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Time Spent Gaming and Conflicted Shyness: Searching for Reciprocal Effects in Adolescence

Hovedoppgave i Profesjonsstudium Psykologi

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Kunnskap for en bedre verden

Preface

Process

The work process on this thesis started with a desire to investigate how gaming relates to social skills among adolescents. After familiarizing myself with research on gaming and social development, a curiosity was sparked. Gamers are often portrayed as socially awkward and withdrawn, this led to a desire to investigate if there are effects between gaming and social traits. Subsequently this condensed to two fitting variables that we had access to from Trondheim Early Secure Study (TESS), namely “time spent gaming” and “conflicted shyness”. Due to access of longitudinal data of the two variables we wanted to check for reciprocal effects between them. We started with an open-ended approach that enabled both positive and negative outcomes of the variables. The main analysis was done by my supervisor Beate Hygen and my co-supervisor Vera Skalicka in Mplus since this analysis software is not available to students. Preliminary analysis was done in collaboration with my supervisors. I have done the interpretation of the results and discussion with feedback from my supervisors. Both supervisors have given me regular advice on further work with the text.

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Abstract

Gaming is a popular pastime activity among adolescents, and many adolescents invest a substantial amount of time playing electronic games. Gaming has long been assumed to negatively influence social development of adolescents. Gamers are commonly portrayed as shy and withdrawn through media. Conflicted shyness is a trait with negative implications on social functioning through adolescence. The current work aimed to examine prospective relations between time spent on electronic games and conflicted shyness in a community sample of Norwegian adolescents (N = 790) controlling for gender, socioeconomic status and gaming with friends. The adolescents were followed up at age 12, 14 and 16. This thesis is the first study to assess relationships between gaming and conflicted shyness across time in adolescence. Results revealed that more time spent on gaming at age 12 predicted higher levels of conflicted shyness at age 14. A correlation between time spent gaming and conflicted shyness was also found at age 12, suggesting that at this age more time spent on gaming is associated with higher conflicted shyness and vice versa.

Keywords: gaming, conflicted shyness, adolescence, longitudinal

Sammendrag

Gaming er en populær fritidsaktivitet blant ungdom, mange ungdommer investerer mye tid i elektroniske spill. Det har lenge blitt antatt at spilling har negativ innvirkning på sosial utvikling hos ungdom. Gamere blir ofte portrettert i media som sky og tilbaketrukne. Sosial sjenanse er et trekk med negativ innvirkning på sosial fungering gjennom ungdomstiden. Det aktuelle arbeidet forsøker å utforske potensielle relasjoner mellom tid brukt på spilling og sosial sjenanse i et utvalg av norske ungdommer (N = 790) kontrollert for kjønn, sosioøkonomisk status og spilling med venner. Ungdommene ble fulgt opp da de var 12, 14 og 16 år. Denne avhandlingen er den første studien som vurderer relasjonen mellom tid brukt på spilling og sosial sjenanse gjennom ungdomstiden. Resultatene viste at mer tid brukt på spilling i 12 års alder predikerte høyere grad av sosial sjenanse i 14 års alder. En korrelasjon mellom tid brukt på spilling og sosial sjenanse ble også avdekket hos tolvåringene, dette antyder at i denne alderen så er mer tid brukt på spilling assosiert med høyere nivå av sosial sjenantheit og motsatt.

Introduction

This paper aims to make a contribution to a small part of the large field that is gaming research by looking at the social trait conflicted shyness and how it relates to time spent gaming. To understand the interplay between gaming and conflicted shyness, both phenomena will be explored in detail.

Gaming

Gaming has become a central part of adolescents' everyday life and only seems to increase in popularity. There is no indication at this point in time to assume that this popularity will diminish in the future (López-Cabarcos et al., 2020). With E-sports, gaming stream platforms (i.e., twitch, youtube), gamification of learning tools and social media, the communities of gamer culture expand like never before (Kim et al., 2021; Ryan et al., 2006). Children and adolescents are exposed to gaming in numerous ways in a technologically focused society.

There are many different definitions of gaming available. In this paper games and gaming will be defined as: “Interactive electronic games where the players actively engage in content of the game alone or cooperative engagement with other players (both physically present or not present) within the gameplay”, derived from the definition used by Hygen et al., (2020) with background from Granic et al., (2014).

Gaming has over the last decade become a more accessible and widespread activity than it used to be (Bergesen, 2017) and can be played on a variety of devices such as mobile phones, computers and different consoles (e.g., Nintendo, Playstation and XBOX). Most Norwegian adolescents (12–16-year-olds) have access to a platform where they can play electronic games ((Norwegian Media Authority, 2022) this will further be referred to as (NMA, 20XX)). According to a report by the Norwegian Media Authority (NMA, 2022), 76% of Norwegian children between 9 and 18 years old are involved in gaming activities. 92% of boys and 59% of girls play games. From 2018 to 2020 a higher percentage of girls reported gaming activities, however the number of girls playing video games drastically declined between 2020 and 2022 from 76% to the above mentioned 59%. Norwegian adolescents spend on average slightly under 2 hours gaming per day, with higher time spent gaming among boys (Tuv & Foss, 2021).

Concerns related to the effects of gaming

The rising popularity of gaming has not been without worries. Gaming has since the early 1990s caused concern among scholars and the general public because of the potential impact on children's behavior and psychological development (Griffiths, 1993). Since electronic games first appeared, there has been a lot of criticism towards gaming, and how it may affect children and adolescents. To the present day, there is still an ongoing debate in the research field of how and if children and adolescents gets negatively influenced by gaming (Mathur & VanderWeele, 2019). A negative stance on gaming comes partially from research focus on excessive problematic gaming and pathological gaming (e.g., Desai et al., 2010; Lemmens et al., 2011) and is driven by and directed towards parental fear of unknown consequences (Narine & Grimes, 2009). A lot of research focus has been directed towards negative outcomes related to gaming such as aggression (e.g., Anderson et al., 2010; Burkhardt & Lenhard, 2022; Drummond & Sauer, 2019), gaming addiction (e.g., Wichstrøm et al., 2019) and psychopathology (e.g., King & Delfabbro, 2016). Therefore the notion of gaming as inherently harmful has been upheld by media articles and scientific articles aiming to find those damaging aspects (often exaggerated and taken out of context) (e.g., Konijn et al., 2007), and thereby skewing the view of harmfulness by not simultaneously checking for positive effects and overall impact of what gaming means to the individual (Kowert & Oldmeadow, 2015). Fear of what gaming does to children can both come from not understanding new things and fear of the unknown, as can be seen in the age group 50 years and above who has the most skeptical attitude towards gaming (Hygen, 2022). This age group might be the one with the least experience with the use of modern electronic games.

In addition to fears of gaming leading to specific psychosocial issues, there is also a fear that normal social interaction (in real life (IRL) face to face interaction) will be displaced by gaming. This notion is best explained theoretically by displacement theory (Kraut et al., 1998). Displacement theory makes it possible to look at media usage in relation to three aspects: time displacement, functional displacement and social displacement (Kraut et al., 1998; Nie, 2001; Robinson et al., 2002). Fears of gaming-effects can arise with background in what the adolescents misses while gaming, such as physical activity, sleep, academic learning or social interaction/friendship (Qin et al., 2021). Among the fears of effects video games might have on adolescents, social displacement is argued to be one of the most prominent concerns (e.g., Narine & Grimes, 2009), particularly directed towards shy children with already limited social practice arenas.

Many hypotheses of displacement theory have emerged over the years, evolving with different perspectives of focus. Displacement theory originated from an idea of time displacement, meaning that to adopt a new media, time spent on other activities will need to be rearranged (Lazarsfeld, 1940). Kraut et al. (1998) later proposed an extended similar hypothesis “Social Activity Displacement” focusing more on the social context and emphasizing that use of internet leads to sacrifice in social involvement IRL. Some studies have noted quality differences in online social interactions compared to face to face-interaction (e.g., Cummings et al., 2002) meaning that IRL-interactions displaced by lower quality online communication could be negative for communication skill-development and other social domains (Shen & Williams, 2011). Following the underlying principle that time is inelastic and a limited resource and quality-differences in its communication, time spent online could come with a sacrifice to time spent IRL developing meaningful relations (Nie, 2001).

Even though concerns and fear were highlighted in early research, a more positive view of gaming has started to emerge in recent years. This has been reflected in the research community (Bavelier et al., 2011; Domahidi et al., 2018; Granic et al., 2014). Domahidi et al., (2018) even directly disputes the claim that social displacement by gaming have negative social consequences for the majority of players, and Hall & Liu, (2022) contests the long held stance that new media displaces social interaction. With gaming on the rise and still uncertainty about its negative effects, there is a much needed unbiased (at least curious and open ended) approach to gaming research.

Conflicted Shyness (CS)

Social withdrawal is the tendency to not partake in social settings and be more isolated from one’s own social surroundings (Rubin et al., 2014). Conflicted shyness is one dimension of social withdrawal, categorized as a high approach-avoidance conflict where the individual have a high desire to seek peer interaction, but are limited by their social fear, anxiety and lacks the ability to initiate those interactions, hence the term “conflicted” shyness (Coplan et al., 2004). The other dimension within social withdrawal is social disinterest where the individual is less interested in initiating a social interaction (Coplan et al., 2004). This distinction is important since the current study only explore and examine the conflicted shyness-dimension.

Low social competence, low self-esteem, introversion, loneliness and social anxiety are all closely related to conflicted shyness but are not the equivalent of conflicted shyness (e.g., Anderson & Harvey, 1988; Jones et al., 2014; Schroeder, 1995; Zhao et al., 2013). People who score higher on conflicted shyness may in general manifest lower levels of social competence and higher levels of social anxiety, and experience a higher degree of loneliness and lower self-esteem (Coplan et al., 2004; Huan et al., 2014; Tian et al., 2021). However, among the conflicted shy individuals, the degree of the aforementioned traits may vary.

Background of conflicted shyness

Development and degree of shyness through childhood and adolescence seems to be rooted in temperament in infancy (Kagan et al., 1994). In childhood, emergence of self-awareness, self-conscious emotions and ability to take others perspective seem to play a critical role of development of conflicted shyness (Hassan et al., 2021; Poole et al., 2018). In adolescence upsurge in the factors emerging in childhood combined with onset of puberty and increased saliency of peer relations is likely to rise the degree of shyness (Tang et al., 2017). Other factors in upbringing may also impact the development of shyness. One example is that some parental styles can be a contributing factor to higher levels of conflicted shyness (Coplan et al., 2004). Authoritarian parenting style may foster more social isolation and withdrawn behavior. Overprotectiveness and over soliciting by a parent may also contribute to shyness as it inhibits the children from exploring the social context themselves and therefore not develop adequate coping strategies for further socialization and therefore experience a higher wariness in social settings (Coplan et al., 2004). Shyness is a relatively stable trait from childhood through adolescence, although it is possible to sustain it more by not engaging in social interaction, and therefore not contest it (Karevold et al., 2012). As considered above, conflicted shyness seems to be rooted in both biology and social environmental factors through upbringing (Rubin et al., 2014).

