully selected the two adapted sports to symbolize disciplines that have gained recognition in major sporting events, particularly since 2016, as exemplified by Adapted Canoeing. Moreover, our commitment to inclusivity extends to ensuring adequate representation of women, leading us to choose Female Adapted Swimming as the second discipline. In a significant development, we had the privilege of establishing contact with one of the most accomplished athletes in Female Adapted Swimming, who is now prominently featured as a character in the mini-game.

In line with the existing disciplines represented in the ParaJecripe game, the two added mini-games offer insights and intriguing facts about each respective discipline (Figure 1). These informational elements serve to educate players about adapted sports while also encouraging their active participation by challenging them with quiz scenarios. By providing a platform for learning and engagement, the game fosters a deeper understanding of adapted sports and motivates players to test their knowledge and skills.

4.1. Adapted Canoeing

The International Canoe Federation (ICF) governs both conventional and adapted disciplines of canoeing[4]. While the conventional and adapted disciplines share similarities, they differ in terms of the distances covered. In adapted canoeing, only individual events are held, unlike the conventional discipline, which also includes events with two or four participants. Moreover, adaptations exist concerning the types of boats used and specific gestures and sounds employed. The competitions take place in calm waters, and the courses are designed as straight routes.
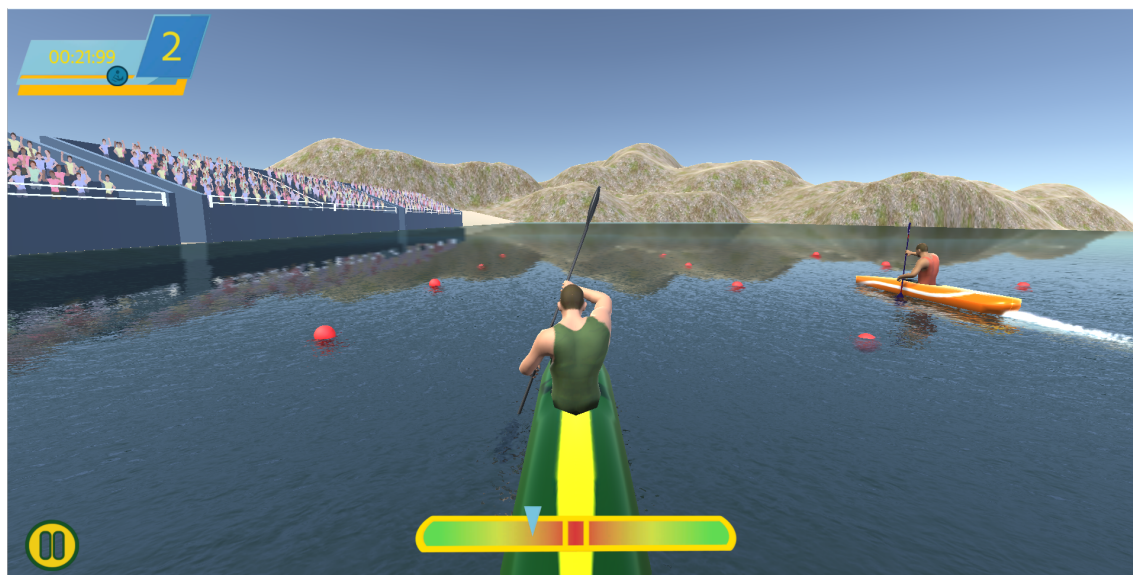

Figure 2. Canoeing scenario with the HUD user interface.

For centuries, humans have been using rowing boats for transportation. However, it wasn't until 2016, during the games held in Rio de Janeiro, that adapted canoeing made its debut among the featured sports in the grand event [Albarello 2014]. This highlights the growing recognition of the need to represent this discipline in various forms of media, including digital games. Despite Brazil boasting international champions in adapted canoeing, it has been challenging to directly engage with athletes from this discipline to accurately portray their characters in the game. Efforts are ongoing to bridge this gap and ensure authentic representation.

