

Adolescents' Communicative Tone in Online Games: The Role of Context and Socio-Cognitive  
Abilities

by

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A thesis

presented to the University of Waterloo

in fulfillment of the

thesis requirements for the degree of

Master of Arts

in

Psychology

Waterloo, Ontario, Canada, 2025

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### **Author's Declaration**

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

## Abstract

While the influx of online communication during adolescence has led to a plethora of research investigating adolescent communication through social media, other online platforms have not been afforded the same attention. Despite high rates of online gaming in adolescence and longstanding reports of communicative toxicity, little is known about many of the factors that could influence communication in this social context. In the present study, we examine how experimental manipulations of context (communicative mode, communicative partner, and prompts of perspective-taking) as well as individual differences in socio-cognitive skills influence the tone of adolescents' communication within online games. Older adolescents, aged 15 to 19 ( $N = 238$ ) participated in an immersive, simulated video game task wherein they received mildly provocative messages from teammates or opponents and responded verbally or via text. Game communication varied widely from aggressive (e.g., "You're trash") to prosocial (e.g., "Thanks Man"). Overall, participants were more aggressive when communicating verbally and when communicating with opponents. Perspective-taking prompts to consider the goals of the message-sender resulted in the reduction of these contextual differences by reducing prosociality towards teammates and in text-based communication. Marginal interactions between individual differences in self-reported perspective-taking and empathy and contextual manipulations indicate an interplay between socio-cognitive skills and contextual features for adolescents' communicative tone. This work illuminates how some of the variability youth experience when gaming (Märtens et al., 2015) can be explained by game context and individual characteristics. Findings have practical relevance for adolescents and caregivers as they navigate decisions about game use. Moreover, this work adds to the growing literature as to how

adolescents navigate communication in an increasingly online world and how socio-cognitive skills that are useful in offline social contexts translate to online environments.

## **Acknowledgements**

The completion of this thesis would not have been possible without the many invaluable contributions of those supporting me. First and foremost, I would like to thank my supervisor, Dr. Elizabeth Nilsen, for her ongoing support and guidance. It has been a pleasure to learn from such a knowledgeable individual these past years, and to teach her online slang in return. I would also like to thank my readers, Dr. David Moscovitch and Dr. Heather Henderson, for taking the time to thoughtfully review this thesis and provide constructive feedback and insights.

Given the scope of this project, I would also like to acknowledge and thank those who were critical to its success. As a whole, my colleagues in the Cognitive Development Lab provided valuable insight throughout the design, data collection, and coding stages of this project, for which I am very grateful. Special mentions are in order for Monica Esa, who was critical in the recruitment of university students, the development of the coding scheme, and the training of coders, and Isabelle Boucher, who was essential to the recruitment of community participants. I would also like to extend my thanks to the families and adolescents who participated in this study, without whom this research would not be possible.

Further, I would like to thank my cohort, the brilliant group of women that I am facing this journey with. I cannot wait to see what the future has in store for us all. Finally, I would like to thank my family, especially my parents, Patty and Steve, for all of their love and support in my pursuit of this degree. I know if I ever needed anything, you would be there in a heartbeat. Thank you for all of your help over the years, and I hope I can continue to make you proud.

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## **Literature Review**

Communication is a fundamental skill for developing relationships that is influenced by a multitude of individual and contextual factors. The study of communication is particularly important to examine during adolescence, a developmental period where peer relationships are crucial for well-being (Roach, 2018). As online interactions become more prevalent, especially among adolescents (Faverio & Sidotti, 2024), it has become necessary to investigate communicative patterns within these novel social contexts. In recent years, the intricacies of communicating via social media and instant messaging have become key areas of research for adolescent development and well-being. However, other online social contexts, such as online gaming, continue to require further exploration. While the research on aggression in video games is vast, there are notable gaps around elements that affect the tone of communication, and how communicative approaches may differ for adolescents, who are still developing social and communicative skills. This literature review will highlight the importance of examining adolescent communicative styles when playing games online, considering the role of developmental, contextual, and individual factors in this process.