Risk of conflicted shyness

The reason to look at conflicted shyness lies in its potential to affect social development and later struggles for individuals. Several studies have evaluated risks of shyness on the account that shyness is a hindrance (negative trait for social interaction) in social settings that can have an impact on life-quality later in life (e.g., Grose & Coplan, 2015; Karevold et al., 2012; Rubin et al., 2014). Shyness in late childhood predicts a less active adult social life and in adolescence often lead to loneliness (Coplan et al., 2004; Rubin et al., 2014). Shyness on a global level shows a delay in common adult social events such as

marriage and parenthood (Grose & Coplan, 2015). In a cross-lifespan perspective conflicted shyness appears to be more negative for boys than girls (Coplan et al., 2004). Shy children are also according to Coplan et al., (2004) more likely to perceive themselves as less competent, increasing the likelihood of negative self-concept. Conflicted shyness is linked to social anxiety and low threshold for physiological arousal that differentiate them from more disinhibited peers (Rubin et al., 2014). In addition to anxiety, conflicted shyness is also associated with later symptoms of depression and internalizing problems (Kopala-Sibley & Klein, 2017). Adolescents that are shy and socially anxious more often experience difficulties in social interactions, proneness to rejection by peers, victimization and internalizing problems (Laghi et al., 2013). Compared to social disinterest, conflicted shyness seems to be a more problematic form of social withdrawal in regard to internalized dysregulating emotions (Rubin et al., 2014). It is argued that due to more demanding and frequent social interaction in adolescence, shyness in this time period is associated with more negative outcomes compared to early shyness (Karevold et al., 2012).

Why it is important to examine factors related to gaming and conflicted shyness

Research can help to understand the impact gaming has on the social lives of children and adolescents (i.e., Hygen et al., 2020). Since “social lives” of adolescents is a vastly broad term, smaller parts of social development need to be examined to understand what influences it. Shyness is a trait that can shape social development and social lives of adolescents (Grose & Coplan, 2015) and is therefore a factor that is particularly interesting to examine together with gaming. Given that many children and adolescents spend extended time on gaming (NMA, 2022) it is important to understand if and how gaming might influence newer generations in the social domain. If there are negative influence of some aspects to gaming, information through research is fundamental to determine how those negative effects can be mitigated or hindered. The same is true with positive influence of gaming, where positive influence or effects can be built upon and expanded to aid in a normal and adequate development. The only way to find out about positive and negative effects is through research on gaming. Since gaming seems to be a resilient and long-lived past time-activity (López-Cabarcos et al., 2020) (although evolving and changing in possibilities with new technology and knowledge) further research plays a key role in monitoring and hopefully guide the gaming industry to a standard of healthy gaming for children and adolescents.

The social aspect of gaming

Children and adolescents' everyday life revolves more around digital communication now than earlier, and they are exposed to more time in front of a screen (e.g., phone, computer and console) on a daily basis (NMA, 2020, 2022). Screen time can no longer be considered a passive activity, especially when it comes to gaming (Hygen, 2022). Gaming has changed substantially in the last decade being more complex, diverse, realistic and social in nature (Ferguson & Olson, 2013; Stenros et al., 2011). The player has more agency related to contributions within the game and possibilities for social exchange. This tendency is rising as games get increasingly interactive and complex. Gaming has evolved from simple single player games (where IRL-physical meeting was the only way to play together) to a vast multiplayer-online connected platform that enables social interactions across the world (with anyone, anywhere, anytime) (Polson et al., 2007). The internet also facilitates easier connection and organizing of larger groups that play together, e.g., clans (Sergeyeva et al., 2018). Scientific studies have a hard time keeping up with the pace of the gaming industry and its effects (both negative and positive) on children and adolescents (Mathur & VanderWeele, 2019).

The social nature of gaming is a complex field. On one side, many games can be a platform for social interaction and facilitate the opportunity to socialize with others (Ducheneaut & Moore, 2004, 2005). Although the social interaction is not necessarily the same as in everyday life when people meet face to face (Downey & Gibbs, 2020). On the other hand, people can choose not to engage in the social aspect of gaming, or play games that are single player focused, therefore not interact with other people. The vast number of different games, genres, subtypes and playstyles makes it hard to generalize how social the players are in game, and what possibilities each game provides with regards to socialization. In other words, gaming can provide the opportunity and context for socializing (R. Perry et al., 2018), but players may choose not to take part of it.

To understand how gaming can be a social activity, it is valuable to look at how games are being used in a social manner. 75% of teenagers play online with others according to the Pew Research Center (Lenhart, 2015). 89% of these teenagers play with friends they know in person, and 54% play with friends they only know from the online community. The high percentage use of gaming platforms as a social tool highlights the social possibilities gaming has to offer for this age group. The Norwegian Media Authority (2022) reports that 63% of the gamers (9-18 years old) associate the games they play with a social aspect, where they

think that gaming is social or makes them have more contact with friends. 48% think that gaming facilitates a higher number of new friends. These high numbers underline the importance of gaming as a significant social arena for young people where they can share an interactive experience with peers. Note that this only portrays the subjective opinion from the respondents themselves and does not differentiate between on-line friendship and IRL- friendships that could have quality-differences in communication.

Gaming with others often involves a substantial element of social exchange (Olson, 2010). Some types of games facilitate this exchange as a part of the gaming experience, as is the case with massive multiplayer online games (MMOGs) and massive multiplayer online role-playing games (MMORPGs) (Cole & Griffiths, 2007; Sergeyeva et al., 2018). By playing these games players are forced to interact with other players through cooperating either for objective gains within the game or just for the social experience and immersion in the gameplay (Jin et al., 2017). Even in most games that are single player focused, there is a social aspect with a community outside the game (e.g., youtube, forums or discord servers) that lets the players exchange thoughts, feelings and comments of the game with others (Paraskeva et al., 2010). Gaming can also contribute to a social arena through more organized activities, like going to an esports club or participating in tournaments (Adamus, 2012). This however requires that a community outside of the platform organizes and facilitates the possibility for a place to gather and engage in gaming activity together.

Social use of gaming related to conflicted shyness

Gamers that struggle with social difficulties (i.e., conflicted shyness) may have an opportunity to engage and practice social interaction in a way that is easier to manage than in face-to-face interactions (Saunders & Chester, 2008). Playing games can make it easier to talk because players have a common goal in-game and a shared interest (Eklund & Roman, 2017; McKenna et al., 2002). In-game communication (either through text, emotes (e.g., avatar movements) or voice chat) limits the need for rapid responses/reactions through facial expressions and body language, and also eliminates the aspect of physical appearance (Cole & Griffiths, 2007). This may make it easier for adolescents with social-, appearance- or body-issues to engage in conversation without the distraction of how they perceive themselves or worries of judgement (George & Odgers, 2015). Social chatting in games through a third party voice chat may also help maintaining contact with close and not so close friends, and can contribute to form and maintaining relations IRL, for example in school setting (Eklund & Roman, 2017). Socialization and communicating takes practice to master, and for people with

difficulties engaging social interactions (as with conflicted shyness) gaming may provide an alternative arena to explore and engage in socialization to a larger degree and in an easier way than IRL (Kowert et al., 2014; Valkenburg et al., 2005). Adolescents with conflicted shyness may experience difficulty initiating or maintaining social contact in everyday life, and the gaming platform can help them get some experience they would else lose out on without this possibility (e.g., Kowert et al., 2014; Kowert & Oldmeadow, 2015). This can also give an alternative arena to feel mastery rather than failure over their socializing skills (i.e. give them a break from struggling socially), that perhaps contributes to help them overcome the initial hesitation to partake socially (Kowert et al., 2014). Gaming may also facilitate socializing and friendship by gathering a group of people with similar interests on a common platform. Digital gaming may act as a motivator for friendships in school settings, and therefore have a positive impact on conflicted shyness by broadening their social circle IRL (Eklund & Roman, 2017; Kowert et al., 2014).

There is still unclarity in the field if children that are high in conflicted shyness have low social and social-cognitive skills, or if they are simply avoidant of initiating social contact (anxiety driven) and therefore show less “prosocial behavior” (Coplan et al., 2004). One distinction that might have an impact on how shy players take advantage of gaming to create and maintain relationships (and therefore practice social interaction) is emotional sensitivity (ES) (Kowert et al., 2014). Emotional sensitivity is a component in social skills (by being sensitive to the social cues) and a behavioral component. It refers to the ability to interpret the nuance of nonverbal and emotional cues of others. Kowert et al., (2014)’s study shows that players with high emotional sensitivity use gaming differently compared to their low emotional sensitive counterparts by expanding their social circle to a larger degree. Highly emotional sensitive gamers use the game time in a more social manner (but not more game time overall) as a place to socialize, get friends and maintain relations (higher number of online and offline friends) (Kowert et al., 2014). Shy individuals tend to have smaller social circles to begin with, and gaming might therefore be a good venue for friendship expansion (Kowert et al., 2014). From this conclusion and higher online to IRL- friendship transfer (among high ES), this might indicate that conflicted shy gamers (subgroup high emotional sensitive) get to practice social interaction with less anxiety. More friends offline might give shy people more chances to engage in IRL social interactions. On the other hand, it is not known if online practice transfers the social skills to IRL (Eklund, 2015), or if online interactions reduces the anxiety in other social settings (i.e., reducing conflicted shyness). Nevertheless, gaming has the potential to be a playground for exploring social interaction

safely without anxiety-inducing elements that IRL-face-to-face communication can require (Kowert et al., 2014).

Advantage of digital communication through gaming

One aspect of the benefits of socializing via gaming is that it is an available communication platform where individuals can communicate with whomever they want, whenever they want and wherever they want (warranted that one has a smartphone or other ways to play). For conflicted shy individuals, this can be an easier way to make the initial contact that they often struggle to achieve IRL (Kowert et al., 2014; Pierce, 2009). The selection process where the shy gamer can choose whom to contact (limiting outer factors as group size compared to IRL) can be advantageous for shy adolescents and they may feel less inhibited in the communication and more in control over the interaction (Valkenburg & Peter, 2011). The communication occurs more at the terms of the conflicted-shy player, where they are more in control compared to IRL due to asynchronicity in response-time where they can think about their response longer before it is given (Valkenburg & Peter, 2011). Also the limitation in visual cues provided by communicating through games can help shy adolescents to overcome the shyness and inhibition they usually experience in IRL encounters (McKenna & Bargh, 2000; Valkenburg et al., 2005). The social norms of when to cut the contact in the interaction is less pressured because the “escape route” and more fleeting encounters (easy as a push of a button, and abbreviated explanations of leaving by just typing G2G (got to go) in the chat). In other words, it can be easier to get out of the conversation at any time because it does not follow the same “strict” social norms of when it is “ok” to leave and how that should be done. In extension of this, internet communication is less formal, and that also might help take off the pressure of the interaction (Zizek, 2017). However, Eklund, (2015) found that some social norms extends from IRL to online gaming connected to whom the players interact with in the game (if they have IRL connections with already established social norms).

