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THE PLAY EXPERIENCES OF DISABLED PLAYERS

Dealing with accessibility barriers and solutions

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ABSTRACT

Markus Kämäräinen: The Play Experiences of Disabled Players – Dealing with accessibility barriers and solutions
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This thesis examines the play experiences of disabled players, the different barriers they encounter, and solutions to alleviate said barriers. As the game industry is slowly transforming to a more inclusive mindset at large, the thesis intends to discover whether the experiences of disabled players correlate with this change. It seeks to find out if disabled players still encounter barriers and exclusion while playing and if there has occurred an evolution in game accessibility or accessible game design to tackle these issues.

An extensive online qualitative survey was wielded to produce rich data from which the appearing outcomes were drawn. The survey reached globally 95 participants with various disabilities and playing experiences. The data was analyzed by comparing quantitative statistics as well as by thematic analysis through coding and dubbing these into two distinct theme sets – one to evaluate the barriers and another to examine strategies to overcome barriers.

The findings indicate that disabled players constitute a diverse and passionate segment of the player community. Despite the existence of structural barriers within commercial games, disabled players adopted various strategies to engage in their gaming activities. In addition, this thesis reveals a recent improvement in game accessibility, with disabled players showing proficiency in utilising available accessibility settings. Many also resorted to software and hardware solutions to address built-in accessibility challenges. Nevertheless, persistent accessibility obstacles persist, primarily arising from game mechanics, hardware compatibility issues, and toxic multiplayer environments. Notably, the latter had a significant impact on respondents, hindering their ability to participate in multiplayer gaming.

Keywords: Disabled players, disability, video games, game accessibility, accessibility barriers, play experiences

The originality of this thesis has been checked using the Turnitin OriginalityCheck service.

Preface

I guess it is done now. Writing the thesis was not the most straightforward process, even though I had a significantly better basis for it than most thanks to Lobna and Pauliina. So, my gratitude is in place for them. Also, I want to thank the supervisors and peer students who gave valuable feedback during the process.

Thanks to my fiancée, daughter, and family for enduring my silent struggle with this pile of papers during the year. It's a bit easier from here on out (for a while at least). Lastly, for my friends guessing a decade ago who would become the most educated member of our group, it pains me to admit you being right. Go get yourself a degree so I am not the odd one out, for crying out loud.

Nokia, October 6th, 2023

Markus Kämäräinen

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1 INTRODUCTION

> "Some people are rude, and can get very angry when my [gaming] performance is not up to their expectations or they use my disability as a way to reject me" (P7, physical disability)

To study the experiences of disabled players[1], one needs to realize the impact of video game accessibility for successful play experiences. Video game accessibility is a fairly recent but crucial development in the game industry, that encompasses means and strategies to develop or modify games for the diverse player base with various, atypical needs or abilities (Yuan et al., 2011). During the past two decades, non-governmental organizations such as *AbleGamers* (2004) and *SpecialEffect* (2007) as well as game media sites like *DAGERSystem* (2012) and *Can I Play That* (2018) paved the way to raise awareness of the issues and possibilities of game accessibility. In commercial games, the change of tide has been visible during the last few years in the gradually expanding options to suit the needs of disabled players. Similarly, the study on game accessibility and disabled players have intrigued several researchers since the early 2000s, gaining wider recognition during the past decade (Aguado-Delgado et al., 2020).

Game accessibility research and studies of disabled players often have focused on, for example, different cases of specific impairments (Breugelmans et al., 2010; Khaliq & Torre, 2019; Oren et al., 2008; Vickers et al., 2013; Yuan & Folmer, 2008), the advantages of games for rehabilitation (Bonnechère et al., 2014; Cimolino et al., 2021; De Giglio et al., 2015; Leporini & Hersh, 2016), or strict game genres such as educational,

[1] Even though guides may recommend utilising the term 'people with disabilities' for neutrality, my thesis purposefully follows the social model way by using the term 'disabled people' where disability is not a negative quality but an integral part of one's identity.

serious games (Gay, 2021; Jaramillo-Alcázar & Luján-Mora, 2017; Terras et al., 2018) or multiplayer games (Gonçalves et al., 2020; Hernandez et al., 2014). Interestingly enough, a significant trend among these research papers is using and providing different guidelines, novel frameworks, and experimental prototypes to design said game types more accessible. Admittedly, they provide benefits in particular use cases but do not necessarily directly apply to the more general context of popular *commercial games*. For example, a framework or prototype version of a specific game for people with visual disabilities does not automatically contribute to the accessibility of mainstream games or for other disabilities, or a strong emphasis on the activity-enhancing and rehabilitating aspects of games is unnecessary to commercial games. Furthermore, the disabled players' voice on the current situation of accessibility in commercial games is severely lacking in research. As the prevalence of accessible commercial games has gradually expanded lately, so has the need for mapping out the recent situation of playing games with a disability to determine the persistent *pain points* and also *positive evolution* in game accessibility.

Contrary to the aforementioned academic developments, my thesis does not focus on a particular disability type or game genre but seeks to uncover and amplify players' play[2] experiences in their entire, rich diversity. The goal is to discover disabled players' playing practices, common issues and barriers they encounter when playing games, and different strategies and solutions they need to utilise to overcome these barriers. Additionally, it seeks to ascertain whether contemporary developments in game accessibility have actualised in play experiences. Therefore, my thesis employs a qualitative approach through an online survey to illustrate the genuine perspectives and lived experiences of the research subjects. As such, my research is built on the individual experiences of

[2] Although the term 'play' possesses several different meanings, in this thesis, it specifically connects to the playing of games.

disabled players operating in a deeply *qualitative paradigm*, where there is no single reality or truth, but multiple subjective ones that are closely connected to the context they occur in (Braun & Clarke, 2013). Consequently, all expressions of lived experiences found in the data are valuable in their own right, but for the sake of clarity, I focus on discerning frequently recurring patterns in the data.

Three research questions I am determined to produce answers to through the thesis are:

1. What are the play practices of disabled players?
2. What accessibility barriers do disabled players encounter while playing?
3. What kinds of strategies do disabled players use to overcome accessibility barriers?

I choose to bring forth three arguments that solidify the importance of the study. Firstly, playing games and participating in game culture is a popular, ever-growing societal phenomenon that encompasses a diverse set of player bases from all genders, age groups, geolocations, skill levels, and abilities. If we investigate the demand numbers-wise, the gradually expanding game industry is estimated to hit $490.58 billion in revenue in 2023 (Clement, 2023) surpassing the combined scale of the worldwide film industry and North American sports industries. (Witkowski, 2020). In addition, the unfortunate global pandemic of 2020 forced people into their homes, which further surged the popularity of games and game-related activities (King et al., 2020). The COVID notably affected at-risk disabled people more severely than others. Unfortunately, the exact number of disabled players is unknown, but, in 2019, a rough estimation suggested the presence of 2.5 to 3 billion active players. (Narula, 2019). Furthermore, at least a third of players experience a disability (Moss, 2014). Another survey revealed that 30% of the US and 20% of the UK population identify as disabled (Ngoc, 2022) – although not all of them play games or utilise game accessibility, the numbers indicate how prevalent disabilities are in society. Moreover, a study conducted in the Netherlands in 2015 revealed that 92

per cent of disabled people play games (Chin, 2015, as cited in Paige, 2020). Lastly, an additional survey indicated that 90 per cent of the study participants thought that their disability impacted their playing (Baltzar et al., 2023). Consequently, virtual worlds of games must be developed to be accessible to avoid exclusion and enable "taking part in a societal phenomenon of growing importance" (Miesenberger et al., 2008, p. 253).

Secondly, society actively disables people by constructing the world for people of perceived 'normalcy'. Certainly, the issue does not lie with disabled individuals themselves; instead, it arises from the construction of normalcy that, in turn, gives rise to the concept of disability (Davis, 1995, p. 24). In this type of society, the majority of physical environments, activities, and hobbies potentially pose hindering barriers for people with disabilities. Therefore, partaking in game cultures can be one of the lone activities that disabled people can consistently pursue – granted that we can effectively discern, remove, and prevent potential accessibility barriers in games. In fact, what gamers with disabilities seem to want, amongst many things, is not necessarily the invention of new accessibility guidelines or features, but the increased integration of current ones in more games so that they can access them like everyone else (Baltzar et al., 2022).

Thirdly, games today are distinguishably different from what they were like a mere 10 years ago. They will continue to evolve as new technologies emerge and are introduced to gaming, such as VR or XR technologies. Hence, game accessibility evolves rapidly making both games and research from more than a few years ago possibly outdated, especially studies focusing on accessible player experiences in commercial games. Even though my study will surely overlap with previous ones, it maps out the most recent situation, which, in the best-case scenario, would be rather evolved and could contain interesting comparisons and new developments that existing studies did not account for.

2 BACKGROUND

Before we can discuss the play experiences of disabled players and their relationship with game accessibility, it is imperative to explicate the concept of disability. Disability has a long and turbulent history, the ramifications of which are still observable in disabled people's peripheral status in society and in game culture sphere as well. Hence, in this chapter, I will elaborate on the subject of disability, its complexity and historical perspectives, and how it is ultimately framed in the thesis. Likewise, I will provide an extensive definition of video game accessibility and its key dimensions.

2.1. The complex conglomeration of disability

From the earliest human history, disabled people have populated the Earth, and simultaneously, they have been put on a pedestal. To be more specific, they have been an odd group that has been praised, pitied, despised, and even murdered throughout history. Per Marini et al. (2011), be it the Ancient Greeks' and Romans' habit of perceiving disabilities as punishment from God and thus killing or discriminating against disabled people, to disabled people being seen as an object for mercy for Christians in the Middle Ages, to the Renaissance witch hunts, factories' preference of healthy able-bodied workforce and firing of injured workers during the Industrial revolution, or Nazis' T4 extermination program, people with disabilities have been kept as weird and dubious – as *others* from the perceived normal.

The derogatory, discriminating practices towards disabled people prevail still in this day and age albeit not through so brutal nor transparent channels. According to prominent disability scholars: "disability tends to be figured in cultural representations as an absolute state of otherness that is opposed to a standard, normative body" (Snyder et al., 2002, p. 2). This is visible in public spheres, where the actions of strangers tend to uphold and

reinforce the otherness of disabled people. For example, by staring incessantly, strangers *objectify* disabled people marking them as non-persons, who supposedly don't mind being observed, questioned, imitated, called names, or avoided (Reeve, 2008, p. 210-211). Yet, as further declared by Reeve, these reactions can negatively impact the emotional well-being of disabled people and indirectly limit what they can do. As Morris states in their book, "It is not only physical limitations that restrict us to our homes and those whom we know. It is the knowledge that each entry into the public world will be dominated by stares, by condescension, by pity and by hostility" (Morris, 1991, p. 25). It is interesting to observe, as will be expanded upon in later chapters, that even today, it is these same attitudes that, for example, demotivate people with disabilities from venturing outdoors and playing an AR game such as *Pokémon Go* (2016) (Salen Tekinbas, 2017).

From a more theoretical point of view, Nagi (1965) devised a pioneer work of the conceptual model of disablement, where they made a distinction between *impairment* (physiological process), *functional limitations* (limitations on obligations within roles), and *disability* (impairments associated with functional limitation) (Nagi, 1965, as cited in Barnartt, 2010, p. 3). Since then, there have been developed several other conceptual models that were influenced by disability movements (Forstner, 2022). The later versions detracted from the biomedical roots of Nagi's model to emphasize the psychological, behavioural, or identity-related factors more as well as environmental barriers. Commonly, two well-known models of disability – the *medical model* and the *social model* – sit on opposite ends of the spectrum, even though they are often intertwined in public discourses. Additionally, they share a common quality that keeps them in congruence, the *permanency* of being disabled, meaning that even after medical interventions or socially constructed disability, impairment causes one to have a permanent disability status (Barnartt, 2010, p. 2).

2.1.1. Medical model

The medical model is a traditional but persisting notion of disability. It is on display in how medical institutions, media, and the general public present and assume disability. Essentially, the model posits disability in a negative light; disability is an ailment, deficiency, tragedy, and deviance from the norm needing to be fixed (Manago et al., 2017; Goodley, 2013).

In both healthcare and public discourses, the common response to someone being or becoming disabled is the inquiry if it is possible to be cured or rehabilitated. In particular, the news media revels on the successful *overcoming* of disabilities and restoring one's abilities. Per Titchkosky (2020), these fairy-tale stories are common and repetitive, further underlining the notion of disability as a negative, even inhumane condition that needs to be overcome.