### **Adolescent Social Development**

Adolescence is a key period for social development (Blakemore & Mills, 2014). This life stage through to young adulthood is largely when people experience their most widespread social networks (Wrzus et al., 2013). This broadening of social connections often occurs as adolescents are exposed to more peers outside of their direct vicinity (Veenstra & Laningra-Wijnen, 2023). In addition to the increased number of relationships, social relationships also hold an increased value during this developmental period. Pubertal brain developments, like the maturation of the limbic system, contribute to the heightened effect of social relationships and feedback during

adolescence (Crone & Dahl, 2012). The ability to navigate the increase in social demands through the development of relevant social skills is key for a healthy transition into adulthood (Kilford et al., 2016).

Social relationships with peers are especially important in adolescence, as they distance themselves from their parents to spend more time with others their age (Veenstra & Laningra-Wijnen, 2023). The formation of peer relationships in adolescence or the lack thereof has been linked to numerous psychosocial outcomes. Positive peer relationships during adolescence have been associated with increased self-esteem, superior academic achievement, and less interpersonal stress among numerous other benefits (Bishop & Inderbitzen, 1995; Gallardo et al., 2016; Mackin et al., 2017). Even a single reciprocal friendship can result in numerous psychosocial benefits, such as higher self-esteem and resilience (Bishop & Inderbitzen, 1995; Graber et al., 2015). However, risky behaviours that are characteristic of adolescence, such as drinking and dangerous driving, can also be encouraged by the presence of likeminded peers or through peer pressure (Chien et al., 2011; Steinberg, 2008). Thus, while peer relationships can lead to positive outcomes, this connection is nuanced and dependent on the nature of the friendship and behaviour of the friends.

Desires around peer acceptance and fears of rejection are also particularly salient during adolescence (O'Brien & Bierman, 1988). When these desires are unmet or these fears are realized, it can have notable consequences for peer interactions. Lower levels of peer acceptance in adolescence are associated with an increase in both bullying and bullying victimization (de Bruyn et al., 2010). These increased desires and fears also coincide with increased emotional reactions to social situations. Adolescents experience lower mood and higher anxiety when faced with peer rejection relative to adults (Sebastian et al., 2010). These emotional experiences are

particularly salient, and they may continue to have a downstream impact as individuals age. For instance, Lev-Wiesel et al. (2006) showed that experiences of peer rejection in adolescence are retroactively perceived as traumatic in young adulthood and are linked to both PTSD and depression. However, it may also be the case that those with greater psychopathology may view these events as more traumatic.

### *Communication during Adolescence*

Foundational to the development of more complex relationships in adolescence is the ability to communicate with peers. The amount of communication occurring in adolescence dramatically increases alongside the importance of peer relationships (Raffaelli & Duckett, 1989). There are many important elements of communication including what is said, how it is said, and when it is said (Beaulieu et al., 2015). Turkstra et al. (2003) examined key elements of communicative behaviour among typically developing adolescents. They found that the presence of nonverbal behaviours like eye contact, nodding, and positive facial expressions were common features of adolescent conversations, while asking for clarification or failing to answer questions were uncommon (Turkstra et al., 2003). Navigating conversations requires adolescents to manage planning, timing, and self-regulation across their verbal and nonverbal language (Turkstra et al., 2003). Given the ongoing development of these cognitive skills during adolescence, managing conversations can prove a challenge despite its valuable role in forming bonds.