Disadvantages of communication through gaming

Although voice-chat can provide the opportunity to practice communication, it is constricted by some limiting factors compared to IRL-communication (Cummings et al., 2002), and may therefore not be a full substitute for the more complex communication everyday life physical interactions provides. Differences in communication-quality in online communications compared to IRL communication (Moore et al., 2007) can limit the

adolescents full experience of the interaction (i.e., text and voice chat compared to face to face interaction). There is a lack of nonverbal visual cues to process within online communication (Kowert & Oldmeadow, 2015), hindering practice on this area of usual IRL communication. There is still uncertainty to what degree digital social communication transfers to IRL-encounters (Eklund, 2015). Practice of limited tasks does not always generalize the outcome of the practice to more advanced tasks (as social interactions IRL is) (e.g., Corrigan & Basit, 1997). Taken together, the lack of face to face (physical presence)-communication in games can both be seen as an advantage and a disadvantage, especially for conflicted shy adolescents. On one side it may take away some of the anxiety-pressure the individual feels in IRL-encounters, but on the other side it lacks the full communication-experience IRL interactions contains. This could limit the full experience of social face-to-face exposure and might restrain transfer of online-social interaction to IRL social interaction.

Gaming motivation and conflicted shyness

(Lenhart et al., 2008) states that most children and adolescents play video games when they are available and affordable. This means that gaming has some form of appeal to young people that keeps them playing and invested in the activity. To determine why young people spend time gaming it is crucial to look into established frameworks of motivation. Many theoretical models have emerged for explaining the psychology behind motivation. One of the most commonly used theoretical models for describing motivation is “Self Determination Theory (SDT)” (Deci & Ryan, 1985; Ryan & Deci, 2000). SDT offers a suggested understanding that underlies motivation of choices, and groups them into three basic universal psychological needs: Autonomy, Competence and Relatedness. The theory emphasizes that the more fulfilled those needs are, the more we are willing to pursue and engage in an activity (Deci & Ryan, 1985). The model also divides motivation into intrinsic and extrinsic, meaning that the motivational factors comes both from both within and external input (Deci & Ryan, 2008; Ryan & Deci, 2000).

This theory is applicable to gaming activities (Ryan et al., 2006), because both motivation to start playing and keep playing the game can be examined in the light of SDT. Intrinsic motivation is the description of motivation that comes from within (Deci & Ryan, 2008). For example, the enjoyment of an activity or if the activity feels interesting. Within gaming the intrinsic motivation is what game developers often seek to expand on and facilitates enjoyment of the gaming experience (e.g., Birk et al., 2016). Gaming especially has

an innate intrinsic motivation factor because it is designed to be fun to play and give joy (Vorderer et al., 2003). Extrinsic motivation refers to the motivation one experiences from the external world, like a reward of some kind (i.e., money, fame, status etc.) (Deci & Ryan, 2008). Linked to gaming, this can be the motivation young gamers experience from boosting social status among peers from being good at a game (i.e., perceived social validation).

Since both intrinsic and extrinsic motivation is involved in gaming, it is reasonable to elucidate the three traits (autonomy, competence and relatedness) in depth to discuss the possible implications and relations it could have with conflicted shyness.

Autonomy

Autonomy refers to the agency and control of one's own actions, to take part in one's own decision making (Deci & Ryan, 2008). Autonomy is central for the feeling of being in control of one's own actions, and keeping intrinsic motivation for a long term goal. It also promotes well-being when one is intrinsically motivated through autonomy in a specific task (Deci & Ryan, 2008).

Related to gaming, motivation to play may be partially explained by the agency one has within the game as one makes choices. The level of control the player has over aspects of the game can determine willingness to keep playing. Games often enable the player to have control over many elements of the game to keep it entertaining and rewarding. Players like to have options they have control over in-game (Tyack & Wyeth, 2021; Uysal & Yildirim, 2016). Some examples are character customization, choices of where to go (open world games) or freedom to accept and decline quest-lines to form the game as the player wishes. Sandbox games (like Minecraft) that let the players form the environment and objectives are especially designed to tap into this domain of autonomy and allow for creativity and self-expression. Autonomy and the ability to make free choices hinders the gaming experience from getting stale and repetitive. Research on STD shows that players like to have choices while playing, and that it motivates for further engagement in a game (Madigan, 2016). This might be particularly important for conflicted shy gamers because they have limited social autonomy and freedom to partake in the social arena. Gaming can be an arena for them to expand autonomy in a less socially threatening environment and possibly fulfill some of the need to have agency in their lives. Conflicted shy people are inhibited in their social interaction with peers. Some anecdotal evidence shows that gaming can be a liberating experience for those who are hindered in IRL social interactions. One example of this is Mats

who had a physical impairment that made him immobile (Steen & Opedal, 2020). He used the game world to run in as a way to experience autonomy and freedom. If conflicted shyness is seen as a social impairment, one can argue that games can be used to “run” in a digital social environment with less constrictions.

Competence

Competence within SDT refers to the need of experience for mastery and being effective and in control of the activity and environment. For this need to be met, the person will need to feel optimally (adequately) challenged without being overwhelmed (Deci & Ryan, 2008).

Related to gaming, competence describes possibility to experience success within the game and expand skillset and mastery of a game. Competence as a motivating factor is often experienced by the player by winning, complete quests, achieve goals or achieve a higher level in-game (Ferguson & Olson, 2013). Gamers like the feeling of progressing and evolving their skills in a noticeable way. People have an inherent desire to complete tasks and feel closure, which in turn leads to satisfaction with playing the game (Madigan, 2016).

Competence related to gaming can be seen as both an intrinsic motivation (by feeling of mastery/progress) and extrinsic motivation (incentives for playing like quest rewards or other in-game benefits). For conflicted-shy individuals gaming might be an arena where they feel mastery over their skills, and some mastery over social interactions in-game (without being overwhelmed). This feeling of mastery while gaming can be important for conflicted-shy adolescents because they often feel inadequate in other social arenas (Tian et al., 2019).

Relatedness

Relatedness within SDT is the need to feel connected with others and a sense of belonging. The motivational factor drives people towards positive social feedback and meaningful attachment to other individuals or groups (Deci & Ryan, 2008).

Relatedness as the last aspect of STD is fundamental to understand social motivation of gaming as relatedness describes the need to interact and connect to others. This happens mainly through contact with other players when people create meaningful relations and can interact in a meaningful way. Most people seek to interact with others and form bonds and relations (Baumeister, 2012). By playing together and successfully communicating within the game, the players experience relatedness to peers, and that in turn can motivate for further

indulgence in the game (Uysal & Yildirim, 2016). Relatedness is an important factor for social motivation for gaming (Uysal & Yildirim, 2016)). Cooperation in games by team-play and third party communication programs make it easier for the player to experience relatedness and engage in the social aspect of gaming (Sergeyeva et al., 2018). Conflicted shy individuals may not have their need for social interaction met IRL, and therefore use the gaming platform as a substitute for social fulfillment. Conflicted-shy adolescents per definition want to have social contact but are limited in their approach to common IRL social situations. Thus, it is not hard to understand why the social aspect that gaming provides with less anxiety-inducing setting is alluring (e.g., Bowman et al., 2015). Non-shy individuals may use gaming as a supplement to meet a higher need for socializing.

Escapism

In addition to SDT as a complete theory of motivation, other supplementary explanations for motivation are also relevant to the theoretical understanding of games and how it relates to conflicted shyness. One that is highly applicable is the phenomenon “escapism”. Escapism is commonly understood to be different actions that promote relief from everyday life (Cohen & Taylor, 2003) or coping with emotional distress by repressing acknowledgement of the stressor (Folkman & Lazarus, 1980).

In an expansion of this, escapism can be seen as a form of self-regulation and an active or passive motivating factor within intrinsic motivation (Stenseng et al., 2012, 2021). Gaming and other leisure activities can produce a flow state that narrows self-awareness momentarily and therefore reduce the emotional strain from problems one experiences (e.g., Baumeister, 1990). Flow state is considered to be a key motivating factor for playing (Hsu & Lu, 2004). Some research shows that shy adolescents are more likely to achieve satisfaction by indulging in escapist behavior (P. Wang et al., 2020). Stenseng et al., (2021) proposes that escapism consists of two separate motives; self-suppression and self-expansion, which can have different emotional outcomes. Self-suppression is more related to maladaptive psychological adjustment and poorer emotional outcome while Self-expansion on the other hand is related to adaptive psychological adjustment and positive emotional outcome (Stenseng et al., 2021). As escapism as a phenomenon can be applied to different leisure activities, gaming is no exception. The findings of Stenseng et al., (2021) indicates that different use of games as a mental retreat can have an impact of emotional effect of the player. The theoretical relevance of escapism on conflicted shyness and time spent gaming is that the player might be motivated differently. Shy adolescent players that are motivated by self-expansion might

experience a flow state more frequently while gaming, and less limited by self-awareness and therefore feel mastery over the social interaction. This in turn could boost their self-esteem that might result in more social interactions and relations (Harris & Orth, 2020) and thus reducing the conflicted-shy feelings. It could also in theory be that conflicted-shy individuals who are motivated by self-expansion would use more time in games due to the positive emotional outcomes of gaming. On the other hand, it could be that conflicted-shy gamers motivated by self-suppression lacks adaptive strategies to overcome the shyness, and therefore spend more time on gaming in absence of better options to cope (e.g., Kardefelt-Winther, 2014; Melodia et al., 2022). There is to my knowledge no studies that directly investigate the difference between self-suppression-motives and self-expansion-motives on for gaming by conflicted shy adolescents.

Other factors related to gaming motivation

Self Determination Theory and escapism can to great extent explain gaming motivation and how it relates to conflicted shyness. However other perspectives can also be of use for the theoretical background. Some research has found that shy people tend to spend more time on a computer and gaming than non-shy people (Ayas, 2012; Chak & Leung, 2004). One explanation is that people have an inherent drive to belong and socialize. Need to belong theory (Baumeister, 2012) postulates that people have a “fundamental, strong and pervasive motivation to form and maintain at least a certain minimum number of social relationships”. This can be an important explanation of why conflicted-shy adolescents seek gaming as a way to meet that need of adequate social relations.

Conflicted shy adolescents are more likely to have lower self-esteem due to inadequacy of IRL social interaction (Colwell et al., 1995; Harris & Orth, 2020), and people with lower self-esteem are more likely to game excessively because of emotional dissatisfaction (Hellström et al., 2012). Conflicted shyness through the mediating part of loneliness (and a need to belong) is a predictor for spending more time on-line and indulge in on-line leisure activities (as gaming is) (Baumeister, 2012; Tian et al., 2021; P. Wang et al., 2020). Taken together, these findings indicates that other traits and factors related to shyness might also be a part of different motivations for gaming. Motivation is composed of a large puzzle of factors that initiate choice-making. As implied in the previous paragraphs, motivation for gaming is both complex and differ in degree of motivational factors drive for motivation between individuals.

Summary of theory

To summarize the theoretical perspective of potential relations between time spent gaming and conflicted shyness, the most relevant possible explanations and pathways will be categorized within four areas:

Why time spent gaming might increase conflicted shyness

Time spent on gaming can displace time used to socially interact IRL (Social displacement theory (Kraut et al., 1998). This can lead to lower social practice if the adolescent neglects IRL-interactions. Gaming can for some be a solitary and isolating activity, as gaming doesn't require social interaction to be engaged in, although it is more common to use gaming socially (e.g., Ducheneaut & Moore, 2004; Ferguson & Olson, 2013; Kowert & Oldmeadow, 2015). Escapism (particularly self-suppression) might be used as a motivating factor for adolescents by avoiding social difficulties and not addressing them (and therefore not practice socially). We do not know to what degree online social interaction (practice) transfers to IRL-social interactions meaning that it could be lower than expected (Eklund, 2015). Depending on the gaming platform and communication channel, quality of the communication could be reduced substantially compared to IRL-communication (Hall & Liu, 2022). This again could reduce the applicability and transfer of skills to IRL-interactions. Different age groups may also use gaming as a social arena to varying degrees. Adolescents with low emotional sensitivity may have more trouble taking advantage of the social possibilities digital gaming can facilitate and therefore engage in less social interactions (Kowert et al., 2014), thereby sustaining conflicted shy tendencies.