Consequently, disabled bodies are put through various rehabilitation channels to get rid of the impediment. From physical therapy and medical interventions to assistive technology and even encouragement of personal willpower (Manago et al., 2017, p. 170; Barnartt, 2010), it is expected that they will, or would wish to, come back to the realm of 'normality'. If we scrutinize game culture through the medical model lens, it obliges disabled players to adapt to the ability requirements of games via assistive technology such as *adaptive controllers*. Therefore, it devolves the responsibility to disabled players and assistive technology developers to enable participation in playing games.

However, disabled people often feel that the medical model does not grasp the true essence of disabled lives and the disadvantages they experience (Dolmage, 2017). Furthermore, even from a medical perspective, disabilities are not necessarily curable nor ever fully preventable as they are part of the human experience (Kafer, 2013). Hence, in

the 1970s, the paradigm shifted towards the more understanding and interpretative social models of disability (Shakespeare & Watson, 2001, p. 23).

2.1.2. Social model

The social model of disability rose as sort of a counteract to the medical model's stigmatizing labels and the systemic oppression of disabled people in the 20th century, although, both models can also complement each other in practice. The tumultuous living conditions of the disabled population degenerated significantly due to massive technological advancements and mass migration during the Industrial Revolution when disabled people were excluded from working life and placed with the unemployed in cities (Goodley, 2013, p. 633). Combined with other developments of the era such as liberal utilitarianism, medicalization, eugenics, and social Darwinism, the situation led to the ultimate boiling point of the aforementioned atrocities of, e.g., Germany's Nazi government (Barnes, 2020, p. 15). Since then, as stated by Barnes, the policies softened largely because of the surge of disabled people, due to the increased wealth and medical advances as well as the moral obligations, because of the injury of a considerable number of people post-Second World War.

Then, in 1974, British disability activists founded the most influential organization for social model thinking, the Union of the Physically Impaired Against Segregation (UPIAS) (Barnes, 2020, p. 15), which attained scientific credibility via the writings of Mike Oliver, Colin Barnes, and Vic Finkelstein (Shakespeare & Watson, 2001, p. 3). According to Goodley, these writers utilised neo-Marxist and Gramscian analyses of material barriers experienced by disabled people in their mundane everyday lives – the writers sought to politicize disability and increase socio-political participation (Oliver, 1990, as cited in, Goodley, 2013, pp. 632-633). UPIAS itself claimed that society *disables* people, making them an oppressed social group, *disability* is compounded by the

exclusion of disabled individuals from participation, adding another layer to their existing impairments, and there being a distinction between *impairment* – which refers to the absence or malfunction of a limb, organism, or bodily mechanism – and *disability* – which involves the exclusion of individuals with impairments from full participation in societal activities due to a lack of consideration for their needs. (Shakespeare & Watson, 2001, pp. 3-4).

The social model had a critical role in the British disability movement as it aided in identifying and removing barriers and put the blame and responsibility on society instead of disabled people, who could not systematically change the social environment they live in, nor their impairments (Shakespeare & Watson, 2001, pp. 4-5). As people with impairments were disabled by society, instead of seeking solutions through medical cures, society needed to change, and disabling barriers had to be removed to promote inclusion. Subsequently, the current game accessibility owes its roots to the same philosophy where people have begun to demand and promote change towards more accessible design from game developers and the game industry in general.

2.1.3. Contemporary perspectives on disability

During the turn of the 21st century, scholars found novel cultural and language-based evolutions for disability studies and started criticizing the unwavering hegemony of the social model. From the cultural point of view, it was deemed that attitudes and constructions of disability affect people's behaviour and interactions with each other (Barnartt, 2010, p. 12). Gappmayer notes that we hold expectations of people's abilities and self-management skills and whoever does not fit said image is perceived as different. This is a direct consequence of *ableism*, a social norm of being able, which dictates the required skills people must have to be acknowledged as human (Gappmayer, 2021, p. 105). Ableism, in turn, results in *disablism*: attitudes and behaviours that perpetuate

differential or unequal treatment of individuals based on their confirmed or assumed disabilities (Campbell, 2009, p. 4; Gappmayer, 2021, p. 105). According to Reeve, disablism occurs both structurally, through imposing barriers and managing what disabled people can *do*, and psycho-emotionally, through improper behaviour by strangers – like thoughtless comments that harm well-being – which affect who disabled people can *be* (Reeve, 2008, p. 206). To avoid *stigmatization*, disabled people wield prostheses, mainstream appearances, and overcompensate to normalize themselves, reducing their differences from non-disabled (Mitchell & Snyder, 2000, p. 3.) In the gaming context, this type of masking can occur through different assistive devices, hiding one's disability 'traits', and reluctance to participate in interactions with other players (Baltzar et al., 2023). In lieu of falling under the scrutiny of strangers in public spaces, social virtual environments hold the potential for creating much more *inclusive* spaces as players can actively influence whether they disclose their disabilities or not to other players. Still, disabling phenomena occur even in virtual worlds as playing games, from accessing them to controlling avatars and appearances in them, often pose structural barriers. Similarly, the ableist attitudes of other players towards disabled co-players impact disabled players psycho-emotionally and may limit or prevent the playing of multiplayer games.

Regarding the social model, per Shakespeare and Watson (2001, p. 3) who were among social modelists of the era, the model had become an ideological litmus test of a disability policy that was utilised to discern organizations' progressivity. They stated that the simplicity of the model was one of the reasons for its stark status as it acted as a tool for effortless evaluation of, for example, did organizations use the term "disabled people" (social model) or "people with disabilities" (medical model). Furthermore, it was deemed that the social model ignored the very concrete detail of being disabled – the impairment. The radical rhetoric of being 'disabled by society' and excluding impairment from the

equation may cause disabled people to not identify with the disability movement and may denounce scholars' arguments as idealistic (Shakespeare & Watson, 2001, pp. 10-11). Impairments are real and concrete, and can be acquired and removed several times during a lifetime via medical or technological aids. Some impairments are static, others are degenerative or episodic which causes a person to shift between being well and unwell. Sometimes disabilities affect appearance and other times functioning (Barnartt, 2010, p. 4; Shakespeare & Watson, 2001, p. 12). Even the activists who campaign for the strong social model "concede that behind closed doors they talk about aches and pains and urinary tract infections, even while they deny any relevance of the body while they are out campaigning" (Shakespeare & Watson, 2010, p. 6). If we deny the relevance of impairment and judge medical interventions negatively, that can impact society and disabled people in harmful ways. Besides, even with the grandest endeavours, we cannot make the whole world fully inclusive to all and every impairment. For instance, as recited by Shakespeare & Watson (2010, pp. 17-18), removing environmental obstacles for some can cause issues for others, or placing the responsibility of a person's constant pain on their social environments would be trivial. Of course, conversely, critique often elicits antithesis, and, in this case, Colin Barnes reprimands the post-modernist critique of the social model. To him, the focus on abstract theorising, such as the philosophical lengths of disability/impairment dichotomy, is meaningless and even harmful for disability studies (Barnes, 2020).

In conclusion, this thesis posits disabilities as a social construction but admits possible concrete effects of impairments on functionality and well-being. The challenges of playing games and frequent game accessibility barriers appear as a direct result of disablism, since the dominating practices of designing games for the assumed normalcy "promote values and, simultaneously, justify forms of oppression such as disablism, racism, homophobia and orientalism that negate the existence of Others" (Goodley, 2013,

p. 637). As such, research subjects' player experiences and potential barriers they encounter are deemed to be a grave problem needing to be investigated by game studios, not as something that disabled players must overcome or succumb to, but also, preferably, to change the game industry at large and not in just sporadic game cases. Still, medical interventions and technologies are not and should not be overlooked but embraced as, in the context of games, *assistive devices* and *adaptive controllers* can significantly enhance successful play experiences. Lastly, as much as we would wish to change and develop games accessible to everyone, we must admit that it is virtually impossible to make all games fully inclusive for every impairment. These thoughts are expanded upon following chapters.

2.2. Video game accessibility

Typically, when contemplating the aspect of accessibility in video games, our initial consideration tends to revolve around various interventions aimed at modifying game mechanics to accommodate players with disabilities. Nevertheless, it is imperative to recognise that game accessibility extends beyond being a mere makeshift solution for universal rectification. For example, game accessibility has been defined as strategies to overcome the barriers of games (Yuan et al., 2011; Grammenos et al., 2007), a lens for considering diverse player base and the possible exclusion from games due to their disability (Cairns et al., 2019), a goal to make games playable by the widest possible audience (Barlet & Spohn, 2012), and to give "as many players as possible the best opportunity of completely experiencing a game" (Straub, 2012). Furthermore, in IGDA Game Accessibility Special Group's definition states: "Disabling situations occur due to mismatches between a person's abilities and the barriers presented by the thing they're interacting with. Often those barriers are unintended, and unnecessary. Accessibility means avoiding these unnecessary barriers" (IGDA-GASIG, n.d.). Often cited Game

Accessibility Guidelines declare accessibility as "means avoiding unnecessary barriers that prevent people with a range of impairments from accessing or enjoying your output" (GAG, n.d.).

It is also paramount to emphasise that accessibility and accessible design, in general, do not only aid people with disabilities but have also proven advantageous to individuals without disabilities, as seen in areas such as telecommunications and the design of mobile phone applications (Henry et al., 2014). Of course, game accessibility is mainly designed to cater to players with impairments, but in truth, it benefits all players. *Situational impairments* can affect anyone, such as dealing with a small screen, a noisy environment, a well-lit room, a sleeping baby, a hand injury, or simply lacking proper game literacy. What is even more significant is that as we age, we typically encounter various sensory and mobility challenges; Barnartt (2010, p. 4) goes as far as to define everyone as "only temporarily able-bodied".

Generally, disabilities can be divided into *sensory* (e.g., vision and hearing), *physical* (e.g., mobility and motor), and *cognitive* (e.g., ageing and learning) disabilities (Rimmer & Braddock, 2002) which all utilise different strategies for game accessibility. For consumers, games are an extraordinarily complex form of media compared to others "in terms of motor and sensory skills needed for interaction control, due to special-purpose input devices, complicated interaction techniques, and the primary emphasis on visual control and attention" (Grammenos et al., 2009, 8:1). Due to the constant requirement of players' extensive physical and psychological attention and capability, *The Game Interaction Model* partitions the gameplay interaction into three successive sections to exemplify the issues with specific disabilities: 1) *Receive stimuli*, in which games provide information about the game events via visual, auditory, and haptic stimuli; 2) *Determine response*, the player must determine what is a correct response for the received stimuli;

3) *Provide input*, after realizing the correct action, the player must physically initiate the input (Yuan et al., 2011). Based on the model, people with sensory disabilities may have issues with receiving stimuli, especially if the actions do not utilise multiple stimuli channels (e.g., getting shot at is implied through the avatar's vocal grunts, visual indicators in the user interface (UI), and haptic rumbling in the controller), people with cognitive disabilities may encounter challenges in determining proper responses to game events or actions, and people with physical disabilities may find input devices difficult, burdensome, or plain impossible to use. These encountered issues through different sections of the Game Interaction Model are *accessibility barriers*.

In order to overcome the barriers, one requires the aid of game accessibility, which frequently manifests through different options in a particular game that players can turn on and off based on their preferences. For example, games may contain full *subtitle customizations*, *difficulty settings*, different *visual outlines* and *colour layers*, a catalogue of supplementary *audio cues*, *screen reader* support, additional *visual indicators*, extensive *button* and *input manipulation*, and a myriad of *game mechanical tweaks*. When comparing two surveys for game developers from the years 2018 and 2023, developers have begun to consider accessibility more in their games, albeit slowly. The yearly *State of the Game Industry* survey showed that, in 2018, 26 per cent had implemented accessibility measures and 50 per cent had not. In 2023, these numbers had transformed to 38 per cent and 32 per cent, respectively. (Game Developers Conference, 2018, 2023.) To illustrate the popularity of game accessibility features with the common accessibility feature – subtitles – in *Assassin's Creed Odyssey* (2018) and *Far Cry: New Dawn* (2019) subtitles are turned on by default, whereupon 95 per cent and 97 per cent of players, respectively, left the subtitles on (Chavers, 2019). Moreover, according to a relatively recent survey of disabled players, 67 per cent of respondents mentioned using in-game accessibility options, of which *subtitles* and *key remapping* were by far the most preferred

ones with *text enlargement*, *contrast* and *colour changes*, and *auditory* and *screen alerts* coming as a second most popular group of options (Beeston et al., 2018). However, a deep care must be maintained when naming different options. In one research, disabled participants hoped for more implicit descriptions in the games' settings since the general difficulty settings – easy, medium, hard – provoked feelings of being inferior (Mason et al., 2022). In the extreme case of *Wolfenstein 2 – The New Colossus* (2017), the game goes as far as mocking players who choose the easiest difficulty as inept babies.