As social networks expand in adolescence, so too do the variety of interpersonal communicative contexts they must navigate. Many aspects of communication vary depending on context. Linguistic researchers have found that both linguistic (e.g., syntax, semantics) and speech behaviours (e.g., pitch, volume) are modified to meet the contextual demands of a

conversation (Wynn et al., 2024). Such differences have been demonstrated across a multitude of communicative contexts such as relational versus informational conversation, and reading aloud versus spontaneous speech (de Ruiter, 2015; Wynn et al., 2024). Studies have also examined how differences in age, gender, socioeconomic status, and communicative partner can influence patterns of communication. For example, adolescents are able to moderate their communicative style to interact more formally with adults and distant peers, and more informally with friends (Larson & McKinley, 1998). Larson and McKinley (1998) found that, although conversation evolved across adolescence, its development was largely nonlinear, with most linguistic features showing dramatic fluctuations between seventh and twelfth grade. To account for all of these elements, the interpersonal synergy model of spoken dialogue proposes that context-based differences in communication occur largely due to the interpersonal dynamics of the particular context (Fusaroli et al., 2014). For example, the functional purpose of a conversation (i.e., problem-solving, arguing, casual chatting) inherently changes the tone and structure of the communication occurring within it. This model highlights both the role of the internal motivations of the individual and the external situation as key influences on the interpersonal context. These individual and environmental influences operate alongside those generated by interpersonal system as a whole to affect the linguistic components of communication across contexts (Fusaroli et al. 2014).

### **Online Communication**

Within the last few decades, communication has transitioned to include exchanges within online environments. This is especially true for adolescents, 96% of whom are accessing websites or apps that allow for online communication on a daily basis in the United States (Faverio & Sidoti, 2024). In fact, according to Mittman et al. (2022), the use of online

communication tools is so prevalent that adolescents acknowledge few differences between the impacts of communicating online and offline. Most adolescents report that their primary reason for using online communication is to foster a sense of peer connectedness (Mittman et al., 2022). Indeed, adolescents use these spaces to communicate in dyadic friendships, small friendship groups, larger peer groups, and with strangers (Mittman et al., 2022).

Many frameworks have been developed to understand how and why communication may differ in online spaces, including Suler's (2004) online disinhibition theory and Nesi et al.'s (2018) transformation framework. The online disinhibition theory explores why people often present themselves differently online than they do in real life, often engaging in increased self-disclosure or increased antisocial behaviour. According to Suler (2004), this effect is driven by six key factors. Dissociative identity involves the ability to act anonymously in online spaces and thus, dissociate the actions you take in those spaces from who you are and how you act in the offline world. Invisibility refers to the notion that people communicating in text-based online spaces are unable to see each other, so even if personal information is shared, the lack of ability to see or hear communication partners can encourage disinhibited behaviours. This theory also acknowledges the asynchronous nature of online communication as a factor that can impede the social norms that exist within face-to-face communication. Blurred boundaries of the communicative partner and the self, feeling as though their online personas exist separately to the offline world, and the lack of information to signify authority are the other elements Suler (2004) credits with contributing to disinhibition in online spaces.

Nesi's et al.'s (2018) transformation framework provides a lens for understanding the role of modern social media in the development of adolescents' peer relationships.

Asynchronicity and the absence of cues that are present in face-to-face interactions are two social

media features included in this framework that echo those identified in Suler's (2004) online disinhibition effect. The transformation framework also acknowledges additional features including how permanently the interaction is available, how public the interaction is, the presence of photos or videos, the ease with which it can be accessed or shared, and the presence of quantifiable social metrics (likes, followers, etc.). A key piece of the framework described by Nesi et al. (2018) is the acknowledgement that each of these features is variable depending on the specific online context that is being used for communication and thus, each must be evaluated on a spectrum for the given platform.

These differential aspects of online communication can lead to both limitations and advantages compared to face-to-face communication. Interacting with peers online has generally been associated with a higher quality of peer relationships in adolescence (Gomez-Baya et al., 2018). However, given the lack of cues while communicating online, misunderstandings are common and often need to be resolved via face-to-face interaction (Mittmann et al., 2022). For some populations, communication in an online environment may be particularly advantageous. For example, with socially anxious adolescents, the opportunity to communicate online has been linked to higher levels of communication and self-disclosure, though still lower than non-socially anxious peers (Mýlek et al., 2022).