In the adapted canoeing mini-game, players have the unique opportunity to control their character using the spacebar key. The paddling actions are executed by alternately pressing the spacebar to simulate paddling with each arm (right and left). This action is

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[4]http://www.inteligenciaesportiva.ufpr.br/site_api/arquivos/canoagem1.pdf

timed with the appearance of a slicing game object at the center of the Heads-Up Display (HUD) game interface bar (Figure 2). The term HUD pertains to elements that are constantly visible to the player, such as a timer or a points counter [Schell 2008]. In game interface design, it's vital to keep certain elements visible to convey the player's progress in response to their actions [Bold and Garone 2013]. The primary objective is to showcase the skills of an athlete in this sport while promoting representation and inclusivity. The mini-game offers players the choice between selecting a tutorial to learn the mechanics or diving directly into gameplay. This flexibility ensures an enjoyable experience for both beginners and seasoned players.

4.2. Female Adapted Swimming

Edênia Garcia is a Brazilian Paralympic swimmer, known for her achievements in the sport. As a four-time world champion, she has represented Brazil in multiple Paralympic Games and world championships, earning a total of 17 medals. Edênia's success extends beyond her athletic prowess, as she also inspires others through motivational speaking engagements. In 2019, she shared her sexual orientation in a public interview, solidifying her role as a trailblazer and an inspiration to many. With her talent, resilience, and positive impact, Edênia Garcia has become an iconic figure in Paralympic sports [Wikipedia 2023].

Edênia is the character's female swimmer of the ParaJecripe game. She swims to the S3, SB2 e SM3 categories, referring to athletes mainly with spinal cord injuries [Mello and Winckler 2012]. In ParaJecripe, the user starts to play choosing between female and male disciplines.

After the user has chosen to play the Female Adapted Swimming, he/she starts the game when the application introduces the instructions showing the main character who performs backstroke (Figure 3).
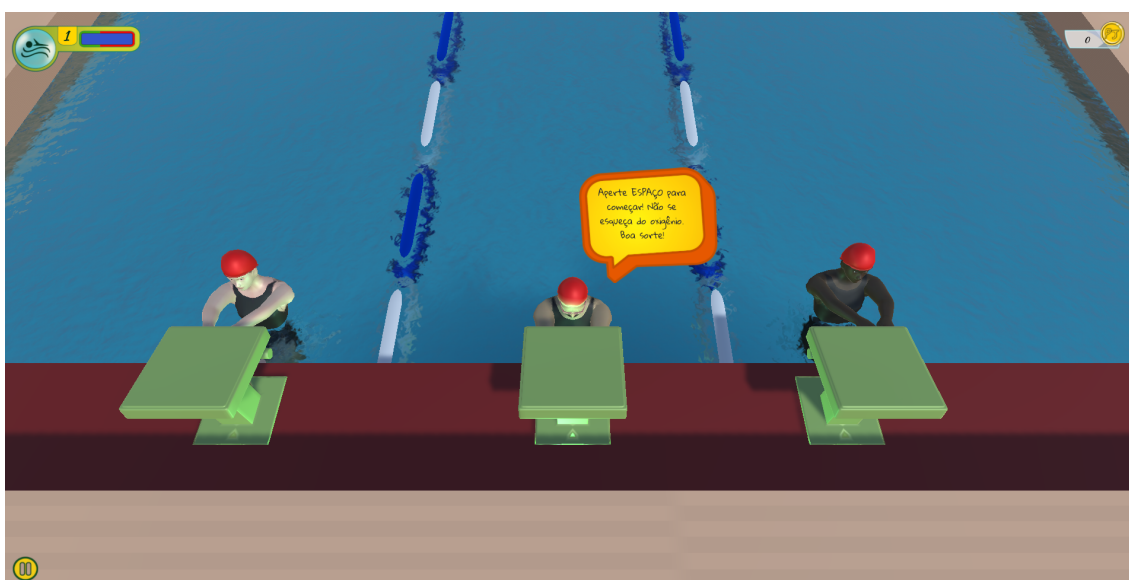

Figure 3. Characters in line to start the game session.