Still, options and difficulty settings alone do not ensure accessible or pleasurable play experiences. As Yuan et al. (2011) argue, games should be designed accessibly from the early stages of development since later patched accessibility modifications may alter the gameplay in such ways that it is not fun to play anymore. Furthermore, Yuan et al. declare multiplayer games as a highly problematic case for accessibility as different accessibility options may put players at an advantage or disadvantage. Consider, for example, a motor-impaired player who requires fully automatic aiming in a first-person-shooter (FPS) multiplayer game, which would put them in a highly advantageous position compared to other players. Indeed, even though there have been suggestions for Parallel Gaming Universes (PGU) allowing players to play multiplayer games in different ruleset 'universes' and combining these universes (Grammenos et al., 2009) or experimental studies on balancing the sensory feedback for players (Westin et al., 2017), there has not yet been invented an effective practice for multiplayer game accessibility.

Another method to reduce barriers and make play experiences smoother are *assistive technologies* and *adaptive controllers*, mentioned in the previous subchapter. Whether the special equipment are mass mass-produced devices such as *Xbox Adaptive Controller* by Microsoft, smaller-scale products like *QuadStick* (Van Ommen et al., 2022), or highly experimental research projects, for instance, a haptic glove (Yuan & Folmer, 2008), an

eye-tracker combined with a data glove (Breugelmans et al., 2010), a system to record and combine inputs (Said & Kane, 2013), or a wheelchair-controller for motion-based games (Gerling et al., 2013), these can alter an otherwise inaccessible game to be relatively playable. Naturally, some means provide more accessible input methods for physical disabilities whereas others transfer key information through alternative ways to aid sensory disabilities. According to the survey of disabled players, 32 per cent of respondents utilised assistive technology with *customized controller*, *alternative PC mouse*, and *screen reader* being the most popular choices (Beeston et al., 2018).

2.3. Accessibility barriers in games

The hectic, physically, cognitively, and sensorily demanding nature of games often poses accessibility barriers for disabled players. Yuan et al. (2011) divided accessibility barriers as *non-critical*, which do not prevent gameplay but may reduce game experience, and *critical*, which prevent the playing of a game. To elaborate, barriers may be a minor nuisance like a distracting icon blinking in the UI, significantly reduce the play experience such as poor visual cues causing unintended deaths, completely prevent the play progression like mandatory sequences requiring rapid button presses, or cause severe health issues, for instance, through flickering lights, which can trigger epileptic seizures.

The research on accessibility barriers by Porter and Kientz (2013) revealed that the incompatibility of assistive technologies with games manifested as a common accessibility barrier among respondents. Whether the technology in question was a text-to-speech system, a software application, or a third-party controller, they posed compatibility issues with some games. Secondly, asking for help was a noteworthy strategy to overcome accessibility barriers. Yet, some participants dismissed this type of ‘social assistance’ as reducing the gameplay experience. Furthermore, respondents,

especially people with visual impairments, preferred *single-player games* significantly more compared to *multiplayer games*, even with the multiplayer game boom at that time. In another study, the lack of cooperative players and the unfairness of multiplayer games due to ability discrepancy acted as a barrier (Gonçalves et al., 2020). In addition, some participants revealed the concerns of failing when playing multiplayer games with non-disabled players. Similarly, the fear of appearing atypical and the harmful behaviour of others caused disabled players to limit or avoid playing with strangers (Mason et al., 2021; Porter & Kientz, 2013). As such, accessibility barriers are not always technical or apparent but *social factors* like the fear of letting down teammates or toxic game communities play a significant role too.

On top of other barriers, the cost of adaptive equipment can also be a limiting factor for the players who would need them. According to Boot et al. (2018), based on 22 key studies, the costs and funding policy was the main barrier that people had with assistive technology – the technology in question concerned devices to aid living, not playing games. In the game realm, the possibility of gaining funding for assistive devices is presumably even harder than more common quality-of-life assistive technology. Frequently, special controllers are third-party devices and, as such, could require different adapters to work properly with consoles, for example. Therefore, the added expenses of the controllers and adapters can be hundreds of euros, sometimes even thousands. Besides, setting up and customising the assistive technology requires patience and technical know-how as one often must learn to adjust parameters, write scripts, and code. That is, a set of skills that should not be mandatory for average consumers since these can significantly impact who can participate in game culture. Concerned requirements are a direct result of *accessibility tax*, a unique type of indirect taxation that demands disabled people to put considerable financial investments and amass technical expertise just so that they are at the same level as their non-disabled peers (Olsen et al., 2022).

2.4. Play practices and experiences of disabled players

Comparing a few studies, when we examine the demographics of disabled players, different forms of motor impairment were most frequently represented in the data with sensory impairments coming as a second, and cognitive impairments taking the third place Commonly, disabled players preferred playing games with PC whereas consoles were a second most popular choice, and handhelds appeared as third. (Beeston et al., 2018; Porter & Kientz, 2013; Power et al., 2021.) In a similar manner, men dominated the participant pools with women and non-binary being far less represented (Beeston et al., 2018; Porter & Kientz, 2013).

Cairns et al. (2021) surveyed both players from the general game community and disabled players to ascertain what aspects of games are important to them. The results provided several different motivations for playing games such as *connecting* with others, *relaxing*, having *fun*, acquiring *benefits*, and *enabling*. These follow the findings of Beeston et al., (2018), where *fun* and *to relax* appeared as the most common motivators among disabled players whereas *challenge*, *community*, *escapism*, and *socialising* were relatively popular motivators. Specifically, the benefits of games in Cairns et al., (2021) ranged from improving motor and cognitive functions and pain tolerance to broadening players' horizons culturally and reducing isolation and depression. Particularly, the enabling theme resonated strongly with disabled players as they emphasized that, through playing games, they could do things that were otherwise impeded to them. For some, the enabling aspect manifested as games' ability to enhance autonomy and to offer a place where they could progress on their own terms without the assistance of anyone else. Likewise, participants of another study favoured independence and autonomy in their activities, whereupon, for instance, they avoided movement-based games as these required assistance from others (Mason et al., 2021).

The article by Power et al. (2021) evaluated accessible player experiences by determining the preferred accessibility options and their impact on player experiences. The online survey reached 162 respondents and content analysis with open coding was employed to produce nuanced answers from the data. Additionally, the researchers utilised the APX model, which will be elaborated and used later in this thesis, to interpret and elucidate popular accessibility options. Regarding the notable results in the connection between accessibility options and play experiences, options relating to *input devices* and *game controls* resonated strongly in both invoking positive and negative experiences. Moreover, a good implementation of *alternative channels* for key information as well as various sets of gameplay adjustments from *difficulty* to *game speed* enhanced play experiences whereas the lack of *clear text* significantly decreased experiences.

3 METHODOLOGY

In the methodologies section, the opting for the qualitative online survey as the data collection method is reasoned. In addition, the subchapter broadly defines the contents of the survey as well as the distribution channels of surveys. Furthermore, there is an explanation of the thematic analysis and APX model acting as data analysis methods. Lastly, the ethical considerations are provided along with an extensive explanation of the positionality in the research process.

3.1. Research questions

To map the current status of being a disabled player and determining their play experiences in the age of semi-prevalent game accessibility, three specific research questions were created:

1. What are the play practices of disabled players?
2. What accessibility barriers do disabled players encounter while playing?
3. What kinds of strategies do disabled players use to overcome accessibility barriers?

In the results chapter, each subchapter is dedicated to one of these questions, and later in the discussion, findings are elaborated and reflected upon with previous studies.

3.2. Qualitative online survey

From the very beginning, an online qualitative survey was considered the most practical and fruitful data-gathering method. According to Braun et al. (2021), the online qualitative survey is an efficient method providing the possibility of wide-angle-lens for hearing a diverse set of perspectives with access to larger and geographically dispersed populations. As the play experiences of disabled players are rather understudied and lack an established theorization, acquiring a considerable set of varied responses offered a

solid basis for discerning common patterns in the conglomeration of differing opinions and lived experiences. In addition, receiving responses from all around the globe was the main target and, as such, an online survey appeared essentially as the only viable choice. Furthermore, Braun et al. expressed how online qualitative surveys grant a voice for people who may avoid face-to-face interviews due to the sensitivity of the topic, and an unobtrusive and less burdensome experience for participants as there are no locational or time-sensitive restrictions. For the disabled participants, the anonymous, asocial, and asynchronous nature of the survey may have been a more compelling method compared to the forced socializing of interviews, for example. Of course, many disabled people are completely comfortable as themselves in whatever situation. Yet, many others suffer from the burden that the unfair and unjust social construct of being disabled has imposed upon them; hence they may avoid research situations where the disability becomes too apparent for the researchers. On the other hand, some disabled participants may have experienced the survey as cumbersome or impossible to fill out. Some may feel that conducting a face-to-face or remote interview is more effortless to partake in and express themselves. Therefore, it is expected that there were some incomplete surveys that did not materialize in the dataset.

Moreover, being disabled often places a person under a phenomenon called *crip time*, which challenges the idea that clock time can universally quantify and organize life. It acknowledges that people with disabilities may require different amounts of time and resources to accomplish everyday activities. Crip time recognizes the unpredictable nature of disabled body-minds and their lives and calls for a rethinking of our notions of time; questioning the normative expectations of pace and scheduling. (Katzman et al., 2020.) With an online, asynchronous setting, participants can decide when and where they will contribute to the research, fitting the filling out process to their crip time. In the best

case, the progress of answering the survey could be saved and divided into multiple sessions – a feature that was not a possibility in this survey.

3.2.1. Survey questions

The online survey was crafted, piloted, and iterated utilising Microsoft Forms. The finalized survey had both Finnish and English versions that included 34 questions – 5 demographic, 11 open-ended, and 18 close-ended questions (see Appendix 1). For instance, the survey inquired about the type of disability, effect of disabilities on gaming, play experiences and habits, motivations for playing, reasons for game choices, encountered accessibility issues, and notions and suggestions for recent developments in game accessibility.

As the survey consisted of an abundance of questions, it provided notably rich data. Still, the vast nature could have impacted negatively on the answering experience, which was visible in some cases where the answers were only a pair of words. Unfortunately, that may mean that the final dataset lost meaningful insight.

Parts of the survey data were also used in the studies of Baltzar et al. (2022, 2023). Naturally, the studies did not have any influence on this thesis or data analysis, which was solely conducted by the author.

3.2.2. Participant recruitment

To enable a wide variety of responses across age, gender, and geolocation groups, the only inclusion criteria for participating in the study were the respondents having one or more disabilities as well as an adequate proficiency in Finnish or English. The survey was sent to renowned figures in accessible gaming communities for them to share it. It was also shared through different channels on X (formerly Twitter), Reddit, Discord, and QuadStick forums, and sent to all the major Finnish disability organisations such as

Kuuloliitto, Akson ry, and Näkövammaisten liitto ry for further distribution. Moreover, the survey was delivered privately via a direct message on X (formerly Twitter) to people who identified as gamers and disabled. The data collection process spanned approximately two months, starting in early March and concluding at the end of April 2022.

3.2.3. Participant demographic

A total of 95 respondents participated, with 65 responding in Finnish and 30 in English. The gender distribution among the participants appeared diverse, with 45 identifying as men, 37 as women, 10 as non-binary, and 3 preferring not to disclose their gender. The majority of participants fell within the age range of 18 to 44 years old, accounting for 72 individuals. The division of disabilities consisted of physical (51), vision (33), neuropsychiatric (26), hearing (13), cognitive (9), and others (14). It is important to note that the combined totals of disability categories exceed the number of participants, as many respondents identified multiple disabilities, which is not unusual. Ultimately, two individuals were excluded from the dataset as they reported having no prior gaming experience.

3.3. Analysis methods

During the initial stages of data analysis, demographic statistics were examined to address the first research question. After summing up the raw quantifiable data, it was compared to the findings of previous studies as well as general statistics of popular games and preferences of common players – disabled and non-disabled alike. Lastly, the findings were illustrated by a variety of charts and tables.

3.3.1. Thematic analysis

Still, if any relevant results wished to be found, the strongly qualitative dataset demanded a more thorough data analysis method than a mere summing up and comparing of varying demographic occurrences. Per Braun and Clarke (2006), *thematic analysis* holds a foundational position in qualitative analysis. It is considered a fundamental approach that researchers should acquire as it imparts core skills applicable to various forms of qualitative research. By mastering thematic analysis, researchers develop a solid groundwork that can be leveraged when employing other qualitative analysis techniques. Therefore, thematic analysis was deemed to be the most appropriate method for addressing the second and third research questions. Admittedly, the adaptability and lack of strict guidelines also played a role in the decision to employ the method in question. Thematic analysis possesses a type of theoretical freedom, which makes it an extensively utilised method across different epistemologies and relatively effortless to adopt for new researchers due to its high flexibility and few procedures (Braun & Clarke, 2006; Nowell et al., 2017). In practice, thematic analysis is used to identify and analyze *patterns* or *themes* within a dataset. It involves organizing and describing the data in detail while also interpreting aspects related to the research topic. (Braun & Clarke, 2006, p. 79).