Whether and how online communication impacts adolescents' well-being is a topic of ongoing debate within the research literature. Communicating in online spaces has been linked to increases in emotions like anger and fear, while also creating a greater overall sense of well-being (Mittman et al., 2022). While some studies have found connections between online communication and loneliness (Costa et al., 2018), others have provided evidence opposing this connection (Hall et al., 2018). Beyond their direct impact, these environments also serve as

platforms for other behaviours with psychological consequences. For instance, the use of online spaces for communicative purposes also provides an arena for behaviours like cyberbullying and social comparison, both of which are associated with psychological challenges (Erreygers et al., 2018; Beyens et al., 2020). It may be that, as many studies suggest, the effects of online communication on well-being are variable and depend on both contextual and individual differences.

The effect of online communication on offline social development and friendships is also a contentious topic in the literature. Kraut et al.'s (1998) social displacement theory argued that, because of the limited time available for socializing, pursuing friendships online would result in the deterioration of offline friendships. This theory also argued that online friendships do not hold the same value as offline friendships, due to their inability to provide the same level of support. More recent studies have built upon this theory, suggesting that social connections in online and offline spaces can be balanced (Przybylski & Weinstein, 2017). Some studies have supported the "rich-get-richer" model, suggesting that those who excel socially in offline spaces will continue to excel online and reap the benefits of that (Cheng et al., 2019; Kraut et al., 2002). The social compensation model posits the opposite, suggesting that those who are socially isolated or lonely offline are able to build social relationships online due to the disinhibiting effects (Ellison et al., 2007). Smith et al. (2021) argued for a more nuanced view of the effects of social media and online communication on social development, pointing out how contextual factors like the specific platforms, and method of communication may have an impact and account for variability in experiences.

Online communication can take many forms. As the types of communicative platforms with the highest usage in adolescence are social media and instant messaging systems, most of

the research in this area focuses on their use and effects (Mittmann et al., 2022). While other spaces for online communication, such as video chatting and online gaming, are sometimes acknowledged, they are often discussed only in passing due to significant variations in their communicative role and usage rates. However, as identified in the transformation framework (Nesi et al., 2018), the contextual differences between these arenas for online communication mean that results may not be generalizable across contexts.

### **Video Game Communication**

The social landscape of video games and the communication that occurs within them is a relatively novel area of study. It originated primarily in the mid-2000s in the context of massive multiplayer online role-playing games (MMORPGs) and has since expanded with the diverse genres of games that now offer online play. The social aspects of video gameplay have been of particular interest in the wake of the COVID-19 pandemic, where video game use reached record highs as these platforms became a primary means of socializing for many youth (Wiederhold, 2021).

Playing video games is a common hobby for adolescents. A recent report from the Pew Research Center found that 85% of American adolescents play video games, with about 40% of those playing daily and considering themselves ‘gamers’ (Gottfried & Sidoti, 2024). According to Rideout et al. (2022), the average American teen will play 1-2 hours of video games each day. Although teens and tweens engage with gaming daily at similar rates, teens spend longer playing, especially for PC and console games (Rideout et al., 2022).

Much like face-to-face interaction and other contexts of online communication, the communication that occurs through online gaming can serve to build and maintain friendships. Those who play games more frequently tend to have more in-game friendships (Cole & Griffiths,

2007). However, in-game friendships are often variable on the basis of gender, with women having more trouble building these relationships due to misogyny and stereotyping (Vella et al., 2019). Indeed, female players often engage in less communication with other players to avoid hostile environments or unwanted advances (Vella et al., 2019). Online games are not just used as a social context to build new friendships, but also to support existing relationships. It is common for individuals to play online games with offline friends, which can serve as a bonding activity (Domahidi et al., 2016). The friendships built and supported in these spaces can be beneficial for the wellbeing of players. Carras et al. (2017) found that being highly socially engaged in online spaces served as a protective factor against problematic gaming behaviours for those who game frequently.