The player controls the character with the arrow keys and the space bar. The strokes are performed by alternating the arrows (right and left). However, in this mini-game, the player will see an element of the user interface, located in the upper left corner,

referring to the amount of oxygen available at any given moment. After a few strokes, the level of oxygen decreases and the player should breathe. Breathing is performed through the space bar (Figure 4).
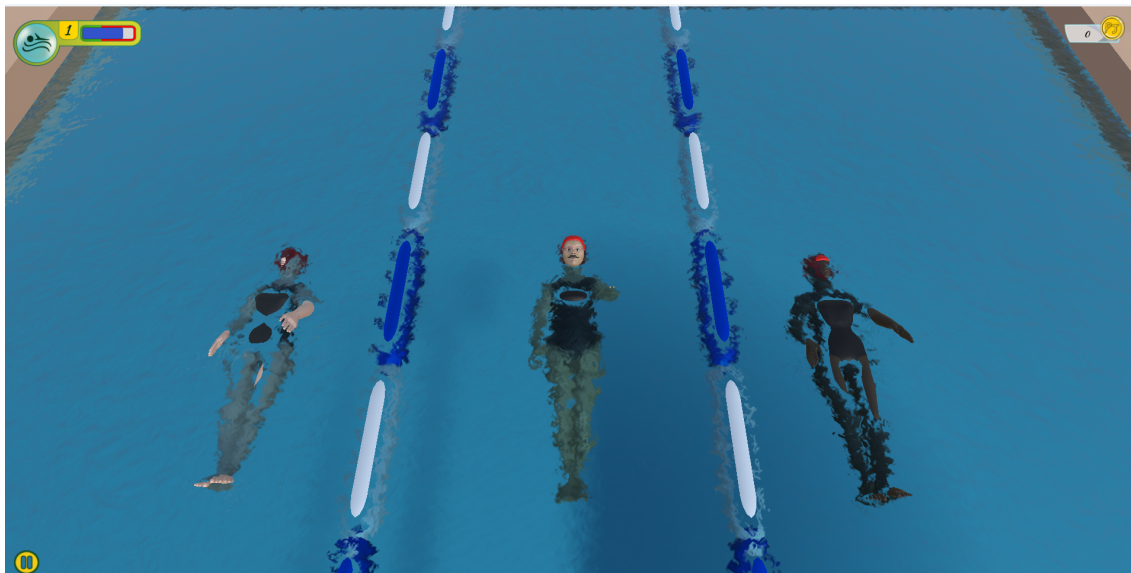

Figure 4. Character performing backstroke.

5. Conclusion and Future Work

This study emphasizes the significance of inclusivity and representation of individuals with special needs in adapted sports through the medium of games. Our research includes a brief survey that reveals a notable absence of digital games featuring gender representation and characters with disabilities in existing literature. The findings from this survey further strengthen the argument that the society should seize the opportunity presented by major sports events to shed light on the importance of representation, not only in digital games but also across various media platforms.

In order to address the existing gap in the literature, as highlighted by our survey, we strongly emphasize the need to continue developing more adapted sports within the realm of digital games. This game should be applied to students in the final years of elementary school and in the first year of high school. As part of our efforts, we are currently working on expanding the ParaJecripe game by incorporating two additional adapted sports: adapted canoeing and female adapted swimming. By including these disciplines, we not only enhance the representation of adapted sports but also consider the importance of gender representation in gaming. We highlight that this study aligns with UNESCO's 'culture of peace' and the Brazilian "National Common Core Curriculum" (BNCC). The ParaJecripe game can be used to stard discussions about gender stereotypes, disabilities, representation and diversity. The users can freely download versions of the game[5].

In terms of future work, we would like to emphasize that the development of the ParaJecripe game will be ongoing, with a focus on incorporating additional adapted

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[5]Downloads for Windows, Mac, Linux and Android – https://jecripe.wordpress.com/parajecripe/

sports. Furthermore, we recognize the importance of conducting a game evaluation to enhance the overall experience. In this regard, we propose the utilization of evaluation methods such as Cognitive Walkthrough and Semiotic Inspection, which should be thoroughly discussed in the continuation of this study. By employing these evaluation techniques, we aim to gain valuable insights and make informed improvements to the game to conduct experiments in school environments.

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