In this study, Atlas.ti 23 software was employed for *coding*, identifying recurring patterns, contrasting and comparing code groups, and formulating themes from the dataset. With Atlas.ti 23, the most effective process formed by going through every relevant response one by one, applying existing codes to them, or developing new ones if none appeared suitable. The analysis phase resulted in the identification of 67 distinct codes in the second research question, which were subsequently grouped whenever feasible. Consequently, several codes were excluded during the iterative process of analysis. In the end, seven distinct themes rose from the code groups. For the third research question, 41 codes and

three themes were constituted. Quantitatively speaking, not all themes resonated too strongly with the code groups or participants, while others manifested extensively across the different response groups. Yet, according to Braun and Clarke (2006), the 'keyness' of a theme cannot be solely defined by its quantifiable prevalence in the data but rather by whether it touches relevant topics regarding the research question. Moreover, patterns in this study mainly formulated directly from the responses without delving deeper into the meanings underneath the obvious. Braun and Clarke (2006) call this *semantic* approach that focuses on the surface meanings of the data, while the opposite is a *latent* approach that goes beyond the surface to examine underlying ideas and assumptions. Surely, in some cases, deeper examination and interpretation were required but mainly the responses were taken at face value as they appeared during theme formulation.

3.3.2. APX model

The Accessible Player Experience (APX) model introduced by Power et al. (2018) and refined by Cairns et al. (2019) was brought along during the theme dubbing process to divide themes reasonably as well as to provide a proven framework for the analysis. This aided in the sense-making of the responses but, most importantly, it solidified the validity of the results. In this thesis, APX contrasts both experienced issues and useful solutions of research subjects. According to the APX model, in order to avoid accessibility barriers and produce pleasurable player experiences, games must first offer players proper means to *access* the game and, after that, provide tools to conquer the *challenges* of the game. To offer you a concrete example, *God of War: Ragnarök* (2022) provides visually impaired players *access* to the game via different visual customizations and screen readers as well as tools to beat *challenges* via extended puzzle times, aim assist, and difficulty modes. It is only because of these tools that the players are able to experience the challenge of the game itself, rather than the challenge of the disability.

Power et al. (2021) further developed the APX model (Figure 1) to be more specific when identifying elements in successful accessible player experiences. As it stands, the *access* sphere of the APX does not consider the game world or mechanics but ensures that players can get over the *player-feedback loop* and *interact* with the game. It is further divided into the following options and sub-options:

1. **Input Options**: Possibility to modify or replace controllers or input devices.
2. **Control Options**: Possibility to replace or modify buttons, add new controls, tune the reaction of the game to controls as well as add macros or other interfaces.
3. **Presentation Options**: Possibility to choose the modality and formatting of information being communicated to players.
    a. **Alternative Channels**
    b. **Clear Text**
    c. **Contrast Personalization**
    d. **Clear Visual Channels**
    e. **Clear Audio Channels**
    f. **UI Personalization Options**
4. **Output Options**: Possibility to replace or modify different output devices.

The *challenge* section, on the other hand, is concerned with *overcoming* obstacles in games. Challenge options enable players to succeed at previously impossible or unreasonably difficult challenges, that are persistent even after the player has adequate access to games.

1. **Performance Options**: Possibility to modify the game obstacles that require reflexes or quick reactions.
2. **Skip Options**: Possibility to bypass unreasonably challenging sections.
3. **Assist Options**: Possibility to enable assist such as aim assist.
4. **Progress Options**: Possibility to preserve or review previously made progress.
5. **Training Options**: Possibility to train skills via tutorials, training modes, and tooltips.

6. **Social Options**: Possibility to modify the way of participation, collaboration, or competition with others.
7. **Moderation Options**: Possibility to choose how to engage with strong emotional content.

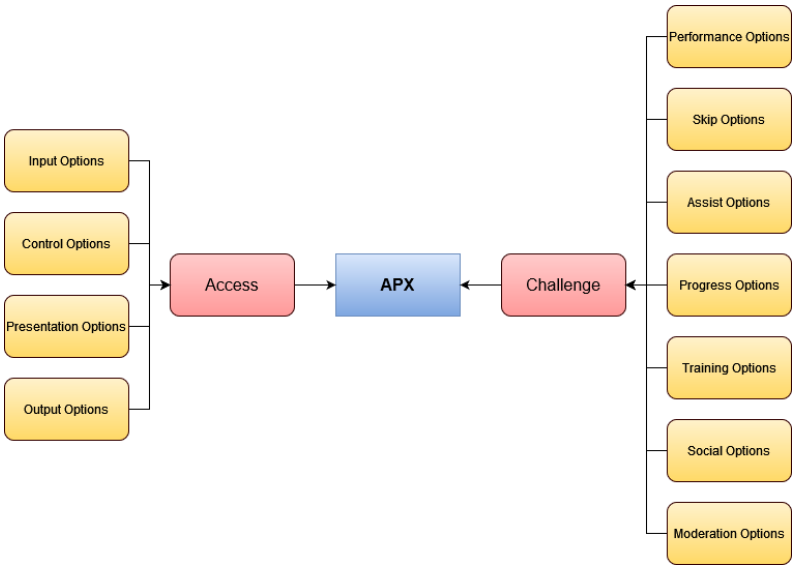

Figure 1. The revised APX model.

3.4. Ethical considerations

During the recruitment process, participants were sent an informed consent form and elaborated on the voluntary participation, anonymity, and confidentiality of the research. Anonymity occurred through the asynchronous data gathering, lack of in-detail personal questions (name, accurate age, city of residency, etc.), and further via data pseudonymisation where the participants were given a combination of the letter P and a number based on the response order. The data was stored in a password-locked PC with the author as the lone person having access. The raw survey data exists in the Microsoft Forms servers with a few selected researchers being able to access it. Storing data in a cloud or server is, of course, always risky, but the lack of personal questions should alleviate the gravity of the situation during possible data breaches.

Conducting bilingual research is another point of ethical consideration. In the surveys, all the questions and multiple-choice responses were meticulously translated so that they

delivered the precise meaning as faithfully as possible. Furthermore, the embedded Finnish quotes were translated into English before being included in this essay. The translated quotes may have lost some of the nuances, even though all the content, even misspellings and erroneous capitalizations, were accurately translated whenever possible. Fortunately, these translations did not have any power nor influence on the analysis; they solely exist to add context and enhance readability.

3.5. Positionality

Lastly, it is paramount to disclose my *positionality* as it directly impacts all aspects of the research. *Reflexivity* informs positionality, by turning the lens back onto the researcher to realize one's own situatedness within the research and its influence on the setting and participants, research questions, and data collection and its interpretation (Holmes, 2020, p. 2; Berger, 2015, p. 220). Positionality holds *fixed aspects* such as gender, race, and nationality, which can incline researchers to a particular point of view, and *subjective* and more fluid ones like political views or personal life experiences, which often change and shift over time (Holmes, 2020, p. 2). In my case, I am a Finnish, white hetero cis male, thus possessing a rather advantageous position in the Western society I live in. Due to my privileged status, some patterns of play experiences, which can be expressions of innate humane experiences, may be concealed, or at least invisible, to me. I am also a left-leaning person with a deep belief in *social constructionism*, that is, "the ways in which we collectively think and communicate about the world affect the way that the world is" (Elder-Vass, 2012, p. 4). It is the notion that many aspects of our reality are indeed shaped by social and cultural interactions with other people. Thus, there may co-exist multiple realities as each person constructs their own version of reality based on their unique perspectives, cultural backgrounds, and social contexts. I do not deny that there are some fixed truths such as universal laws of physics or mathematical principles. Yet, at the same

time, I see their creation greatly impacted by the interpretation and communication in social contexts, which again are influenced by cultural values and historical occurrences. Therefore, in the research process, I approached every respondent and response with the utmost respect as they are the experts of their bodies and experiences. Especially, when the research subjects are disabled players, their realities can be vastly different, both from each other and non-disabled players. So, I am merely seeking to make sense of their realities, aiming to discover some consensus and common ground between individuals for my research questions. In the process, I must omit some valuable information since I could not coherently fit every single experience into the relatively strict themes.

Furthermore, while conducting a study, researchers always fall into a side of *insider-outsider* axis, which thoroughly influences the study process. If the researcher shares some group identity with participants, they have an *insider* status whereas the researcher with *outsider* status does not share such identity (Braun & Clarke, 2013). Both have advantages while conducting research. Insiders have easier access to the culture in question, the ability to ask insightful questions due to prior knowledge, may gain more trust for honest answers, can produce more authentic and thorough descriptions, not be so vulnerable to potential culture shock, and possess a better understanding of language and non-verbal cues. Yet, insiders also have drawbacks vis-à-vis outsiders such as potential bias and excessive sympathy towards the culture, being too close may hamper objectivity and prevent asking challenging questions, participants may assume the insider knows more than they actually do, leading to unarticulated information, lack of an external perspective, inability to ask "dumb" but important questions, and reduced willingness of respondents to reveal sensitive information due to ongoing contact with the insider. (Holmes, 2020, p. 6.) Whatever the relevant status may be, researchers do not need to choose between either or, but the insider-outsider status can appear highly dynamic depending on the particular study situation. Mercer (2007, p. 13) states that an

insider or outsider status cannot be curtailed to a single inherent characteristic, such as gender or ethnicity. The junction of different characteristics determines *insiderness*, of which some are innate, and others are not. Also, the relationship between the researcher and the research subject does not stay fixed but oscillates along a continuum of possibilities.

Here, I must disclose the most pressing matter that will affect the research in its entirety. Aside from my white, heteronormative traits, I am deeply insider in this case as I am disabled myself. I have a C-5 level quadriplegia, meaning I cannot move or feel anything under my chest and my hands are barely functional. All this means, that I know how it feels like to be a disabled, person and player, in this society and digital culture. Namely, the abundance of barriers, negligence, and a constant struggle with crude and complex assistive technologies that may work for now but not tomorrow. Yet, I have also witnessed the positive movement across the academic field and the game industry during the past few years, that have made game accessibility gradually better in every passing year. This change led me to scrutinise the current situation.

Still, even when I can label myself disabled, I cannot declare that I understand each experience of other disabled people. Quite the contrary, and that is where my outsider traits in the research come into existence. I can firmly say that I am able to fully understand the struggles with motor accessibility, assistive technology, and the general *stigma* of being disabled. However, I am no better than any other at truly realizing, for example, what it means to try to participate in the gaming culture like everyone else when one does not have eyesight and games do nothing to aid in that situation. Thus, I must maintain an objective lens at all times and use my subjective, insider knowledge only to add context and reasoning to others' experiences.

4 RESULTS

In this chapter, the key findings of the study will be disclosed. First, the relevant demographic statistics are visualized and elaborated to give an idea of the playing practices of the participants. In the second subchapter, seven themes for different accessibility barriers are presented. The themes are dubbed under the *access* and *challenge* label according to the APX model. The third subchapter elaborates on strategies utilised to make digital games accessible if such options were available.

4.1. Play practices

4.1.1. The playing habits

Reason to play	
Fun	91%
Relaxation	84%
Action	58%
Experience	51%
Challenge	49%
Creativity	45%
Mental health	45%
Socializing	45%
Stress	37%
Competition	24%
New Skills	24%
Other	13%

Table 1. The table presents the motivations for playing games among respondents.

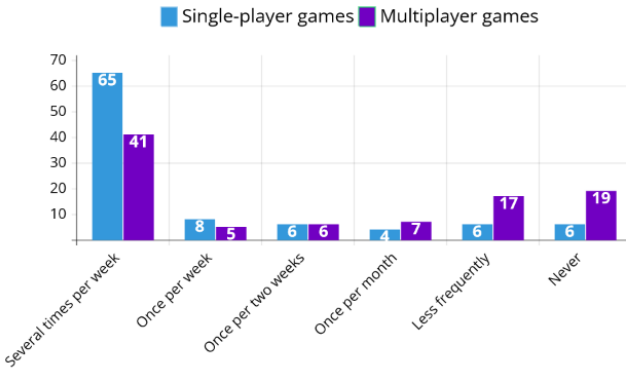

Figure 2. The frequency of how often participants play single- and multiplayer games.