Despite the general prevalence of this hobby, engagement and experiences have been shown to be quite variable on the basis of gender. Video gameplay is nearly ubiquitous among male adolescents, with 97% reporting that they play video games (Gottfried & Sidotti, 2024). While the gender disparity for playing video games has been steadily decreasing, boys still represent a disproportionate amount of those who play games, especially those who game more frequently (Gottfried & Sidotti, 2024). Stereotypes around gender and video games are often used in these spaces to delineate who “belongs” and who doesn’t, leading to increased hostility directed towards minorities, especially women (Tang & Fox, 2016). Shaw (2011) found that for members of marginalized groups who play video games frequently, including women, there is often a reluctance to identify as a “gamer” because they did not align with the stereotype.

Some studies also suggest that individuals' time spent playing video games influences their gameplay behaviours and its effects on their mental well-being. For instance, Tang and Fox (2016) suggested that those who spend more time playing perceive harassment behaviours as

more typical. Hilvert-Bruce and Neill (2020) echoed these findings, demonstrating that gamers find aggressive behaviour to be normative in online contexts. Frequent players may be more likely to lash out at those they perceive as a threat to their space, including minority players and researchers looking at negative outcomes related to gaming (Tang & Fox, 2016). However, Sauter et al. (2021) argued that these findings were skewed by sample size and that the more important factor was players' motivations for playing. Their study found that those who were motivated by achievement or escapism had lower life satisfaction and acted more negatively, whereas the majority, who played to have fun, were more satisfied with their lives. Vuorre et al. (2022) produced similar findings when looking at the relationship between objective gameplay data and well-being, identifying motivation as a more important predictor than time spent playing.

As Sauter and colleagues (2021) and Vuorre and colleagues (2022) identified, motivations for playing are also an important area of focus when discussing effects on gameplay behaviours and player well-being. Intrinsically motivated gaming, or playing for the inherent satisfaction of doing so, shows positive relations to well-being, while the opposite is found for externally motivated gaming, driven by a desire for external reward (Vuorre et al., 2022). A meta-analysis from Bäcklund et al. (2022) showed that many motivations for engaging in gameplay had some connection to increased problematic video gaming behaviours, but escapism-related motivations had the most robust connection. Among highly engaged gamers without problematic gaming behaviours, common motivations include socializing, competition, learning English, and becoming more tech-savvy (Razum & Huić, 2023). Motivations can also have more general effects on how the players engage with the game. For example, Hilguard et al. (2013) found that players who were playing for social reasons were more likely to play for

longer periods. This connection was attributed to the social obligations and peer pressure that came with player-to-player interactions.

### ***Communicative Mode within Video Games***

When discussing socialization in the context of online gaming, it is important to acknowledge that these environments are not uniform, and that contextual differences may influence the interactions that occur in these spaces. One key element of communicative context in gaming is the mode through which communication is occurring. Communication in gaming originated with text-based systems. However, these systems were not ideal for the quick planning and strategizing needed to succeed in fast-paced multiplayer games (Wadley et al., 2015). As a result, players resorted to using external platforms like VoIP to communicate using their voices. At present, many multiplayer games offer the option of both text- and voice-based communicative channels. Preferences for communication mode within these games are variable depending on player differences as well as differences in game genre (Wadley et al., 2015).

With text-based communication, the nonverbal cues of offline communication are missing, replaced by emojis, misspellings, and slang specific to the environment (Kashani et al., 2023). Those who communicate via text in online games report that this mode of communication allows them to think before sharing their thoughts with other players (Wadley et al., 2015). Meanwhile, players reported that voice-based communication added a new social dimension and increased the emotional impact of in-game communication (Wadley et al., 2015). Despite some early work and qualitative information suggesting that there are notable differences between these modes of communication, there are few studies that examine their effects.