Why time spent gaming might reduce conflicted shyness

Time spent on gaming can facilitate practice of social interactions in a less stressful environment making it easier for adolescents to partake (Pierce, 2009), increasing social confidence if the social-skill transfer is higher than expected. Related to gaming motivation, adolescent can practice autonomy by actively make own choices (possibly increasing social autonomy IRL), competence by mastery of the social situation (possibly negating feelings of social inadequacy IRL) and relatedness by creating meaningful relations (boosting access to a social network and bond with peers) (i.e., Deci & Ryan, 2008).

Why conflicted shyness might increase time spent gaming

Conflicted shyness can lead to more gaming due to the need to belong socially (Ayas, 2012; Chak & Leung, 2004). Shy adolescents may seek gaming to meet that need of adequate social relations that they lack IRL with theoretical background in need to belong theory (Baumeister, 2012). Some research has found that shy individuals tend to spend more time gaming than non-shy individuals, this is also elevated through the mediating factors of low self-esteem and loneliness (Hellström et al., 2012). Conflicted-shy adolescents may also be more prone to extended time gaming due to alluring gaming motivations through autonomy (increased social autonomy), competence (mastery of a life aspect) and relatedness (feeling of belonging and acceptance) (i.e., Deci & Ryan, 2008). There is also escapism to consider (from the non-satisfactory IRL-social lives) that could lead to more time involved in gaming activities (i.e., Stenseng et al., 2012).

Why conflicted shyness might reduce time spent gaming

Conflicted shy adolescents generally have a smaller social circle (Kowert et al., 2014). Some research shows that adolescents are influenced to spend more time playing games if their peers play more (Amialchuk & Kotalik, 2016), a larger social circle could therefore indicate that there is a higher chance for influence to play more amongst those who have a larger social circle. In contrast a smaller social circle (as shy people often have) could mean that conflicted-shy individuals would not be influenced to the same degree by friends to play games, thus reducing time spent gaming.

Why there might be reciprocal effects between conflicted shyness and time spent gaming

Arguments on how conflicted shyness and time spent gaming can be related is shown in all 4 constellations of possible outcomes (why more time spent gaming might increase conflicted shyness, why it might reduce conflicted shyness, why higher conflicted shyness might increase time spent gaming and why it might reduce time spent gaming.) In a theoretical perspective, conflicted shyness and gaming might therefore exert reciprocal effects on each other but presumably through different mechanisms and motivations.

Current study

The current study aimed to explore the possible reciprocal effects of conflicted shyness and time spent gaming at three time points (when the participants were 12-, 14- and 16-year-olds). To my knowledge no other study has been conducted on this subject with longitudinal data and checking for reciprocal effects at this age group (12-16 years old). Some studies touch the thematic of gaming and shyness (e.g., Ayas, 2012; Desai et al., 2010; Evensen & Sognnes, 2022.; Hygen et al., 2020; Kowert et al., 2014; Kowert & Oldmeadow, 2015; Laghi et al., 2013; Wang et al., 2020) but with different focus areas, parameters and age groups than in the current study. There is limited research on conflicted shyness as a phenomenon per now. The lack of research done on reciprocal effects between conflicted shyness and gaming makes it an interesting field to explore. Longitudinal data on time spent gaming and conflicted shyness is collected from Trondheim Early Secure Study (TESS) (Steinsbekk & Wichstrøm, 2018) where a vast amount of information is gathered biennially on a group of children followed from 2007.

The benefits of using longitudinal data compared to cross-sectional data in psychological research is that longitudinal data span over time and can uncover over-time-changes, while cross-sectional data only contains a glimpse into one time point. What this means for application of analysis tools is that it is possible to analyze a phenomenon in chronological order by longitudinal analysis (Caruana et al., 2015). Longitudinal data contains more information on development of different factors (for us time spent gaming and conflicted shyness). The age group we look at (12-, 14- and 16-year-old) is an age group that undergoes a vast change in both social development and activity interests. By grouping them into one segment in cross-sectional analysis, the nuanced differences could fade, and age specific effects might be overlooked.

Since both time spent gaming and conflicted shyness could be influenced by other factors, a selection of possible influencing variables has to be controlled for. Firstly, socioeconomic status (SES) is controlled for because it may have an impact on both time spent gaming (e.g., Mollborn et al., 2022), and conflicted shyness (e.g., Lawrence & Bennett, 1992). Because of the possible link between SES and the two main factors we are looking at, it could be a variable that could skew the findings if not accounted for. Secondly, gender (G) is controlled for because on average more boys play video games than girls do (Fairclough et al., 2009). Girls tend to primarily seek close, intimate relations while males tend to be more

oriented towards larger networks of shallower relations (Baumeister, 2012). Gaming communication with its limiting factors could be more suited to uphold a larger number of shallower relations and therefore possibly be more satisfying for boys, and less satisfactory for girls. There could also be gender differences in shyness through adolescence (Doey et al., 2014). Gender imbalance should therefore be addressed and accounted for. Lastly, gaming with friends (GWF) is controlled for due to the difference in effect of solitary gaming and cooperative gaming (e.g., Bowman et al., 2015) could have on the main variables.

To examine the possible effects of time spent gaming and conflicted shyness on each other, four hypotheses were formed to account for all possible outcomes due to possible effects (previously discussed and summarized) of both factors on each other:

H1: More time spent gaming leads to elevated levels of conflicted shyness in subsequent years.

H2: More time spent gaming leads to reduced levels of conflicted shyness in subsequent years.

H3: Conflicted shyness leads to more time spent gaming in subsequent years.

H4: Conflicted shyness leads to less time spent gaming in subsequent years.

Choice of age group

Adolescence is the period between childhood and becoming an adult where children seek away from their parents and more toward peers for social development and acknowledgment (Nickerson & Nagle, 2005). Around age 11 (girls) and age 12 (boys) generally marks the start of adolescence (start of puberty) (M. Perry, 2012). It is a vulnerable time in a person's life, and adolescents are more prone to get a problematic self-evaluating mindset if they don't have the necessary skills to develop or use social skills in relations to peers (e.g., not feeling like they handle the social situation in an adequate way) (Coplan et al., 2004). Socialization and friends become increasingly important in adolescence, and the social complexity of making friends and maintaining relations also increase. Since adolescents tend to seek more toward peers and peer relations and less to their parents, it is highly relevant to study the age of 12-16 years old for a better understanding of what may affect social interaction between peers, and how gaming might affect and/or be affected by social interaction in this age group. The continuous task of acquiring and maintaining peer relations

is especially important in adolescence since it is a foundation of later relation-skills and social participation as these skills have to be founded, practiced and maintained (Olson, 2010).

The time period of adolescence is where many people undergo a change from adult administered rules, to take more part in decision making processes (e.g., more freedom to choose time spent on self-selected activities such as gaming). The parents are believed to have less oversight over their children's game-time and use as their offspring gets older and more independent (Lukavská et al., 2022). Before adolescence the parents have more control over the time and types of games children play. This makes the adolescent segment a desirable age-group to study when it comes to gaming due to lesser parental control/interaction over gaming (although not total lack of control). This notion is reflected in Trondheim Early Secure Study (TESS) by switching from asking parents of younger children about time spent gaming, to asking the adolescence instead.

Methods

Study design

The present work has its bases in data form the fifth (T5), sixth (T6) and seventh (T7) wave of the Trondheim Early Secure Study (TESS) (Steinsbekk & Wichstrøm, 2018). The first wave of TESS was conducted in 2007 and 2008 (T1), and the participants were followed up biennially for further testing. It included participants from two birth cohorts (children born in 2003 and 2004). The Regional Committee for Research Ethics, Mid-Norway, approved the project for each wave of data collection prior to startup (www.etikkom.no, REK 4.2008.2632).

Participants and Procedure

Trondheim Early Secure Study (TESS) is an extensive ongoing longitudinal study of child development gathering data on both physical and psychological aspects of the participants. The participants consist of children born in 2003/2004 in Trondheim, Norway, and their parents. By parent permission, children were recruited to the study at the age of 4 years in collaboration with the Well Child Clinic on their annual routine check-up in 2007. The check-up is a free service available for all children residing in Norway. Before the check-up, 3456 invitations to participate in the study were sent out to families, alongside a screening tool for mental health problems called "Strengths and Difficulties Questionnaire" (SDQ) 4-16 version for them to fill out. Completed SDQ forms were then collected. 3358 families

attended the health check-up, corresponding to 97% of the contacted families. 176 families (5%) were excluded from participating in the study due to inadequate proficiency in Norwegian. Of the families that attended the health check-up, 3182 families (95%) met the inclusion criteria. The attending nurses forgot to ask 166 parents (5%) for participation, the remaining 3016 families were then given more detailed information about the study and asked to participate with a written informed consent. Of the families informed, 539 (18%) declined the offer to participate further, resulting in a total of 2475 families (82%) giving written consent to participate.

In TESS, children with emotional and behavioral problems were oversampled to increase variability and therefore statistical power. The total score of SDQs were divided into four strata with cut-of 0-4, 4-8, 9-11 and 12-40. A pre-defined portion of children in each stratum were then randomly selected to participate. The probability of being selected to participate in the study were therefore higher with increased SDQ-score. Of the 2475 eligible consenting families a sample of 1250 families (50%) were drawn to participate and invited to the university for interviews. Of the invited families, 1007 families (81%) were successfully interviewed in the first wave (T1) (mean age = 4.55 years; 50.6% boys). At T1 in the clinic, 81% of the children were accompanied by their biological mothers, 99% of the children were of Western ethnic origin and 86% of the children's parents lived together in the same household. During the recruitment phase, dropout rate did not vary by gender ($\chi^2 = 0.23$, $df = 1$, $p = .63$) or SDQ-strata ($\chi^2 = 5.70$, $df = 3$, $p = .13$). See Figure 1 for a flow-chart overview of recruitment and follow-up process. For a more detailed description of recruitment and procedure, see Steinsbekk & Wichstrøm, (2018).

The current study is based on data from later follow-up assessments when the children were 12 (T5; 666 participants), 14 (T6; 636 participants) and 16 (T7; 665 participants) years old. A total of 790 participants had valid values on at least one observation time in this period, constituting an analytic sample consisting of $N = 790$ in further analysis. See Table 1 for sample descriptives derived at T5. Attrition analyses were conducted to examine whether the variables applied in the study predicted dropout. The results of the attrition analyses showed that conflicted shyness at age 12 (T5) predicted attrition at age 14 (T6) (OR= 1.06, $P = .03$, C.I.= 1.004- 1.109). Thus, children with a higher score on conflicted shyness at age 12 were more likely to quit the study at age 14. Missing data were managed with full information maximum likelihood estimation.