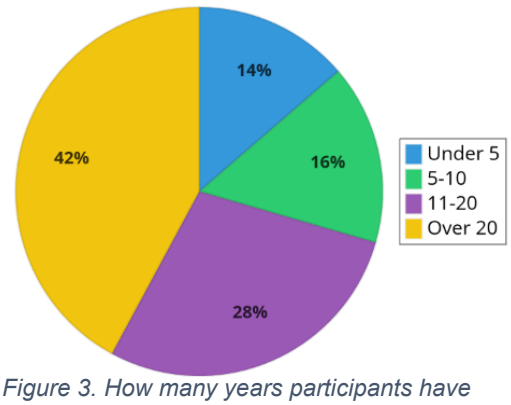

Figure 3. How many years participants have played games.

Participants appeared to be experienced players with widely different reasons to play games. 70 percent of the respondents had over 11 years of playing experiences and nearly half had been playing games for over 20 years (Figure 3). Furthermore, the majority of

research subjects play single-player games actively on a weekly basis whereas multiplayer games are less popular (Figure 2). Still, even though single-player games appeared clearly more preferred ones, multiplayer games resonated relatively strongly among participators – albeit being played far less frequently. Moreover, not surprisingly *fun* (91%) and *relaxation* (83%) were the most common motivators for playing by a wide margin (Table 1). Yet, *socializing* as a motivation resonated with only under half of respondents, which does not follow earlier studies, nor does it correlate with the popularity of multiplayer games. Of course, multiplayer games do not automatically lead to or foster socializing, but they afford sociality more than single-player games do.

4.1.2. Preferences on platforms and games

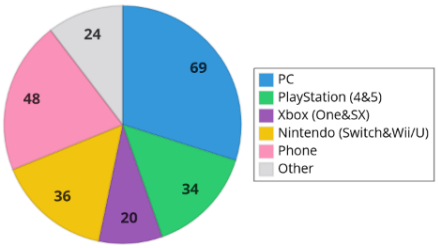

Figure 4. The preferred game platforms of participants.

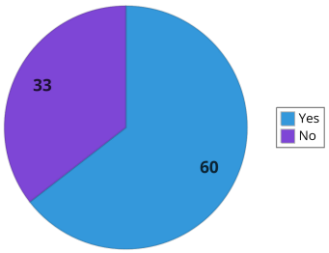

Figure 5. The usage of in-game accessibility settings.

Top single-player game(series)		Top multiplayer game(series)		Best-selling games of 2021 (NPD)
The Sims	10	Hearthstone	7	Call of Duty: Vanguard & Black Ops: Cold War
Horizon	8	Counter-Strike	5	Madden NFL 22
Assassin's Creed	7	Final Fantasy XIV	5	Pokémon: Brilliant Diamond/Shining Pearl
Pokémon	7	Grand Theft Auto	4	Battlefield 2042
Minecraft	5	Halo Infinite	4	Marvel's Spider-Man: Miles Morales

Table 2. Popular single- and multiplayer game titles and frequencies among responses as well as best-selling games of 2021 according to NPD Group (Rousseau, 2022). Some games are serie titles as not all were specific about whether they spoke about the series as a whole or an individual instalment.

Similar to previous studies (Beeston et al., 2018; Porter & Kientz, 2013; Power et al., 2021), PC holds the top position in preferred gaming systems, with consoles as combined second and handhelds as third (Figure 4). However, there is a clear difference from the previous studies in the considerable popularity of phones compared to individual consoles. Additionally, the findings do not fully mirror the 2022 Finnish Player Barometer (Kinnunen et al., 2022) in which mobile games were the most popular ones before PC and consoles. Said survey, however, was of Finnish players, in general, with little information on the difference between disabled and non-disabled players. Furthermore, in previous studies, the Nintendo systems did not have notable popularity, yet now they manifested as the third most popular consoles after PCs and phones. Moreover, playing games with Xbox systems appeared a somewhat rare occurrence, which is surprising since they are considered highly accessible ecosystems compared to rivals. Most likely, this is due to the majority of Finnish respondents, since PlayStation and Nintendo are more popular game systems in Finland.

Preferred games offer some interesting insight. First of all, participants did not share plenty of similarities as, regarding the top popular instalments, only ten participants mentioned the same single-player game and seven included the same multiplayer game in their answers. Overall, the answers mentioned 154 different single-player game titles as well as 107 multiplayer titles, which exemplifies vastly varied tastes. Secondly, all single-player games in the top list of respondents are relatively accessible either by design such as easily controllable *The Sims*, *Pokémon*, and *Minecraft* or through a variety of options in *Horizon* and *Assassin's Creed* series (Table 2). In the case of multiplayer games, most are either slower-paced and easier to manage such as *Hearthstone* and *Final Fantasy XIV* or not necessarily competitive like *Grand Theft Auto*, yet *Halo Infinite* and especially *Counter-Strike* are highly competitive and demanding games in both skill- and ability-wise. Lastly, there was no overlapping of best-selling games of the past year and

favourite games of participants aside from *Pokémon*, which may be due to the inaccessibility of best-selling games or just sample bias.

4.1.3. Social play

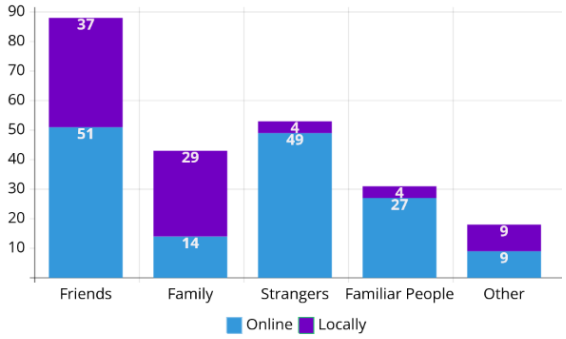

Figure 6. With whom the participants play multiplayer games online and locally.

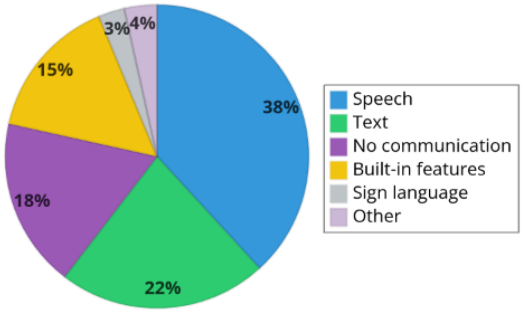

Figure 7. How do the participants communicate with other players.

Not surprisingly, respondents preferred playing games with friends or family, especially if the setting is local play (Figure 6). Overall, the evenness of playing with friends and strangers in an online context is curious since it can be limiting for play sessions to always aim to include friends in contrast to always available multiplayer sessions with strangers. It may indicate a stronger preference of playing with people who one is familiar with and thus, avoiding possible negative encounters that could come with gaming while disabled.

Moreover, a significant portion of respondents preferred communicating with text or built-in features or refused to communicate altogether (Figure 7). Naturally, not all respondents were able to converse with speech but the tendency to utilise non-verbal techniques or refusal of communication may indicate a conscious choice of avoiding spoken interactions. Whether this is due to the habit of masking one's disability or a general unwillingness to partake in voice interactions, remains to be examined in further studies. Yet, 28 per cent of individuals who did not use speech as a communication method had some forms of concern towards the toxicity of multiplayer games. Still, over one-third of respondents who play multiplayer games used speech in interactions, making it a popular alternative in social situations.

4.2. Accessibility barriers hindering play experiences

4.2.1. Access – Controlling the game

The most frequent issue with games, among the answers, was related to controlling the game. Whether the encountered problem was the difficulty using the controller, compatibility issues with third-party controllers, or too complex input requirements in games, the root cause circled back to challenges of players' possibilities in controlling games. Several respondents voiced their frustration with holding, pressing, or manipulating console controllers as well as PC mouse and keyboard. Often, the mismatch between the physical ability or required limbs and the design of controllers acted as a limiting or preventing factor.

> "I am unable to reach most keys on a keyboard. And due to my limited strength, I cannot use certain buttons on controllers like clicking of sticks" (P8, physical disability)

> "Limited chances… if others use ten fingers, how can I with five fingers and one hand use them [controllers] as quickly?" [translation] (P59, physical disability)

Others mentioned that game systems, notably PlayStation 5, did not support the assistive technology they required. Thus, some resorted to technological kludges such as expensive adapters to "cheat" the consoles to believe that they are being used with a proper controller. Yet, this results in an accessibility tax in the form of additional financial investments as well as a certain level of needed know-how and dareness requirements. Therefore, others acquiesced to play older compatible games with new game systems.

> "Well, I have a PS5 but I cannot use my accessible setup at all so currently, I can only play PS4 games on it" (P9, physical disability)

The complexity of games combined with challenging input requirements posed considerable issues to several respondents. Some complained about the convoluted mechanics and amount of button requirements in modern games. A few others noted that

complicated button combinations, mandatory fast reactions, and repeated button pressing appeared problematic.

> "Hard to say, but the more advanced the games have become, the more intricate have user interface, controls and controllers changed. Doom -shooter could be played with approx. 10 buttons, when a modern average FPS at least doubles or triples the number of required buttons." [translation] (P32, physical disability)
>
> "Button combinations are sometimes difficult, as well as quick reactions and quick repeated clicking [of a mouse]." [translation] (P77, neuropsychiatric disability)

4.2.2. Access – Receiving key information

Players, especially ones having sensory disabilities, expressed their frustration with key information in games that did not support alternative sensory channels or enhance existing information for players with reduced senses. Thirteen respondents struggled with the visual aspect of games such as discerning correct paths, fonts, smaller UI objects and icons, and maps. For some, the constant intensive staring of tiny elements appeared a major struggle, others quickly exhausted their eyesight in the process, and a few noted how it led to a disadvantageous position in FPS games. Similarly, several participants expressed frustrations if a game relies on sound for passing crucial information without alternatives. Especially, in the multiplayer setting, problems arose in communication situations as well as hearing enemy footsteps.

> "I have low vision, which makes it very difficult to see small fonts/icons." (P18, vision disability)
>
> "Lights, certain shades, and even details can be missed for example in Horizon Zero Dawn I would frequently miss climbable areas because of the blend in of natural elements which is nice visually but not nice when you need to see it" (P3, vision, physical, cognitive, and neuropsychiatric disability)
>
> "I'm severely blind, so I easily miss enemies in FPS games and the reaper visits instantly." [translation] (P80, vision disability)
>
> "Deafness makes it sometimes difficult to hear teammates and in particular games (for example Overwatch, csgo) hearing enemies' movements." [translation] (P34, hearing disability)

Not always was information missing but, in some cases, the flow of information may be unnecessarily lengthy or prolix. Hence, respondents complained about situations where they repeatedly would lose focus or interest in the game, be it due to their disability or to the games being too complicated or slow-paced, and thus they miss critical information about in-game events. Notably, games strongly focusing particularly on stories, characters, and dialogue, caused these issues.

> "Cognitive information processing slowness influences my thought processing speed and adhd causes constant problems with attention and focus, and even while playing I find myself having short memory blackouts due to my inattentiveness." [translation] (P68, neuropsychiatric disability)

> "It's very difficult for me at play longer games where the story and interaction (dialogue) are in focus or important feature. These games don't have enough "tempo" that my adhd would be kept captivated. Games like witcher series are games that I've started over multiple times but never have played more than 4h." [translation] (P66, neuropsychiatric disability)

4.2.3. Access – Stimuli triggers discomfort

In some cases, the visual and auditory content was discernible for the players, but the different stimuli – visual, auditory, and haptic – imposed harmful effects on players. The discomfort manifested as a variety of negative feelings, encompassing all from sensory overstimulation to severe medical problems. Excessive visual effects, shaky camera, narrow view, or motion blur resulted in the feeling of sickness, migraines, sensory overloads, and reduced play experience. For some, the same effects lead to micro-seizures that incapacitated them for hours. Bright lights, especially blinking ones, engendered epilepsy seizures among participants – one being extremely frustrated with game studios as their mere epilepsy warnings when starting the game would do none for them. Similarly, too noisy games caused anger, migraines, and sensory overload. In the worst situations, players suffered from severe emotional damage, panic attacks, or extremely bleak intentions due to challenges or morbid themes in games.