### ***Contextual Features, Aggression, and Prosociality***

The presence of aggressive and prosocial behaviours in video games, as well as the contextual factors that lead to them have been a focus for researchers since the popularity of video games skyrocketed in the 1980s. Although in-game communication can be used primarily for planning or conveying strategies, video games are often designed to evoke more emotional responses (Kashani et al., 2023). For some players, the draw of the game is this ability to elicit an emotional response, even if that response may be generally thought of as negative, such as anxiety or frustration. However, in multiplayer contexts, these responses can be directed towards others in the form of aggressive behaviour. In 2019, a study conducted by the Anti-Defamation League found that almost three-quarters of video game players had experienced some form of verbal abuse, harassment, hate speech, or discrimination while communicating during gameplay. Thus, one way to characterize the tone of communication occurring in these spaces is on a continuum from aggressive to prosocial.

Despite the moral panic around depictions of violence in video games and associated aggressive tendencies, this link remains a divisive topic within the relevant literature. This connection is largely based on the framework of the General Aggression Model (GAM), which posits that contextual and individual factors interact to cause aggressive cognitive, emotional, and physiological states (Anderson & Bushman, 2002). In reference to violence in gaming, the GAM is used to explain that exposure to violent media allows individuals to access aggressive thoughts more easily, leading to increased aggressive feelings and behaviours (Bushman & Anderson, 2002). Meta-analytic reviews from Sherry (2001) and Ferguson (2015) support the notion that, for children and adolescents, playing violent video games is linked with increased aggression and reduced prosocial behaviour along with other negative effects on school performance and mental health. However, Przybylski & Weinstein (2019) found no connection

between adolescents' experience with violent games and their engagement in aggressive behaviours. Some researchers argue that the effects of violence may be more nuanced, and thus, require the consideration of additional individual and contextual factors. For example, Matthews (2015) found that the effects of violence on aggression may vary by the skill level of the player, with more skilled players being less affected.

There have also been extensive links drawn between aggression in video games and competitive contexts. In competition, the possibility of losing to a competitor increases the likelihood of a negative emotional reaction (Breuer et al., 2015). As a result, antisocial behaviours are commonly expected and rewarded through in-game success in competitive online environments (Ross & Weaver, 2012). In violent competitive games, Dowsett and Jackson (2019) found that competition exhibited a stronger influence on aggression than violence. Breuer et al. (2015) found that, when having participants compete against a confederate in a sporting video game, losing the game was the most significant factor in predicting aggressive behaviours afterward, even above trash-talking. A series of studies conducted by Przybylski et al. (2014) found that a key piece of the connection between aggression and competition in online gaming may be driven by a thwarted need for competence. When players feel as though they are unable to succeed in a game, they often get frustrated and are more likely to engage in an aggressive manner (Przybylski et al., 2014). These factors of skill level and in-game performance are often identified as key influences on the relation between competition and aggressive online behaviour.

While competitive contexts are generally linked to increased aggression, the literature around cooperative gameplay is not as clear cut. Despite the link between competition and aggression, cooperative games can also provoke aggression towards teammates when they make

mistakes, or their contributions are deemed inadequate (Tang & Fox, 2019). However, cooperative gameplay has also been identified as a protective factor when examining tactics for disrupting the connection between violence in games and aggression, (Greitemeyer et al., 2012; Jeraback & Ferguson, 2013), and been shown to increase empathy (Greitemeyer, 2013). Jin and Li (2019) found that engaging in team-based gameplay increased prosocial behaviours compared to playing alone regardless of a game's violent or nonviolent nature. As with competition, other factors such as the specific gaming context and player experience may affect how cooperative contexts lead to aggression or prosociality.

Some studies have identified that the prosocial benefits of gaming may also be reliant on the content of the video games that children play. Among girls aged 7-15, those with more experience playing games with prosocial content were more sympathetic and prosocial (Vieira, 2014). Harrington and O'Connell (2016) also found that prosocial gaming was linked to an increase in offline prosocial behaviours like sharing and cooperation, and that this link was mediated by empathy.