Measures

Time spent gaming (TSG)

The adolescents were interviewed at age 12, 14 and 16 (T5, T6 and T7) regarding how many hours and minutes they played electronic games during a typical week supplemented by how many typical play-days they had in a week. To help with the recall process and estimations, the adolescents were asked to estimate time played in natural segments of a typical day. Those segments were: number of hours and minutes before school (and number of days per week), during school hours (and number of days per week), after school (and number of days per week), before dinner (and number of days per week), in the evening (and number of days per week) and during night (and number of days per week). Weekends were also estimated with similar questions and segments of the day (school-related questions were omitted). The estimated game time-average for the days were then multiplied by the respondents' reported days of gaming in a week. This data resulted in a continuous index of time spent gaming per week. Before answering the questions, respondents were given the following instructions by the research assistant:

“By gaming we refer to games mostly played online, where other players participate. However, it is not a requirement that other players participate. When answering questions about time spent gaming, do not forget to include time spent on games that are played on computers, devices and consoles such as smartphones, tablets, Playstation and Nintendo where you are not online. Do not include board games and games similar to that, and do not include time spent on the Internet for school purposes, pure social media sites or sexual online pages.”

Conflicted shyness (CS)

Coplan et al., (2004) developed The Child Social Preference Scale (CSPS) to assess social withdrawal among children. CSPS originally had two dimensions, shyness and social disinterest. In TESS, only the conflicted shyness dimension was used. Teachers that knew the adolescent were asked to rate each child on this dimension. The conflicted shyness dimension consists of six items. These are some sample questions for reference: “The child declines social initiative from peers because he/she is shy”, “the child “hoovers” around other children’s play while not partaking” and “The child rarely takes initiative to activities with peers”. Teachers rated each item on a 5-point Likert scale ranging from 1 (to a small degree) to 5 (to a large degree). A sum-score was then created for each child. Internal consistency

(Cronbach's alpha) of the CSPS conflicted shyness subscale were in the range between good and excellent at all time points (T5; $\alpha = .87$, T6; $\alpha = .86$, T7; $\alpha = .85$).

Socioeconomic status (SES)

The International Standard Classification of Occupations (ISCO; ILO, 1990) was used to measure parental SES. Socioeconomic status was operationalized as the parent's highest occupational status in the family. The SES classification is based on skill level (i.e., formal and technical skills required in the job, included years of formal education) together with skill specialization (consists of specific knowledge requirements; proficiency in use of tools/machines, what materials being worked on and what goods and services that is produced). Occupational status was then coded on a scale from 1 to 5 where 1 represents unskilled worker and 5 represents leaders.

Gaming with friends (GWF)

To determine the frequency of social interaction between friends while gaming at age 12, 14 and 16 (T5, T6 and T7), the adolescents were asked how often they played games with friends. This was reported on a five-point Likert scale ranging from: (1) always, (2) most of the time, (3) sometimes, to (4) rarely, and (5) never. A higher score reflects less time gaming with friends.

Data analysis

Structural equation modelling (SEM), adjusting for covariates, was used for examining cross-sectional and longitudinal relations between conflicted shyness and time spent gaming. For a visual theoretical model of the cross-lagged effects at ages 12, 14 and 16 between conflicted shyness and time spent gaming, see Figure 2. Mplus 8.4. (Muthén & Muthén, 1998-2012) was used to test the autoregressive cross-lagged model. To investigate possible bidirectional effects of conflicted shyness and time spent gaming together with control variables (socioeconomic status, gaming with friends and gender) all dependent variables were regressed on all variables from previous time. Correlations at all time points of the residuals were allowed. To provide corrected population estimates, weighted analyses were performed corresponding to number of children in the population within the specific stratum divided by number of participants in the stratum. This was done due to the overrepresentation of children with high SDQ-scores within the sample. Children with low SDQ-scores were weighted up, while children with high SDQ-scores were weighted down. Full Information Maximum Likelihood (FIML) procedure was used to handle missing data. According to

criteria postulated by (Hu & Bentler, 1999) model fit was assessed. These criteria included comparative fit index (CFI) $>.90$, Tucker-Lewis index (TLI) $>.90$, root mean square error of approximation (RMSEA) $<.06$ and standardized root mean square residuals (SRMR) $<.05$.

Results

Preliminary analyses: Descriptives and Correlations

Descriptives of study variables are presented in Table 2. Time spent gaming increased in average from around 10 hours (SD = 10.353) spent on gaming each week at age 12, to around 14 hours (SD = 14.133) at age 14 and over 17 hours (SD = 16.855) at age 16. This means that average game time increased nearly seven and a half hours from age 12 to age 16 (in average hours playing weekly). Conflicted shyness was on average centered around the lower part of the scale, representing that the majority of children had low levels of conflicted shyness reported by the teachers. Socioeconomic status did not differ much from age 12 to age 14 (M = 4.7, SD = 0.96) indicating high stability in socioeconomic status. Gaming with friends increased slightly from age 12 (M = 3.1, SD = 1) to age 14 (M = 3.3, SD = 1.2) indicating that youth spend a little less time gaming with friends at age 14 than they did at age 12 (higher score indicates less time gaming with friends).

Correlations between study variables are presented in Table 3. Significant positive correlations of time spent gaming were found between all three time points. The same is found for conflicted shyness between all three time points. Time spent gaming correlated significantly in a positive direction with conflicted shyness in all constellations. This suggests that there is a correlation between time spent gaming and conflicted shyness before control variables are introduced.

Among the control variables, there were also found significant correlations. Socioeconomic status had significant positive correlates with socioeconomic status between all time points. One negative correlation was found between socioeconomic status at age 14 and time spent gaming at age 12, other correlations between socioeconomic status and time spent gaming were not significant. One positive correlation was also found between socioeconomic status at age 12 and gaming with friends at age 16. Gaming with friends at age 12 and age 14 had significant negative correlations with time spent gaming on all time points, indicating a connection between higher social use of gaming and time invested in games where those who

play more with friends spend more time gaming. No significant correlations were found between gaming with friends at age 16 and time spent gaming on any time point. One positive correlation was found between gaming with friends at age 16 and conflicted shyness at age 12. No other correlations were found between gaming with friends and conflicted shyness at any other time point. Gender had significant negative correlates with time spent gaming at all time points, meaning that girls spend less time gaming. Significant positive correlations were also found between gender and gaming with friends at age 12 and 14 (not at age 16) indicating gender differences in social gameplay at these time points where being a girl is associated with playing less with peers. Taken together, this suggests that the selected control variables could influence the relations between time spent gaming and conflicted shyness and is therefore included in the further analysis.

Reciprocal-Effects Analysis

An auto-regressive cross-lagged model was fitted within a structural equation model (SEM) using Mplus 8.4 (Muthén & Muthén, 1998-2012). First cross-lagged paths across the longitudinal measures of time spent gaming and conflicted shyness together with cross-sectional covariance and adjustment for covariates were fitted in the SEM model. For improving model fit based on modification indices, a second-order regression path from time spent gaming at age 12 to time spent gaming at age 16 were added to account for a sleeper effect. After adding the second-order regression path and adjusting for socioeconomic status, gaming with friends and gender, results revealed adequate model fit: χ^2 (df = 16, n = 790) = 39.75, $p < .001$, CFI = .97, TLI = .92, RMSEA = .04, SRMR = .03.

The main analysis (see figure 3) uncovered one significant pathway between the main variables from time spent gaming at age 12 to conflicted shyness at age 14 ($\beta = .18$, $p < .001$) indicating that more time spent gaming at age 12 increased levels of conflicted shyness two years later at age 14 with an effect size of .18. By suggested conventional coefficients-correlation, this value implies small to medium effect (between .10 and .30) however large effect (over .12) if a dedicated cross-lagged interpretation is used (Orth et al., 2022). The results also showed that time spent gaming at age 12 was associated with conflicted shyness-levels at age 12 (positive correlation, $r = .21$, $p < .001$), indicating cross-sectional association. Time spent gaming had by conventional standards upper-moderate to high stability from age 12 to age 14 ($\beta = .48$, $p < .001$), upper-low to moderate stability for time spent gaming from age 14 to age

16 ($\beta = .25, p = .001$) and between time spent gaming from age 12 to age 16 ($\beta = .28, p = .001$). Conflicted shyness had by conventional standards moderate to high stability from T5 to T6 ($\beta = .42, p < .001$) and moderate stability from T6 to T7 ($\beta = .36, p < .001$).

There were also significant pathways for the control variables on the main variables. Gender predicted time spent gaming at all timepoints, age 12 ($\beta = -.42, p < .001$), age 14 ($\beta = -.31, p < .001$) and age 16 ($\beta = -.19, p = .003$). This signifies that girls spend less time gaming than boys at all tested times timepoints. Gaming with friends at age 12 predicted time spent on gaming at age 14 ($\beta = -.07, p = .03$) meaning that those who play less with friends at age 12 spent less time gaming at age 14. Gaming with friends at age 12 correlated with time spent gaming at age 12 ($r = -.18, p < .001$), indicating that less gaming with friends at age 12 associates with spending less time gaming at this age. Time spent gaming at age 12 predicted gaming with friends at age 14 ($\beta = -.16, p < .001$), suggesting that more time spent gaming at age 12 predicts more gaming with friends at age 14. Note that gaming with friends is coded so that higher score means less gaming with friends. All the discoveries mentioned above imply that more time spent gaming with friends increase time spent gaming and vice versa on different time points.

Significant pathways were also found between the control variables. Gender correlated with gaming with friends at age 12 ($r = .30, p < .001$) and gaming with friends at age 14 ($r = .38, p < .001$) implying more social gaming among boys in those age groups. Internal predictions within categories across time were found between gaming with friends at age 12 and 14 ($\beta = .35, p < .001$) in addition to socioeconomic status at age 12 and age 14 ($\beta = .66, p < .001$).

Discussion

From the widespread use of online games and time spent gaming, it is evident that gaming plays a role in the everyday life of adolescents. The average adolescent spends a considerable amount of time gaming each day. Adolescence is also a challenging time for many when it comes to socialization. A trait that can have consequences for how the adolescents socialize is conflicted shyness as conflicted shyness is generally believed to negatively influence how they perceive themselves in social situations and limit their ability to instigate and partake in social interactions. This study aimed to find reciprocal effects of time spent gaming and conflicted shyness between three time points (age 12, 14 and 16) accounting for the control variables gender, socioeconomic status and gaming with friends.

The results showed no support for hypothesis 2: More time spent gaming leads to reduced levels of conflicted shyness in subsequent years, hypothesis 3: Conflicted shyness leads to more time spent gaming in subsequent years, and hypothesis 4: Conflicted shyness leads to less time spent gaming in subsequent years. Further discussion will focus on the significant finding.

Main finding

Hypothesis 1: “More time spent gaming leads to elevated levels of conflicted shyness in subsequent years”, was partially confirmed due to the effects of time spent gaming at age 12 which predicted a slight increase in levels of conflicted shyness at age 14 (only partially since only one pathway was found). No other predictive pathways between time spent gaming and conflicted shyness emerged for other time points. The lack of other significant predictive pathways between time spent gaming and conflicted shyness indicates that there is no reciprocity between the two main variables across time when we control for gender, socioeconomic status and gaming with friends. However, cross-sectional correlation between time spent gaming at age 12 and conflicted shyness at age 12 was found, indicating a reciprocal association between the two main variables at this specific time point. No other statistically significant effects emerged on any other time points when it comes to the association between time spent gaming and conflicted shyness on the same age group (age 14 and age 16).