> "Motion sickness is triggered by narrow FOV, motion blur and effects like camera shake or head-bobbing, making me from dizzy to physically sick." (P7, physical disability)

> "However if there are issues of a graphically triggering nature, the only warning I will have gotten from the game is a text prompt as the game starts, telling me that the game may or may not actively attempt to kill me during the next 20-120 hours of gameplay." (P30, hearing disability)

> "I hate sounds in most games. I enjoy soundscapes in zelda but soundscape in mobile games resembles too much annoying alarm clock -like sound. I hate game ads, that have loud alarm noises. If game ads are made then I'd like a sound that makes the game move forward or alternatively the possibility to mute sounds if one wishes." [translation] (P75, neuropsychiatric disability)

> "The worst part though if triggering my anger side of IEED is that it will spiral me into a severe depression episode when really bad I can even sink low into suicidal thoughts (luckily I have a service dog for these episodes) but this really impacts my choices of games especially if there are no features for hints, guides or difficulty setting changes so I am less triggered" (P3, vision, physical, cognitive, and neuropsychiatric disability)

4.2.4. Access – Lack of awareness

Interestingly enough, one of the frequent barriers for accessing games was simply the uncertainty or lack of knowledge of available accessibility options. Some participants mentioned that they had never heard of any accessibility features; others had some faint idea. Similarly, assistive technology for games appeared to be a foreign concept for a few respondents, even though some emphasized that such solutions would be of aid. Additionally, there were remarks about knowing about assistive technology for games combined with complaints about the lack of advertisement or marketing of these solutions, which made respondents reluctant to seek and try their suitability. For some reason, all the issues with awareness of available accessibility options transpired only among Finnish participants, which may be due to selection bias. Still, the Finnish alternative for the term 'accessibility' may have appeared foreign in the survey process. Also, we need to consider how it can be much more effortless to gain information and purchase accessibility hardware for native and well-versed English speakers.

> ”I haven’t heard about accessibility settings before now that I answer this survey, so that’s why I haven’t used them, and nobody else haven’t talked about them while I’m present.” [translation] (P45, vision, hearing, physical, cognitive, and neuropsychiatric disability)

> ”And somehow marketing or information I would need about different assistive game equipment. For example, websites where one could explore assistive things for games. Now information is hard to get or find.” [translation] (P72, physical & vision disability)

4.2.5. Challenge – Incomplete accessibility features

Plenty of games were accessible enough to be playable to a degree but the absence of comprehensive or suitable accessibility features significantly reduced the play experience. In some cases, players required assistance from other people in some sections of games such as navigating menus. Other times, particular game mechanics were inaccessible like ‘Skill move’ in FIFA but they did not fully prevent the gameplay. Furthermore, several participants mentioned that, as they stand, in theory, games are playable for them but demand so much energy and work that they are not very enjoyable.

> "Many games have half-baked implementation of what should be standard accessibility features, making the games only partially accessible or unplayable." (P2, vision disability)

> "Movement require alot more efford then i want to relax playing a game. Menus has to be repeatedly scan to read the text. Makes gaming feels like work and less enjoyable." (P20, vision disability)

Many respondents specifically mentioned that the fast-paced games and sections needing quick, precise reactions reduced or prevented their play experiences. Most often these barriers originated from the physical requirements of executing inputs in a swift or accurate manner. Additionally, quickly perceiving the environment and game elements or reading the rapidly moving text led to problems with the gameplay.

> "Games requiring quick movements and complex key timings are outside of my ability to play so for example, moving and building in Fortnite." (P15, physical disability)

> ”For example the required accuracy and quickness in platformers I can’t do at all” [translation] (P38, physical & neuropsychiatric disability)

> ”I can’t really play fast-paced multiplayer games, as there isn’t enough time to scan the environment” [translation] (P80, vision disability)

4.2.6. Challenge – Abstruse game elements

Participants had issues with interpreting what games were saying or demanding them to do to be able to progress. The games were lacking or missing guidance or tips, especially about the goals of the games or how to progress. Therefore, players felt constantly confused about what to do and where to go in games. Moreover, there appeared challenges in understanding the speech, text, and events of games. Notably, a few mentioned the difficulties of interpreting the emotions of game characters.

> "Let's not forget in Elden Ring there is no guidance feature either. Which means I will easily get lost or forget where I am going and where I have been." (P3, vision, physical, cognitive, and neuropsychiatric disability)

> ”Challenging to perceive ”what should be done” or where to go if there is not some clear mark.” [translation] (P47, vision disability)

> ”It would be nice if it would be easier to interpret the emotions of characters, for example that mood would be put “[.]” inside with the subtitles.” [translation] (P79, neuropsychiatric disability)

Among Finnish respondents, the problems with perceiving the game mostly arose due to the lack of localization. They felt that their skills in English were not on a sufficient level to understand the game. For some, the language barrier had a decreasing effect on play experience whereas others refused to play such games.

> ”In most games the language is english and rarely the games that interest me have subtitles in my own mother tongue, so that confines many interesting games out.” [translation] (P57, physical disability)

4.2.7. Challenge – The problematic multiplayer space

Possibly acting as the least surprising revelation, a great deal of participants who played multiplayer games had experienced toxicity, anger, belittling, and abuse from other players. Sometimes, the harassment was elicited due to the differences in skill levels, other times gender birthed the issue, and sadly, occasionally the disability was used as

ammunition for bullying. Not all players were discouraged by the abuse but some preferred to play only with friends or family or actively mute everyone. Unfortunately, in the fear of toxic episodes, some had not even begun multiplayer games and others stopped playing them altogether.

> "Strangers curse at me sometimes in Counter-Strike and such when I'm not fast enough at killing enemies." [translation] (P47, vision disability)
>
> "Boys and men are really bad. I avoid games where I have to talk to them, because they harass and verbally abuse me, mocking my gender and age" (P5, vision, physical, hearing, and cognitive disability)
>
> "I don't tell people I'm disabled even when I can't do something. I'd rather just take the L" (P1, cognitive & physical disability)
>
> "However, in my early teens, I learned the hard way that it's not a good idea to tell about your disability in gaming communities, which mainly consist of strangers. Therefore, the people, with whom I spent a considerable amount of my free time as a youngster, while playing multiplayer games, don't know about my disability even today, and our friendships didn't extend beyond the game world. I believe that I might have befriended some of them outside of the game, and still interact with them, if I wouldn't be disabled." [translation] (P32, physical disability)

Many of the issues in multiplayer games stemmed from the general inaccessibility of such social games, especially compared to offerings of single-player games. Respondents remarked how multiplayer games lack even the very basic accessibility features; namely aim assists and input alternatives. Often, mentions of the faster pace as well as the dichotomy between balance and accessibility in multiplayer games arose from the answers. Many felt that the balance comes first in these games, often rightly so, and as such accessibility features could be exploited to provide unfair advantages to players who use them.

> "Multiplayer games, however, are super-inaccessible for me because they often lack very basic accessibility features such as solid aim assist, which is, of course, understandable so it doesn't give a benefit to others." (P4, physical disability)
>
> "Multiplayer is far less accessible and relies on speed more." (P28, vision & hearing disability)

> "multiplayers games are generaly focus on the competition between the players, if someone doesn't have the same chances of winning it's not fun." (P26, vision disability)

4.3. Solutions to overcome barriers

Respondents offered plenty of strategies on how they could alleviate the encountered barriers. Some had tried and tested solutions to find the best ones for their needs, others only offered a wish to see such features as options while playing. Ultimately, the solutions were divided into three themes that were *settings-based*, *software-based*, and *hardware-based* solutions.

4.3.1. Settings-based solutions

Settings-based strategies, meaning accessibility features that could be changed in-game, were by far the most prevalent in the dataset. Based on the responses, button and input manipulation rose as the most prominent solutions. Nearly one-third of the players used the button remapping feature in some way or form to tailor the play experience better. Most of the answers did not elaborate on the reasoning for remapping, but there appeared mentions of being left-handed, needing simpler control schemes, and putting many actions into extra buttons of a mouse. Similarly, alternative input methods such as utilising toggles, minimized interaction requirements, removing motion controls, and simple QTEs (quick-time-events) gained significant traction in the responses. In addition, multiple responders emphasized the importance of aim assists.

> "More modern games have key remapping, so I can favour my left hand. However, I think at the moment because I play older single player games it's unfortunate they lack accessibility settings." (P17, physical disability)

> "Button remapping (including the touchpad on the DualSense/DualShock 4), easy to swap presets, the option to fully turn off motion controls." (P24, physical disability)

> "There should be an option to replace holding a button down with toggle, ie. a menu that stays open only if you hold a button down is hard for me" (P6, physical disability)

> "Destiny 2 is surprisingly playable even for me, despite requiring speed. It has the most effective aim assist of the games I've played, the movement is smooth, and there are enough settings to customize. The game can also be played in different styles, and I like that it doesn't force close-quarters combat but allows you to play at a slower pace from a distance and still do well." [translation] (P38, physical & neuropsychiatric disability)

Participants, especially ones with sensory disabilities, embraced varying strategies that made the information more presentable to them. Particularly, one code manifested from the responses: the popularity of subtitle adjustments. 28 per cent of players specifically mentioned this feature. Especially, the possibility of adjusting the font size was apparent, but some preferred also font colours and backgrounds, sound effect captions, and tailoring the amount and speed of subtitles per phrase. Another popular feature set was visual adjustments, assists, and cues. In these codes, players did not hesitate to offer solutions which ranged from ordinary brightness, resolution and contrast settings as well as removing motion blur and screen shaking to more profound ones like manipulating the colour of game objects, highlighting crucial content, or changing the visual layer completely. Among the suggestions, a few players hoped for less flashing of lights and "safer" graphics to have a pleasurable play experience.

> "Many games could use better subtitles (bigger fonts, backgrounds, emotional cues...) but otherwise I can play games just fine." (P14, neuropsychiatric disability)

> "Some things that come to mind are high contrast mode, increasing font size, colorblindness filters. I usually set the resolution to low." [translation] (P85, visual disability)

> Horizon Forbidden West has actually been very accessibility with their brightness and contrast setting which can help dull or highlight things (I do wish I could change the machine lights separately though), their climbing feature, aim assist and more. (P3, vision, physical, cognitive, and neuropsychiatric disability)

Lastly, players favoured a diverse set of gameplay tweaks that altered the core gameplay or game mechanics in one way or another. The most well-known feature of these, the possibility to adjust the game difficulty, resonated strongly with respondents. Some wished for regular difficulty settings, others preferred god modes or skippable mini-puzzles and overly challenging events. Moreover, slowing down the game speed gained plenty of traction among the players, which is a relatively rare feature in commercial games. Additionally, traversal in games was deemed to pose challenges for many. Hence, they expressed the benefits of different types of traversal assist, from preventing game characters from falling off ledges to automatic movement and navigation aids.

> "Enlarge fonts, sometimes easy mode or god mode if available." (P27, physical disability)
>
> "As well Hades has a special mode that makes you stronger each time you die, which I found made the game easier for me to play without taking away the challenging factor." (P17, physical disability)
>
> "Or alternatively, slow down my game enough so that I could press all the buttons at the speed at which my fingers would work." [translation] (P78, physical & neuropsychiatric disability)
>
> "Visual elements can be handled through alternative means or have some assisting features, like in-game navigation for those who require it." [translation] (P44, visual disability)

All in all, there appeared a myriad of other good suggestions. However, they were so scattered and catered to specific needs that they did not apply to this section without convoluting the structure.

4.3.2. Software-based solutions

Respondents took advantage of a diverse collection of third-party software to produce more accessible play experiences. Concerned software necessarily were not meant to be used with digital games, yet they seemed an effective, or at least prevalent strategy to bypass barriers. Similar to the first paragraph, button remapping manifested itself in this theme too, yet on a different level. Whereas many games nowadays provide remapping

features, plenty of others do not. As such, many respondents resorted to relatively technical means by tweaking their controllers and PCs with third-party software. The software in question is usually combined with third-party hardware, such as adapters, to enable inaccessible games. These allowed respondents to program more accessible control schemes for their specific requirements.

> "I use a Titan2 adapter which allows me to code/add accessibility settings like remapping, toggles and to write custom button combos." (P9, physical disability)

> "I guess my keyboard and mouse's software counts? Allows me to remap buttons for games that do not have the option built-in." (P15, physical disability)

Furthermore, other types of software were used for other needs, mainly to convey information or supplement input catalogue. Belonging to the former, frequently requested screen readers, arose as a divider of whether blind or low-vision players could play the games. Additionally, a digital magnifying glass, Zoom, and Sonic Radar –software to alter in-game sounds – were beneficial for some. On the other hand, the latter encompassed techniques such as voice commands and voice recognition, that could be used to generate additional inputs and actions in games. One participant even mentioned ingeniously utilising Cheat Engine, a notorious software used to cheat in games, for accessibility purposes.

> "I am blind, so I must use a screen reader to play all games" (P2, vision disability)

> "If I were to play games today, I would definitely use screen reading software as needed, depending on the situation, with Braille display and/or speech support. However, I have played games in the past, mainly on a Commodore 64 computer, during which there weren't the same assistive technologies available as there are today. So, back then, we relied on sound cues just like we do now, if one were to have access to that particular device." [translation] (P45, vision, hearing, physical, cognitive, and neuropsychiatric disability)

> "Third party software to perform actions via voice commands." (P7, physical disability)

4.3.3. Hardware-based solutions

The hardware theme encompassed all the solutions that issued such physical devices that were used to aid gameplay. Considering the high number of players with motor impairments in the survey, the prevalence, even overrepresentation of adaptive controllers from the answers did not come up as a surprise. Many players expressed playing with relatively established products such as XAC (Xbox Adaptive Controller) and QuadStick. Others preferred more common controllers that contained lighter structures and buttons, but also more niche devices such as one-handed modified game controllers were mentioned. Likewise, a collection of different mouses and trackballs were used. To supplement the input catalogue, some participants combined eye-tracking software such as Tobii Eye Tracker to be more efficient and accurate.

> "By enabling the use of several different (third party) controllers at the same time. For me it's the XAC which I use with my feet plus a console/VR controller, keyboard, trackball" (P6, physical disability)
>
> "The Quadstick enables me to play almost any game." (P11, physical disability)
>
> "I found an accessory for Nintendo Switch controllers in the United States that allows me to connect the controllers in a way that I can play with one hand." [translation] (P57, physical disability)
>
> "[I have] all kinds of mice, keyboards, and controllers, each suitable for different activities." [translation] (P90, physical disability)

Moreover, some participants were not completely sure what was meant by accessibility features and solutions. As such, they hesitantly mentioned using eyeglasses, contact lenses, big gaming screens, and hardware setups allowing for playing further from monitors to enhance the readability of games – all of which are perfectly suitable hardware-based accessibility strategies. Other similar, more generalised products were hearing aids, earmuffs, wrist supports, additional controller grips, and ergonomic stools. Yet, some mentioned being familiar with novel technologies like haptic headphones that will vibrate the sounds to their heads. Ultimately, multiple respondents expressed their

specific needs and bemoaned how there are no such products in the market; even though there very much is.

> “It's not exactly assistive, but I plug all platforms into a big-screen television to play.” (P18, vision disability)

> “There seems to be a lack of businesses producing custom gaming controllers in the market, but disabled gamers are likely a small and heterogeneous group.” [translation] (P32, physical disability)

> “I've been dreaming for many years that for people with disabilities whose hands function similarly to mine, someone would create a controller where you could perform some functions by just turning your head. Alternatively, something like the old joystick style, as seen in the Amiga 500, for example, or a method where you could achieve the same functions by speaking or typing.” [translation] (P78, physical & neuropsychiatric disability)

5 DISCUSSION

This study intended to uncover the play experiences of disabled players through three research questions. In addition, it sought to explore whether there has occurred any change for the better due to the more accessible commercial games on the market over the past few years. Here, the main findings are elaborated in contrast to each research question and comparisons are drawn to the APX model and previous studies. After that, the overall findings are elaborated and reflected upon the current game culture and game industry in general.

1. What are the play practices of disabled players?

It is essentially impossible to provide a clear-cut answer to this question. Disabled players are far from a homogenous group as the data showed significant variance with virtually every possible demographic variable. The gaming years, weekly play hours, motivations, preferred genres, games and platforms, and social play habits had all sets of differing responses. Some respondents were seasoned game veterans whereas others had just begun their gaming journey. There were enthusiastic action-heavy game fans as well as ones leaning towards calmer games, ones which offered tools for self-expression. Interestingly enough, based on Table 2, disabled players were not the core player segment for the year's best-sellers, but opted to spend their time with a myriad of other games. As such, it is paramount to halt the thinking that it would be sufficient if only some games or prototypes would be accessible. It is evident, that the tastes and preferences of disabled players vary a great deal. Therefore, the major catalogue of commercial games should have, at least, the bare minimum of accessible features to cater to this segment of players and provide extensive inclusion and desirable play experiences. There are use cases for specific game prototypes (see Yuan & Folmer, 2008) and niche genres such as audio games, yet they should not be the sole option for players with particular needs.

Moreover, regarding the motivations to play games, *fun (91%)* and *relaxation (84%)* dominated the responses (Table 1). Interestingly, motivations such as *action*, *creativity*, and *competition* did not garner a more universal agreement, considering that digital games could elicit these much more effortlessly than barrier-filled real-life hobbies, for example. Overall, a study comparing the play motivations among disabled and non-disabled players would be fascinating. In any case, the two most popular play motivations repeated the earlier findings of both Beeston et al. (2018) and Cairns et al. (2021). Other distinct connections to the results of the aforementioned studies were *challenge* and *socializing*. However, the latter, social aspect resonated with just slightly under half of the respondents, which does not convincingly support the common idea of digital games fostering a sense of community, at least not within the disability community. Whether this is due to the numerous issues in multiplayer game accessibility or due to a random occurrence in the participation pool, that remains to be seen in further academic endeavours. Ultimately, the semantics of the motivation choices in surveys seemed to differ to a degree between this and previous studies. In consequence, there is no clear answer as to whether the motivations to play have changed in the past few years.

2. What accessibility barriers do disabled players encounter while playing?

Even with today's game accessibility frequency, the barriers were numerous and divided rather evenly to *access* and *challenge* segments of the most recent version of the APX model (Power et al., 2021). In the *access* section, the barriers manifested mostly based on the type of disability. Namely, players with physical disabilities mainly represented the base complaining about issues with controls, input requirements, and issues with third-party device compatibility – also a frequently mentioned barrier in previous studies (Porter & Kientz, 2013; Power et al., 2021). This finding falls under problems with the *Input* and *Control Options* of the APX model.

On the other hand, players with sensory disabilities struggled with the information channels of games, which was also noted in the paper by Power et al. (2021). In these cases, it seems like games did not provide any feasible alternative channels to deliver key information; hence the major issues or complete prevention of playing the game. However, this study also uncovered a rarer finding in the form of players missing the information due to convoluted or slow-paced games. One could dismiss this as a personality issue, but neuropsychiatric disability appeared to have a visible influence on this barrier. Both of these barriers belong to *the Presentation Options* of the APX model, yet the position of the latter finding in the model is debatable. One could argue that not being able to concentrate on the story is not a critical barrier and, as such, does not prevent access to the game. Still, the APX model does not provide a proper alternative for it and thus, it found a logical place in the second theme. Furthermore, the third theme regarding players' discomfort due to different stimuli follows the description of the *Presentation Options*, especially if they are severe ones. That is why it is peculiar that the APX model offers an also fitting option for this, *Moderation Options*, in the *challenge* section. If the players' fear of encountering such harsh content prevents them from acquiring and playing the game, how can the option be anywhere else than the *access* section of the APX?

The lack of knowledge of available accessibility solutions was an accessibility barrier that no previously encountered study has written. The fact that this was only a barrier among Finnish players was solidified by Figure 5, which shows that 33 respondents (35 per cent) do not use accessibility settings in games. It turned out that all of the 33 in question were Finnish, making the players that do not utilise accessibility settings a slight majority of Finnish participants. This needs to be investigated further from multiple viewpoints in the future. On the one hand, we should examine if the players who do not know about accessibility settings, in fact, formed the core group who also did not use them. If it were

so, then it could be deduced that potentially more, if not all, of the disabled players in this study would turn on accessibility settings in games, if such options were available, and would significantly experience increased access because of it. Especially, it is significant, because the percentage of people who use accessibility settings would rise from 65 per cent to 100 per cent without Finnish respondents, which, in turn, would indicate a rather positive change in game accessibility since the paper by Beeston et al. (2018). On the other hand, it must be investigated *why* Finnish players do not know about accessibility features and settings. Is it because of absent marketing in Finland? Is it because games and game accessibility news are mostly not in Finnish? Maybe it is just a nuisance to try to order assistive technology overseas. There are many avenues for further study. Nevertheless, as this was a novel finding, it does not resonate with any category in the APX model.

In the *Challenge*-related themes, the distribution of disabilities appeared slightly more varied but still followed relatively logical trails of what could be assumed based on the disability type. The fifth theme about lacking accessibility features is rather significant in that sense that it is the most straightforward hindrance to fix if game studios are determined to listen and execute. Players were somewhat specific about their problems and needs, even when discussing accessibility barriers on a general level. This indicates that, if willing, the player research departments of bigger game studios would have plenty of knowledgeable lived experiences in hand, if they establish a solid method to reach disabled players. The barriers in this theme touched on multiple options of the APX model, mainly the *Performance*, *Assist*, and *Progress Options*. Similarly, the sixth theme about unclear game elements falls under these same options. Also, it is an issue that, when corrected, could aid considerably all players, disabled and non-disabled alike. Being lost and confused in games without any decent hints, waypoints, and indications can be a significant barrier for smaller children and players without proper game literacy. At times,

game studios seem to assume that players automatically understand some universal cues, such as waypoints marked with yellow objects. In consequence, seemingly obvious game elements are not elaborated, which may significantly reduce play experiences. Although the absence of guidance is not always a deliberate game design choice, sometimes the shrouded mystery and convoluted information is a kind of trademark of games, as is the case in one of the quoted games, *Elden Ring* (2022), for example.

Finally, the findings in the last theme about multiplayer games' inaccessibility and toxic nature replicated the outcomes of previous studies (Mason et al., 2021; Porter & Kientz, 2013). Surprisingly, some participants thought the inaccessibility was justified, so that the correct balance stays in these games, even if it meant to impose them barriers. This sentiment was noted already by Yuan et al. (2011) over a decade ago. The reasoning for maintaining balance is reasonable, but there should exist other solutions than excluding disabled players, even when players themselves seemed to be modestly content to their fate. The toxicity, however, in multiplayer games has been a hot topic for a good part of two decades now. Commonly, it is related to women, people of colour, and LGBTQIA+ minorities in highly competitive game scenarios where the emotions run wild, and anonymity blinds the players to throw the vilest threats that one can even conjure. Yet, this study indicated similar toxicity encountered by disabled players. For some, it was just a nuisance, one which they could avoid by, for instance, not communicating or disclosing their disabilities. The communication preferences in multiplayer situations (Figure 7) seemingly support the sentiment as surprisingly few – excluding players with hearing impairments – opted to utilise the usually effortless communication method, speech. Besides, participants preferred relatively strongly to play multiplayer games with friends, family, and familiar people over strangers (Figure 6), which is understandable but may limit the multiplayer game sessions if no such co-players were available. Regardless, for other respondents, the toxicity was too much and caused them to avoid multiplayer games

altogether. Therefore, when we scrutinize the APX model, it is curious that the sole option resonating with this barrier, *Social Options*, is located in the challenge section. If players experience the hostility of multiplayer games so harmful that they refuse to participate in such play environments, then the option should be put into the *access* section of the model.

3. What kinds of strategies do disabled players use to overcome accessibility barriers?

Even with all the barriers hindering the play experiences, disabled players generally were not helpless but came up with various sets of solutions. As game accessibility settings have become more widespread, less surprisingly these resonated heavily with disabled players. Ones, who used accessibility settings, were knowledgeable on their use cases and benefits for the players. Thus, some of them made even relatively thorough propositions about where these settings should be implemented – a feat which requires decent game literacy skills. The most popular accessibility settings in this study – input customization as well as (audio)visual presentation and subtitle adjustments – were also commonly favoured in the study of Beeston et al. (2018). In addition, respondents' preference for game difficulty and speed settings were determined to enhance play experiences already in the recent research by Power et al. (2021). All these popular preferences about accessibility settings directly relate to five of the barrier themes, aiming to alleviate common hindrances.

Participants also were not afraid to get their hands dirty, in a manner of speaking, but had resorted to purchasing and coding devices to their needs when games failed to do so. In a sense, it can be seen as an applaudable persistence and passion towards playing games that players were willing to go to such heights via buying and tweaking third-party devices and software. Yet, in truth, it is an unfortunate situation and a prime example of an *accessibility tax* (Olsen et al., 2018). Based on this study, disabled players are still in

an unequal position and are required to spend significant amounts of money and time to be in the same positions as non-disabled peers. If these devices would be bought or recompensed by social security services or such parties, then it would be more understandable. Currently, such research on assistive technology used in games is lacking, but one can assume that general compensation for leisure time devices is not frequently covered. In any case, were the payment for these devices falls on players or the government, as long as such technology is urgently needed for meeting accessibility needs, games and game accessibility cannot shed the label of the *medical model* from itself.