The effect size of the main finding was small to medium, meaning that there is an effect of time spent gaming at age 12 on conflicted shyness at age 14, but the practical application and overall contribution of time spent gaming on conflicted shyness-levels is limited. This implies that other factors not included in this study also account for a substantial part of changes in conflicted shyness. No other studies have to my knowledge explored the reciprocity between conflicted shyness and gaming among adolescents, this makes it difficult to support the revealed finding through other studies discoveries. Therefore, the explanations of how time spent gaming relates to later conflicted-shyness-level will include possible theoretical understanding from available literature on gaming, shyness and online communication previously mentioned in this paper. There are several potential explanations of why time spent gaming increases levels of conflicted shyness. The predictive link between gaming and conflicted shyness will be further discussed through this section.

Displacement

First, the most prominent explanation of why more time spent gaming leads to increased conflicted shyness lies in displacement theory, more specific social displacement (Kraut et al., 1998). Adolescents who spend more time gaming may spend less time with friends in real life. In adolescence peer-interaction is essential for development of sociability (e.g., Andrews et al., 2020; van Hoorn et al., 2016) by practicing skills that makes it easier to partake in communication and instigate interactions. By displacing face-to-face interactions (albeit in various degrees) the adolescents who spend more time gaming may have less social practice-opportunities for sufficient social interaction and social development. Social skills have to be founded, practiced and maintained. Griffiths, (2010), suggests that gamers who spend more time gaming may develop poorer social skills by compromising social learning in adolescence. For the majority of children and adolescents, social communication and interaction comes naturally through IRL practice. Some adolescents on the other hand struggle to automatically take part in social settings. Children that struggle with engaging in social interaction might need more practice than their peers to engage in and manage social situations. If IRL social-interactions is displaced by solitary gaming or gaming with little social interaction it can lead to less direct communication-practice and is therefore a limited arena to practice social skills. However, the effect of time spent gaming on conflicted shyness persists even when accounting for gaming with friends (non-solitary gaming). An explanation for this could be that gaming with friends does not always warrant direct communication (talking) and might therefore reduce the communicative quality of the interaction.

The current study finding implies that gaming might not be the best arena for communication-practice at age 12 because of its implications for shyness. However, increased conflicted shyness caused by time spent gaming was only found at one time point (time spent gaming at age 12 to conflicted shyness at age 14), indicating that the overall influence of gaming on conflicted shyness through adolescence is lower than it would be if H1 was fully supported at all time points (i.e., if the pathway was found on additional time points). The difference in findings between age groups could arise from multiple areas. This will be further explored in coming passages.

Quality of communication

Limitations of online communication. Displacement of social interaction through gaming leading to higher levels of shyness could be further supported by enlightening differences between the quality of online-interaction and offline-interaction. Quality of the communication being displaced, and the quality of the on-line substitute could be a more nuanced way of understanding the effect gaming (via online communication) has on conflicted shyness. It is important to note that displacement of IRL-communication to online-communication often just involves a change in communication-quality (Moore et al., 2007), not an overall displacement of social communication (Hall & Liu, 2022). Nevertheless, online communication can be disadvantageous for practicing social interaction due to its inherent limitation of physical presence of the communicating parts (Moore et al., 2007). The lack of visual facial expression in the communication is one example of online limitations compared to offline interaction. This quality-difference in communication can be of importance since a substantial part of communication happens through nonverbal signals (H. Wang, 2009). Some types of online communication limit the expression of nonverbal signals (e.g., text and emotes) (Moore et al., 2007), making it harder to observe and use the full range of expression from the other player. This makes it difficult for the online-communicating adolescents to make sense of the full range of information conveyed by the other part (e.g., real time turn-taking for talking and gesturing) (Moore et al., 2007). Adolescents who spend less time fine-tuning their skills in reading and exerting nonverbal signals at age 12 could therefore be at a disadvantage when they socialize IRL. This might further lead to a perceived inadequacy in social settings compared to peers, thus strengthening shy traits.

Differences in games played by age groups. By looking at the most popular games among the different age segments (NMA., 2016,2018,2020), it is evident that there is a shift in types of games played from age 12 to age 16. The possibility for communication-quality improves with the type of games played by the older adolescents. Among the youngest group, mostly games that require little communication (and lower communication quality, i.e., text and emotes) were played. Minecraft is one example as the most popular game among 12-year-olds in 2016 (at T5). This game is often played on phones or on the computer, but without third party voice-communication channels. The players may still text with each other and perform tasks cooperatively in-game. At the time of T6 in the TESS-study (2018) the most popular games among 14-year-olds were FIFA, Overwatch, GTA and Fortnite (Minecraft was still the most popular game among girls for this age group). These types of games require

more cooperation for in-game objectives, are more demanding in communicative actions and more often involve third party voice-communication to supplement the social gaming experience and enrich the communication quality. Many of the same games were played by the 16-year-olds in 2020 (T7). It can seem that for the above 12-year-segment, adolescents seek games that facilitates a higher communication-quality. Older adolescents may therefore be exploiting the online communication quality available to a larger degree. Games played by older adolescents often are more complex, have a higher degree of difficulty and demand more cognitive capacity of the user (Eglesz et al., 2005). This demands a higher communication-quality, thus motivate the user to cooperate more with others to achieve goals in game (e.g., demanding quests, missions and planning how to defeat opponents). This could possibly lead to a communication-practice that is closer to IRL-communication and therefore potentially more transferrable to IRL-encounters. Variations in type of games used by different age segments through adolescence could account for our finding that time spent gaming at age 12 yielded different results than gaming at age 14 and 16 on conflicted shyness. As we do not have the data on type of games played by different age groups in TESS, and an assumption that the adolescents in TESS play the most popular games at different time points for specific age-groups (i.e., representative games for their age group) is made to support this explanation.

Gaming with friends. Although gaming with friends was accounted for in the analyses, it is possible that this younger age group uses games in more parallel play instead of social interactive play (for example not using microphone as often when they play together) (however this is not to my knowledge confirmed in gaming-research-literature). Still, it could be that the younger children reported that they “played with friends” by cooperating within the game but not actually communicating verbally or through text. This notion is based on knowledge of the games mostly used by the younger adolescents, and the communication those games facilitate. This type of gaming with friends might be overlooked while measuring gaming with friends. It may be that we are not capturing what we aim for by asking about the quantity of gaming with friends. Perhaps asking how much communication, and type of communication (e.g., verbal, written, emotes) would be better suited to differentiate the communication-quality while gaming with friends.

Transfer of social skills. As discussed through the previous sections; displacement of social interaction, quality of communication facilitated in different games and how different age groups take advantage of said communication may be influencing adolescents ability to transfer social communication skills to IRL-encounters. Gaming as a social communicative platform is restricted by the type of communication it allows to use (although third party communication channels can be used as a supplement). As an example, mobile mini-games facilitates less social communicative interaction than other platforms which often gives opportunity to connect via voice-chat. Games that facilitate communication close to IRL-communication (i.e., voice-chat) is argued to be more positive for communication practice and could therefore have a higher transfer value to IRL interaction (e.g., Williams et al., 2007). Communication through text or emotes narrows the communication quality as it is further from face-to-face interaction (Baym et al., 2004) and therefore conveys less emotional expression and practice in communication. As previously stated, young adolescents more often play games that facilitate less communication-quality than the older adolescents. This combined with the results that more time gaming at age 12 leads to more conflicted shyness at age 14, it is possible that transfer of social skills from practicing online might be lower for the 12-year-olds than older age groups. It may also be that younger adolescents talk more about what is happening in-game, and less about relational topics (not supported through literature to my knowledge). If this however is the case, it may limit the authenticity of conversation compared to IRL-conversations, and thus not accurately portray communication in real life encounters. The gap between the in-game conversational topics and IRL-topics together with lack of nonverbal cues and other limitations in the communication-quality can indicate that young adolescents have a poorer foundation for skill-transfer from online encounters to IRL-encounters. Kowert & Oldmeadow, (2013), found that increased involvement in games could be linked to social hesitation IRL (as conflicted shy individuals struggle with). As conflicted shyness involves inability to instigate and partake in social encounters in a satisfactory way, low transference of skills practiced online to offline might therefore lead to a greater displacement to quality communication-practice elevating perceived shyness in IRL encounters. Online to offline transfer of social skills may therefore be a piece in the puzzle of why more time spent gaming at age 12 leads to higher level of conflicted shyness at age 14, although this direct link is not investigated in previous research.

Change of social environment

Another explanation of the finding that time spent gaming at age 12 leads to higher levels of conflicted shyness at age 14 is the change of school and social environment. Norwegian adolescents start at junior high school the year they turn 13. This usually means a drastic change in social environment and forming of new social circles. It could be that more time spent on gaming is especially impactful as a predicting factor for developing higher conflicted shyness at this time because of this abrupt change in social circles as they transition into the new school setting (i.e., Kraut et al., 1998). Changing of formerly stable social circles can be a big challenge for many adolescents (i.e., Eccles & Roeser, 2011). Perhaps at this time their online network serves as a constant, stable and safe social circle causing the adolescents to focus on their online friendships rather than engaging in new IRL-friendships (i.e., need to belong is rooted more in the stable social circle, acting as a displacement for the possible new friendships). This however cannot be supported by literature per now, and only serves as a suggested supplementary proposition for why time spent gaming influenced conflicted shyness only from age 12 to age 14.

Escapism

Another possible understanding of why more gaming leads to more socially withdrawn and shy adolescents is the way gaming can be used as an escapist behavior. Some adolescents might be inclined to use gaming as a self-suppression tactic, and experience poorer psychological adjustment as a result (Stenseng et al., 2021), further hindering them from practicing social encounters and promote shy traits (Melodia et al., 2022). Escapist behaviors that are motivated by self-suppression are maladaptive in the long term, and is associated with more problematic coping of problems and poorer social functioning (Stenseng et al., 2021). Self-suppression-escapism can help gamers to flee from their social shortcomings for a brief time, but without an active self-expansion motivation in-game this could further uphold shyness because of motivation not being directed at getting better socially, but instead “hiding” from real life social difficulties. However, in the current study we do not have the data to support degree of self-expression vs. self-suppression-levels, meaning that we do not have any way of knowing what type of escapism is being used, and by whom (shy vs. non-shy).

Anxiety

Social anxiety is a trait that is closely connected to conflicted shyness, as shy individuals are believed to experience a higher anxiety-level in social interactions. Some individuals are believed to experience an increase in social anxiety with more time indulging in online gaming (Gioia et al., 2022). Increase in this felt anxiety from more time gaming could theoretically lead to a strengthening of shy traits. Gentile et al., (2011) supports this connection between more time spent gaming and increased anxiety in social situations among adolescents. This might be a small part of the explanation of why time spent gaming increases conflicted shyness-levels through motivational factors. If adolescents use games as a mean to avoid face-to-face communication due to initial social distress, this can be problematic. Avoidance-tactics seldom helps to overcome anxiety and can in the long run lead to sustaining said anxiety due to few correcting experiences and a feeling of not coping well according to the situations (Glass & Shea, 1986).

Secondary finding

In addition to the main finding, a secondary cross-sectional association emerged in the results as time spent gaming at age 12 correlated positively with conflicted shyness at age 12. This correlation indicates that more time used on gaming is related to higher levels of conflicted shyness, and higher levels of conflicted shyness relates to more time spent gaming at this specific age. This is a reciprocal effect, although not persisting between time points. As the current study aims to find reciprocity of time spent gaming and conflicted shyness across time, the finding is considered to be secondary. However, the secondary finding shares a variable with the main finding, namely time spent gaming at age 12. The convergence of the two findings may indicate that age 12 is a particularly important age in adolescence for understanding the interaction between time spent gaming and conflicted shyness (with emphasis on time spent gaming at age 12). The secondary finding will briefly be examined. Discussion of the pathway that more time spent gaming influences conflicted shyness is largely covered through the previous paragraphs. Influence of conflicted shyness on time spent gaming have however not been discussed. The most prominent theoretical background for explaining this interaction is need to belong theory (Baumeister, 2012). Conflicted shyness may lead to more time spent gaming because shy adolescents can use gaming to meet the need for adequate social relations that they may lack IRL. To compensate for social inadequacy and fulfill the need to belong

socially, the adolescent therefore use gaming as a platform for social interaction (Ayas, 2012; Chak & Leung, 2004). Gaming-motivation through increased social autonomy, competence and relatedness (feeling of belonging to a group) (Deci & Ryan, 2008) may also be a driving factor for more time spent on gaming due to shyness. Escapism through gaming (Stenseng et al., 2021) derived from social struggle among the more shy adolescents could also be a potential explanation for why we see an association between higher conflicted shyness and more time spent gaming at age 12. Gaming as an arena to communicate is less threatening and makes it easier to instigate interactions for shy individuals (Kowert et al., 2014; Valkenburg et al., 2005), which in turn can appeal towards more time spent gaming.

Effects of control variables

In the current study, we found no significant effects of the control variables socioeconomic status, gaming with friends and gender on shyness. However significant effects on time spent gaming were uncovered in the control variables. Girls spent less time gaming at all ages in the study. This find is in line with previous research that also indicates less time spent gaming by adolescent girls (e.g., Fairclough et al., 2009). Less time playing games with friends at age 12 were associated with less time spent gaming at age 12, indicating that social motivation could be important for further motivation to engage in gaming. No link between socioeconomic status and time spent gaming were found, suggesting little difference in game-involvement based on socioeconomic status.

Discussion remarks

It is important to note that conflicted shyness does not arise from gaming on its own. There are other factors that play a large part on the development of shy traits like early temperament, emerging self-awareness, sensitivity to social feedback and also parental styles in the upbringing together with biologically established underlying cause (Hassan et al., 2021; Kagan et al., 1994; Poole et al., 2018; Rubin et al., 2014; Tang et al., 2017; Yingmin et al., 2013). The current result can only be useful to broaden the understanding of shyness if other established predictors of shyness are also considered and accounted for. Conflicted shyness in itself is also not fully understood where both anxiety and lower social/social-cognitive skills could be the driving factor. In this paper both anxiety and low social skills are taken in

account in an attempt to understand how shyness may be affected by time spent gaming (e.g., anxiety as a mediating factor could account for some escapism behaviors through gaming for the adolescents, while poor social skills can be seen together with less adequate social practice through displacement (less practice of social skills)).

Adolescence is a period in life with lots of changes for the individual that enables a vast amount of third part variables. With this said, the current study has uncovered that time spent gaming is a factor that influences conflicted shyness in early adolescence. The current study's findings can only determine that there is a connection between time spent gaming and conflicted shyness, but no concrete evidence of why this happens. The low effect size indicates that time spent gaming only has a minuscule effect on conflicted shyness as a trait. No larger generalizations can be drawn from this (e.g., "gaming makes adolescents shy"), nevertheless the finding may contribute with a small piece of information to a larger puzzle for understanding associations between gaming and shyness.

Summary of discussion

Arguments for the current study find that time spent gaming at age 12 lead to increased conflicted shyness at age 14 have been discussed. In short, proposed potential ways that more time spent gaming leads to conflicted shyness is as follows. Trough displacement of IRL social interactions (limiting the quality of communication in social practice with low transference of practiced skills to IRL encounters specific for the age group). Trough time spent gaming as a factor for conflicted shyness when changing school (as sensitive time in adolescents lives when forming new social circles). Trough escapism leading to less social practice. Through increased anxiety from more time spent gaming leading to elevated levels of conflicted shyness. These attempts of possible explanations for how time spent gaming at age 12 influence higher levels of conflicted shyness at age 14 have however not been established, further research is needed to support the suggested propositions. Third party factors not related to gaming might still account for most of the change in levels of conflicted shyness and should be further researched for a better understanding of implications.

Implications

The finding that more time spent gaming at age 12 has a small contribution to increase in conflicted shyness at age 14 can be helpful in further research to illuminate on how gaming shapes children at different age groups and to what degree. Increased time spent on gaming for this particular age group contribute to more conflicted-shy behavior, although miniscule in the overall picture. There is still a large puzzle to piece together in the gaming-research field, making it wanting in the terms of further research.

In a more general note, this study may have implications for the TESS-study by expanding the understanding of different factors contributing to conflicted shyness strengthening the overall pool of available recourses for further studies. Also, specific research on conflicted shyness is scarce. This study can therefore extend the understanding of conflicted shyness as a phenomenon in later research.

Strengths

One strength of this study is the robust data collected from TESS. The longitudinal data and thorough well documented data-collection and selection process of the participants strengthens the validity of the study. A longitudinal perspective also helps to establish interactions in chronological order, making it easier to find influences across time between factors. Another strength of the current study is that there are few to none earlier studies examining the reciprocal effects of time spent gaming and conflicted shyness. This makes it valuable for further research on the subject.

Limitations

The most prominent limitation of this study is the lack of earlier research on the subject (reciprocal effects of time spent gaming and conflicted shyness), leading to deficiency in literature-support of possible explanations for the current study find (that time spent gaming at age 12 influence conflicted shyness at age 14). Since the current study find is so age-specific, this further limit use of available literature. Therefore, no definitive conclusions of why more time spent gaming leads to conflicted shyness can be made, only propositions of possible explanations. However, further research of the subject might help aiding explanatory paths and strengthening understanding of connections between gaming and conflicted

shyness. Gaming literature is often polarized and not checking for control variables, treating gaming as it is happening in a vacuum. This makes it hard to rely on the real-world applicability of simplified studies that explore influence of gaming in complex social interaction. Also, most gaming research is not longitudinal, possibly masking time-changes in the variables. As adolescence is a time where people undergo vast changes in a short amount of time with large differences in developmental stages (i.e., onset of puberty, cognitive development and social development), there is large variance within the age groups. This makes it hard to generalize explanatory models that fits the “typical” adolescent within an age-group (i.e., “most 12-year-olds play this type of game”). The demand for a higher and more complex understanding of social interaction arises as the adolescents grow older, and therefore the social interaction becomes more challenging and protruding. In the current study, we did not include data to explore age differences of social complexity of different age groups. As discussed in this paper, different utilization of gaming-communication by age groups could have an impact on communication quality and transfer value to IRL-interactions. However, this is not possible to determine without further support from age-specific research.

The measure of conflicted shyness is a teacher reported questionnaire. Although the same measurement of conflicted shyness is used across all three points in time (12, 14 and 16 years old), the teacher that evaluates is not a stable factor. When the children move from primary school to junior high school, they get different teachers. This can affect the contingency of this factor. The involvement of teachers and degree of how much the teachers know or see each individual student at different schools may also be a factor of how accurately they can perceive and report the student’s conflicted shyness. In addition to this, shyness is often covert (Saunders & Chester, 2008), and the internal experience of shyness for an individual can therefore differ from the teachers behavior-observations.

Self-reporting the time spent gaming may be underestimated by the respondents. This underestimation of time spent gaming can happen for both the short durations of time the adolescents add up (Tobin & Grondin, 2009) and overall estimation (Nuyens et al., 2020). We do not know to what degree players in the higher end of time spent gaming versus those in the lower end of time spent gaming skews their estimations, and how this relates to conflicted shyness. We also do not know if age relates to skewing of reported time spent gaming and if that could influence the results.

Game genres are diverse and may therefore have different impact on conflicted shyness. We do not account for this by grouping every type of electronic gaming activity

together (everything from simple mobile games on phones to first person shooters and MMORPG's on computers). This grouping can mask the more nuanced finds in each genre. Although for practicality and overview- purposes it makes more sense to include all forms of gaming.

Another limitation of this study is that natural changes in the participants lives due to them entering a time in their lives where they go from children to adolescents. Other factors not mentioned in this paper that can be of importance to both levels of conflicted shyness and time spent gaming (e.g., change of school, new friend groups and social circles). As we do not have an overview of these factors, it could be that important influential control variables are missed.

Conflicted shyness is a less studied domain than shyness and social withdrawal in general. Therefore, there may be studies referred to that includes both conflicted shyness and social disinterest that do not differentiate, constraining applicability. In the current study, we did not check for differences between high-conflicted-shy and low-conflicted-shy groupings and how those groups respond to more time spent gaming. Further research including group-differentiation could possibly lead to more nuanced finds of how gaming influences conflicted shyness.

Conclusion

This thesis aimed to explore possible reciprocal effects between time spent gaming and conflicted shyness over time in a large sample of adolescents (age 12 to age 16, N = 790), adjusting for the effects of the control variables gender, socioeconomic status and gaming with friends. The results showed that more time spent gaming at age 12 predicted increase in conflicted shyness-levels at age 14. This pathway was however exclusively found between age 12 and 14, thus only partially confirming hypothesis 1, "More time spent gaming leads to elevated levels of conflicted shyness in subsequent years". The lack of other significant predictive pathways between time spent gaming and conflicted shyness indicates that there is no reciprocity between the two main variables across time. However, the results also revealed positive cross-sectional correlation between time spent gaming at age 12 and conflicted shyness at age 12, indicating a reciprocal association between more time spent gaming and higher levels of conflicted shyness (and vice versa) exclusively found at age 12. Taken together, some support of reciprocity between time spent gaming and conflicted shyness is shown, however the reciprocal effect did not persist across time points. The effect size of the

main finding was small to medium, and effect was only found in one pathway between age 12 and 14, raising questions about the overall contribution and real-world applicability of time spent gaming on conflicted shyness through adolescence. This overall perspective somewhat mitigates previous concerns about the adverse effect of gaming on shyness. The current study findings should not be taken out of context and overgeneralized. More work is needed to understand how and why time spent on gaming influences conflicted shyness. Since the variable “time spent gaming at age 12” was central in both findings, further studies on the subject are advised to investigate age specific differences in how gaming is used socially and differences in communication quality online. Research on transfer value of online communication to IRL-communications is lacking, further research is therefore encouraged to fill this gap in literature for a better understanding of the effects gaming has on conflicted shyness. Between-group differences for high and low conflicted shyness could also be an interesting path to follow for further research, nuancing the differences this could have related to gaming influence.