Then, there is the pressing matter of whether play experiences and game accessibility have improved in recent years along with more frequent accessibility settings in commercial games. The answer is twofold. Yes, there are more and new accessibility settings that players know and are willing to utilise. Such is the case, for example, in gameplay tweaks and slowdown mode. The feature in question appeared in a recent paper by Power et al. (2021) and was extensively noted in this dataset but was not mentioned in previous papers, indicating that it is a newcomer to the accessibility setting scene. Overall, disabled players discussed accessibility features, preferences, and solutions in such a manner, that they seemed to possess rather good insight about available solutions. These solutions encompassed a wider spectrum of disabilities from colour and visual aids and subtitles to traversal assists and in-game guidance. Many of these features came into the commercial game sphere only recently, hence players have adopted them quickly. Furthermore, the high number of gaming years and weekly play hours indicate that even though the study found a plethora of persisting issues, respondents were avid players with an admirable passion for their hobby. Sometimes they even went so far as to purchase a set of hardware and program them to be able to play. Fortunately, these devices were available, and players knew about them, excluding a segment of Finnish players. As for

the motivations for playing, they seemed to replicate findings from previous studies (Beeston et al., 2018; Cairns et al., 2021). Yet, *fun* and *relaxation* are relatively commonly occurring motivators for playing, so even if games are widely and highly accessible, these motivations hardly change.

Still, there manifested plenty of familiar issues and barriers that underline the ongoing *disablisms* that game studios, and game industry, at large, practice. Many of these barriers were the same ones that over a decade-old studies acknowledged (Porter & Kientz, 2013; Yuan et al., 2011). Consequently, if game studios were willing to promote inclusion, they would have both the know-how and passionate experts to aid them. Alas, most games still are solely developed for the perceived 'normal' players who possess sufficient functionality and game literacy to play these games without decreased experience. Disabled players seem to continue being an afterthought and they must continue to battle through the structural barriers that non-inclusive game design imposes upon them. Certainly, the industry's change towards more accessible game design is apparent (Game Developers Conference, 2018, 2023), but it is painfully slow. Furthermore, console makers' reluctance to meet halfway players, who have spent a considerable amount of their fortune and time on third-party technology, appears somewhat contemptuous attitude. The fact that assistive technology incompatibility manifested as a frequent issue back in 2013 (Porter & Kientz) and similarly now a decade later does not paint a very positive picture of the developments in that respect. Of course, these devices can be used in harmful ways, for instance, cheating in multiplayer games; hence the probable reason why such devices are generally made incompatible. Yet, for some disabled players, the technology in question is the only lifeline to continue participating in their favourite pastime activity. Hence, there should be ways to enable console compatibility with these assistive technologies for players who require them. Besides, even though consoles bring markets their assistive technology (see Van Ommen et al., 2022), they are not necessarily

suitable at all for some disability types. Moreover, multiplayer games turned up surprisingly hostile to participants, both regarding their inaccessibility and toxic player base. All of these multiplayer hardships were noted already in previous studies (Gonçalves et al., 2020; Mason et al., 2021; Porter & Kientz, 2013), hence no significant change in that department. Understandably, game studios cannot comprehensively influence the behaviour of their player bases in the multiplayer setting. It is a more widespread problem impacting players from all minority groups, not just disabled players. Still, game studios could at least enhance the accessibility of multiplayer games to promote inclusion. Better yet, they could, for instance, develop dedicated servers for more altered rules, customised game mechanics or disabled players. How to supervise and control these servers is another hurdle but some change is urgently needed. In any case, that is another topic for further study. Overall, from multiplayer game troubles, we can draw connections to Reeve's (2008) notion of *disablism*, where the game studios impose barriers and manage what disabled players can *do*, and the behaviour of other players impact who disabled players can *be*.

Ultimately, this study contains several considerations and limitations. First of all, after the research progressed, it appeared that the APX model was a great, albeit imperfect, framework for finding barriers regarding accessing and playing games. The model lacked some important sections such as players having no information about accessibility possibilities or the gravity of hostility in multiplayer spaces. Furthermore, even when the model's name, Accessible Player Experiences, implies, it does not feel like the best method to measure experiences. Yes, it determines accessibility barriers, which are core factors in the play experiences of disabled players. However, it keeps the study on the surface level without truly diving deep into the mechanics of players' feelings, emotions, and reasonings. For instance, if there were a way to combine or modify PLEX cards (Lucero & Arrasvuori, 2013) in the context of disabled players, it could provide more

meaningful and personal expressions – ones that revolve around the feeling and thinking aspects of players during gameplay rather than whether they can interact with particular sections of a game well, adequately, or not at all. It is yet another solid possibility for studies in the future. Secondly, the recruiting of participants from the game spheres could have skewed the results in some ways. For example, avid players may be more knowledgeable about different game accessibility features and solutions than more casual players. This then, in turn, could offer a more positive view about the change in games' inclusivity than what it is in reality. However, plenty of respondents were also recruited through disability organizations, so the study should encompass various player types, which the demographic statistics also indicated. Thirdly, even with the conscious choice of including all disabilities in this study, it begs the question of whether it would have been better to focus on particular disabilities. Sure, the findings were rich and abundant and provided a comprehensive view of the current state of being a disabled player. Yet, the results stayed at a rather general level without going too deep into personal level and singular matters. By picking the most prominent and repeated expressions during coding, many potentially fruitful but niche opinions were left in the darkness. Through a more focused and compact participant pool, this study could have discovered genuinely something novel instead of mostly repeating the same outcomes as previous studies – even though this thesis shed some new light on the matter. Finally, the study encompassed an international participant pool, but aside from a few exceptions, the respondents were from Western countries. Thus, we can assume that all of the findings apply only to the Western setting. Namely, if a similar type of study were run in non-Western-centric circles, we could have entirely different experiences, barriers, and solutions. However, this type of study would need several well-versed translators; a feature which was not possible in this thesis. Thus, it is left for further inquiries.

6 CONCLUSION

In the 2020s, disabled players are a rich, diverse, and passionate segment of the player base that has found several means to embrace their gaming activities, even when commercial games still raise structural barriers decreasing the play experiences. Based on the study, accessibility in games has improved in recent years and disabled players themselves are generally well-versed to utilise, or at least realize, different available accessibility settings that could aid them to have more desirable play experiences. Many players also handily used several software- and hardware-based methods to overcome built-in accessibility issues in games, albeit these technologies can be unnecessarily costly and time-consuming to set up. Still, there appeared several persistent accessibility barriers that impeded players' experiences. Mostly, these were due to barriers in game mechanics or presentation, hardware incompatibility, and toxic multiplayer space. Especially, the latter caused significant problems among respondents and, for some of them, prevented playing and participating in multiplayer games.

Therefore, we can conclude that even though commercial games have become evidently more accessible, there is still plenty of work to do to promote full inclusion and ensure pleasurable accessible play experiences for disabled players. The work for change does not completely fall on game studios, however, but console makers, singular game developers, games media, and other players are urgently needed for a change of direction. Not only do games need to transform to comprise inclusive game design, but the game industry should learn to do it in terms of disabled players by hiring them full-time and establishing accessibility departments as a standard practice.

When the rest of the world imposes restrictions one after another on disabled people, let us create virtual worlds as a utopia where everyone equally can truly express themselves without needless worries or limits!

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APPENDIX 1. SURVEY

Playing digital games as a disabled person.

1. Your country **[required]** *

2. Age **[required]** *

- ◯ Under 18
- ◯ 18-24
- ◯ 25-34
- ◯ 35-44
- ◯ 45-54
- ◯ 55-65
- ◯ Over 65

3. Gender **[required]** *

- ◯ Woman
- ◯ Man
- ◯ Non-binary
- ◯ Prefer not to say

4. How long have you played digital games? **[required]** *

- ◯ Less than 5 years
- ◯ 5-10 years
- ◯ 11-20 years
- ◯ More than 20 years

5. Type of disability **[required]** *

- ☐ Vision
- ☐ Physical
- ☐ Hearing
- ☐ Cognitive
- ☐ Neuropsychiatric
- ☐ Muu

6. Does your disability affect your playing? **[required]** *

- ◯ Yes
- ◯ No

7. Describe your disability especially from viewpoint how it affects your playing **[required]** *

You can elaborate more on your disability if you want. For example if you chose vision disability, you could elaborate on the type of disability (e.g., color blind, low vision, blind). From playing perspective you can elaborate how your disability affects your playing.

8. Do you use built-in accessibility settings while playing? **[required]** *

For example subtitling, contrast and button remapping can be accessibility settings

- ◯ Yes
- ◯ No

9. What built-in accessibility settings do you use?

10. Do you use assistive products while playing? **[required]** *

For example screen reader, custom-made controller

- ◯ Yes
- ◯ No

11. What assistive products do you use while playing?

12. How many hours per week do you play digital games? **[required]** *

- ◯ Less than 5 hours
- ◯ 6-10 hours
- ◯ 11-15 hours
- ◯ 16-20 hours
- ◯ 21-25 hours
- ◯ More than 25 hours

13. On which platform do you play? **[required]** *

Choose all the options that fit you

- [ ] Playstation 4
- [ ] Playstation 5
- [ ] Xbox Series X
- [ ] Xbox One
- [ ] Nintendo Switch
- [ ] Nintendo Wii/WiiU
- [ ] PC
- [ ] Phone
- [ ] Muu

14. What type of digital games do you play? **[required]** *

Choose all the options that fit you

- [ ] Puzzle
- [ ] Gambling
- [ ] Card
- [ ] Strategy
- [ ] Simulation
- [ ] Digital Board Games
- [ ] Racing
- [ ] Shooter
- [ ] Sports
- [ ] Platformer
- [ ] Fighting
- [ ] Rhythm/ Music
- [ ] Adventure
- [ ] Role Playing Games (RPG)
- [ ] Massively Multiplayer Online Game (MMO)
- [ ] Audio Games
- [ ] Muu

15. I play video games for the... **[required]** *

Choose all the options that fit you

- [ ] Challenge
- [ ] Competition
- [ ] Socialising
- [ ] Action
- [ ] Achieving new skills
- [ ] Experience
- [ ] Creativity
- [ ] Fun
- [ ] Mental health management
- [ ] Stress management
- [ ] Relaxation
- [ ] Muu

16. How often do you play single-player games **[required]** *

- ◯ Several times per week
- ◯ Once per week
- ◯ Once per two weeks
- ◯ Once per month
- ◯ Less frequently
- ◯ Never

17. What single-player games do you play?

18. How often do you play multiplayer games? **[required]** *

In this study a multiplayer game is a video game, that more than one person can play at the same time, or in turns, in the same environment either locally or online with a game console or computer.

- ◯ Several times per week
- ◯ Once per week
- ◯ Once per two weeks
- ◯ Once per month
- ◯ Less frequently
- ◯ Never

19. If you don't play multiplayer games, what is the reason for it?

20. What multiplayer games do you play?

21. How often do you play multiplayer games online? **[required]** *

- ◯ Several times per week
- ◯ Once per week
- ◯ Once per two weeks
- ◯ Once per month
- ◯ Less frequently
- ◯ Never

22. Who do you play multiplayer games with online?

- ☐ Friends
- ☐ Family
- ☐ Strangers
- ☐ People I know
- ☐ Muu

23. How often do you play multiplayer games locally? **[required]** *

Locally means in the same space

- ◯ Several times per week
- ◯ Once per week
- ◯ Once per two weeks
- ◯ Once per month
- ◯ Less frequently
- ◯ Never

24. Who do you play multiplayer games with locally?

- ☐ Friends
- ☐ Family
- ☐ Strangers
- ☐ People I know
- ☐ Muu

25. How do you communicate while playing multiplayer games?

- [ ] Speech
- [ ] Text
- [ ] Sign Language
- [ ] Buillt-in features (such as communication wheel)
- [ ] I don't communicate
- [ ] Muu

26. Does your communication differ depending are you playing online or locally? How?

27. How other players treat you in multiplayer games?

28. What do you think of the statement: Games are accessible for me currently **[required]** *

- ◯ Fully disagree
- ◯ Somewhat disagee
- ◯ No opinion
- ◯ Somewhat agree
- ◯ Fully agree

29. Argument your answer: Why the games are/are not accessible for you currently? **[required]** *

30. Which games you have played are the most accessible? Why? **[required]** *

31. How could games be made more accessible for you? **[required]** *

32. From accessibility viewpoint, do you think playing games has changed during the years you have played? How? **[required]** *

33. Have you noticed any differences in accessibility between single-player games and multiplayer games? What?

34. What do you think of the statement: I would play more if the games would be more accessible **[required]** *

- ◯ Fully disagree
- ◯ Somewhat disagree
- ◯ No opinion
- ◯ Somewhat agree
- ◯ Fully agree