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Table 1*Sample Characteristics and Descriptives*

Characteristics	Valid percentage, % (n = 790)
Gender of child	
Male	47.1
Female	52.9
Parent with highest socioeconomic status	
Leader	22.3
Professional, higher level	37.3
Professional, lower level	27.8
Skilled worker	12.1
Unskilled worker	.5
Biological parent's marital status	
Married	59.1
Divorced	20.5
Cohabiting > 6 months	15.3
Separated	1.8
Never lived together	1.5
Widowed	.8
Cohabiting < 6 months	.9

Characteristics/descriptives derived at T5. N = 785 valid, 5 missing.

Table 2*Descriptives of study variables*

Study Variables	Min-max	M	SD
Time spent gaming, age 12 (T5)	0-65.750	10.188	10.353
Time spent gaming, age 14 (T6)	0-82.583	14.133	15.004
Time spent gaming, age 16 (T7)	0-90	17.613	16.855
Conflicted shyness, age 12 (T5)	7-35	10.157	4.493
Conflicted shyness, age 14 (T6)	7-33	11.327	4.866
Conflicted shyness, age 16 (T7)	7-31	11.333	4.886
Socioeconomic status, age 12 (T5)	1-6	4.706	0.960
Socioeconomic status, age 14 (T6)	1-6	4.736	0.964
Gaming with friends, age 12 (T5)	1-5	3.081	1.026
Gaming with friends, age 14 (T6)	1-5	3.336	1.194

Table 3
Correlations between study variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Time Spent Gaming, age 12 (T5)	-												
2 Time Spent Gaming, age 14 (T6)	.65***	-											
3 Time Spent Gaming, age 16 (T7)	.53***	.51***	-										
4 Conflicted shyness, age 12 (T5)	.22***	.21***	.12*	-									
5 Conflicted shyness, age 14 (T6)	.27***	.21***	.24***	.49***	-								
6 Conflicted shyness, age 16 (T7)	.15**	.11*	.19**	.32***	.35***	-							
7 Gaming with friends, age 12 (T5)	-.17***	-.25***	-.13*	.03	.03	-.03	-						
8 Gaming with friends, age 14 (T6)	-.17***	-.25***	-.12*	.002	.02	-.04	.35***	-					
9 Gaming with friends, age 16 (T7)	.07	.006	-.02	.17***	.09	.01	.07	.13*	-				
10 Socioeconomic status, age 12 (T5)	-.05	-.01	-.07	-.03	-.06	-.10	.03	.03	.16**	-			
11 Socioeconomic status, age 14 (T6)	-.17**	-.06	-.07	-.06	-.08	-.05	-.02	.03	.11	.66***	-		
12 Socioeconomic status, age 16 (T7)	-.09	.005	-.05	.005	-.06	-.09	-.03	-.01	.08	.50***	.53***	-	
13 Gender	-.42***	-.54***	-.39***	-.02	-.01	-.007	.30***	.37***	.10	-.03	.004	-.05	-

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. Boys = 1, Girls = 2. Higher score on gaming with friends equals less gaming with friends.

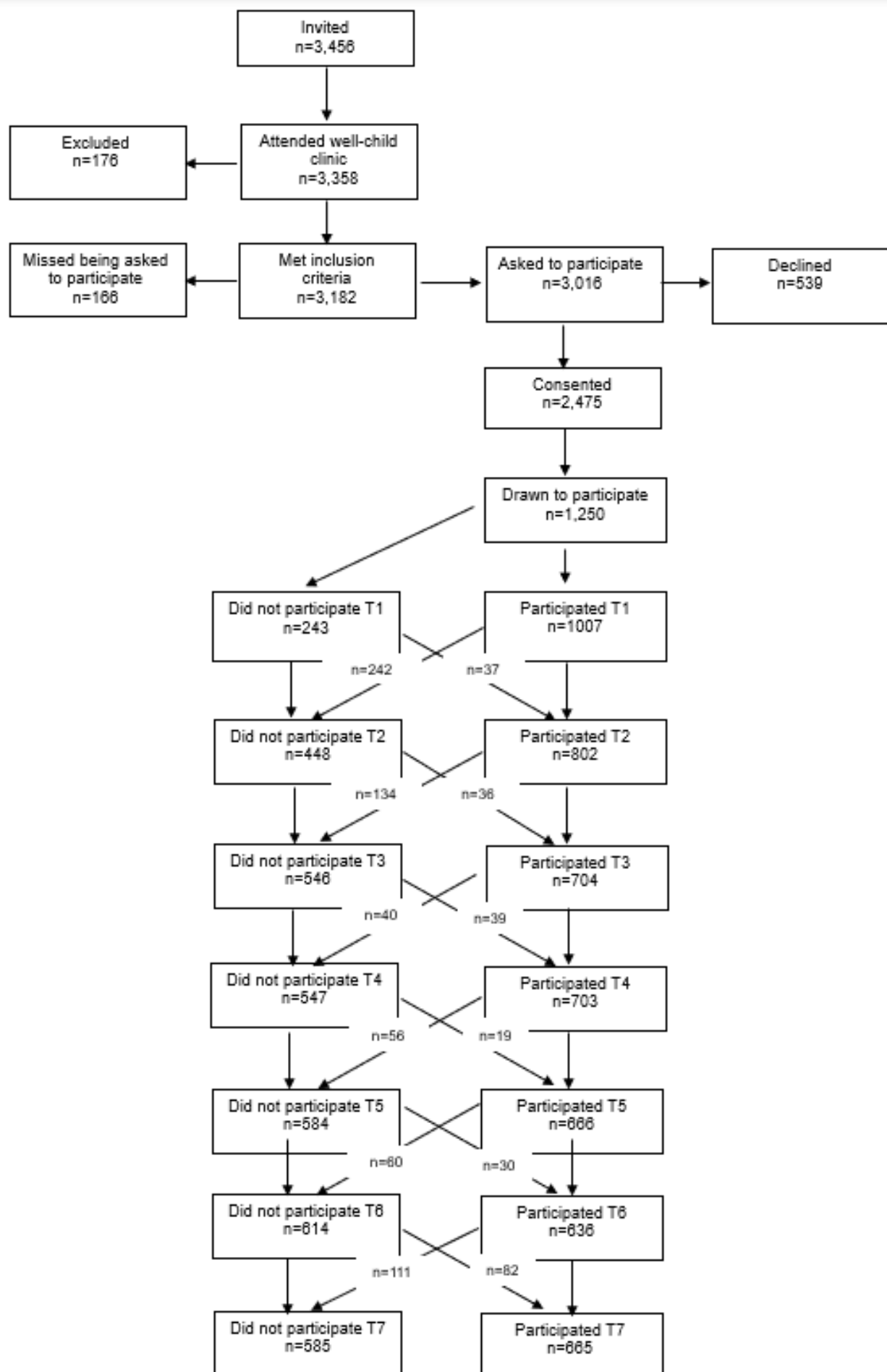


Figure 1. Flow chart of recruitment and follow-up.

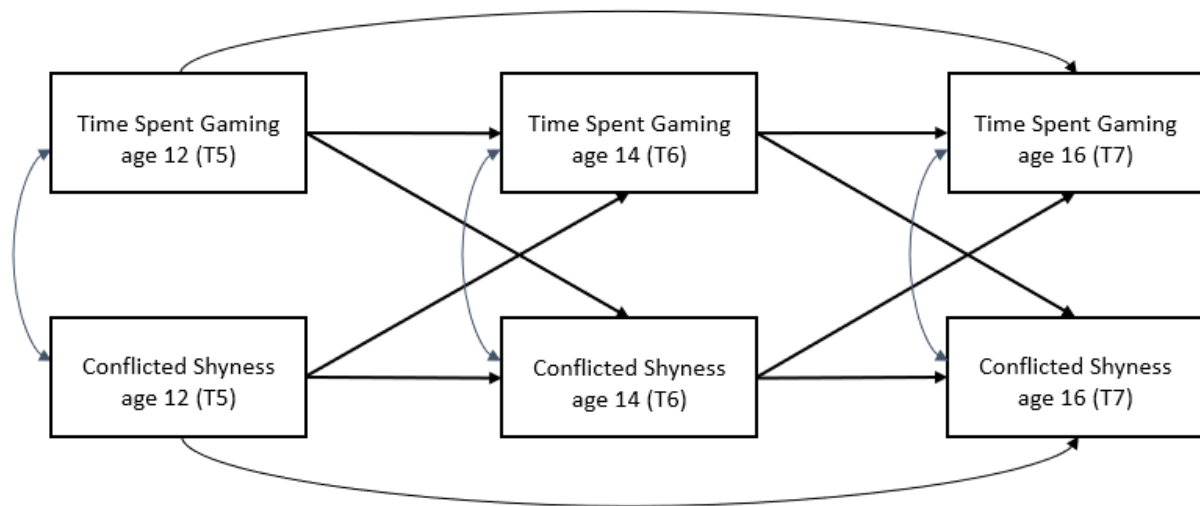


Figure 2. Theoretical model of cross-lagged effects between time spent gaming and conflicted shyness, and correlations between the measures.

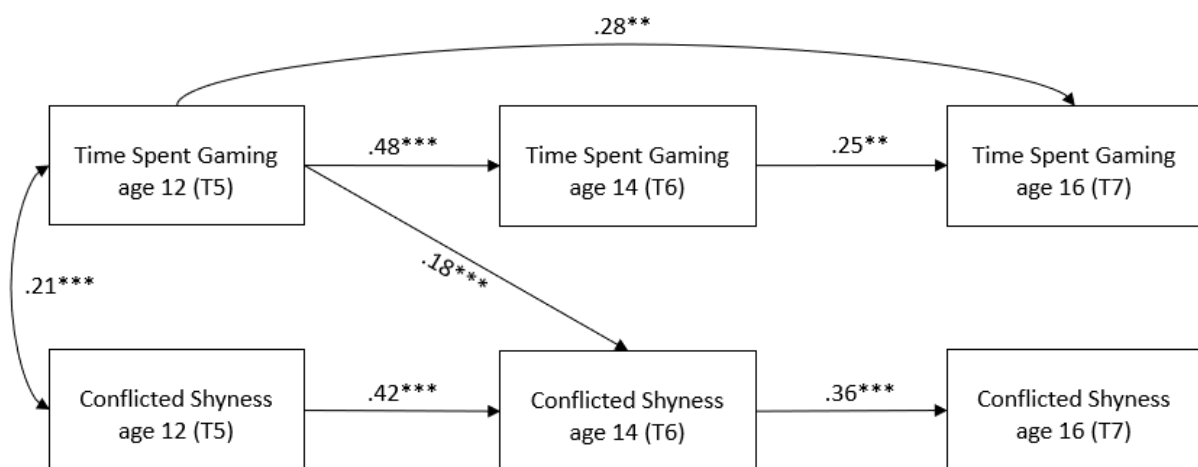


Figure 3. Adjusted for covariates, a predictive pathway from time spent gaming at age 12 to conflicted shyness at age 14 was found. Association between time spent gaming and conflicted shyness was found at age 12. Only significant pathways are displayed in the model
 * $p < .05$, ** $p < .01$, *** $p < .001$