Together, this body of work suggests that contextual factors have important effects for both prosocial and aggressive behaviours within a gaming context.

### **Adolescent Characteristics and Online Behaviour**

Although aggressive or prosocial behaviours may emerge as a result of contextual factors such as competition, frustration, or game content, it can also arise from intrinsic motivation and individual differences. Players who exhibit aggressive communication in online games tend to be more reactive (Lemercier-Dugarin et al., 2021), have higher levels of anxiety, and less modesty (Kashani et al., 2023). Intrinsic motivation and individual characteristics, such as agreeableness (Worth & Book, 2023) have also been linked with more prosocial behaviours. Lemercier-

Dugarin et al. (2021) found that players who were more empathic were more likely to report aggressive behaviours. While these recent findings indicate that there are connections between certain traits and in-game behaviours, there is relatively little work on the subject. Most notably, socio-cognitive skills (e.g., perspective-taking, empathy) that are key to the development of relationships (Reed & Trumbo, 2020) and have been linked to communicative tone (Hanel & Paulmann, 2025) and factors like competition (Epley et al., 2006; Gilin et al., 2013) in other contexts have rarely been a focus within online/gaming spaces.

### ***Perspective-taking and Empathy***

Perspective-taking, or the ability to put oneself in the place of another to understand their thoughts or feelings within a given context, is a key social cognitive ability. This ability is often discussed alongside more general skills around intuiting the mental states of others, such as mentalizing, reflective functioning, and theory of mind. Although there are slight differences between these terms, they all address an underlying ability to intuit the mental states of others. This ability has been a key focus for researchers looking at social cognitive development in adolescence. While fundamental perspective-taking abilities are developed early in childhood, social perspective-taking or the ability to use perspective-taking skills to navigate social situations, continues to develop in adolescence (Tamnes et al., 2018). As the skill of perspective-taking continues to develop throughout adolescence, it allows for the development of more complex social relationships (Guazzelli Williamson & Mills, 2023). Dumontheil et al. (2010) suggested that the ongoing development of this skill could be attributed in part to the intrinsic motivation of developing these peer relationships.

Perspective-taking is often discussed in tandem with empathy, which also requires an understanding of others' mental states. Empathy refers to the overarching ability to emotionally

connect with others, which can manifest in several different ways (Gilin et al., 2013). Although the distinction is not always clear within the literature, it can be helpful to break each of these skills into their cognitive and affective components to understand how the effects of using these skills may vary based on context. Healy and Grossman (2018) define cognitive perspective-taking as the ability to infer thoughts and beliefs, while affective perspective-taking focuses on the inference of feelings or emotions. Likewise, they explained that cognitive empathy involves understanding the emotional states of others while affective empathy involves sharing others' emotions. As indicated by these definitions, there can be notable overlap between these two constructs, especially between affective perspective-taking and cognitive empathy, which are considered to represent the same ability. However, outside of this overlap, these subdivisions of perspective-taking and empathy are viewed as distinct constructs (Healy & Grossman, 2018) that may in turn show differential associations with adolescents' behaviour.

**Competition.** Although perspective-taking and empathy are generally perceived as beneficial for the construction of social relationships, some work suggests that the interplay of these individual skills and the particular context within which they are exhibited is important. One contextual element in which the interplay between context and individual abilities has been examined is competition. The distinction between the cognitive and affective components of these skills is particularly important when discussing their role in competition. When it comes to competitive contexts, the role of perspective-taking abilities can be quite variable. Gilin et al. (2013) demonstrated that while cognitive perspective-taking abilities are generally linked to success in competitive bargaining tasks, empathy or affective perspective-taking play a more crucial role when competitive contexts require relationship-building or accurate social perceptions to win. In fact, using cognitive perspective-taking skills in affective-oriented

competitive tasks actually put participants at a disadvantage in the bargaining task compared to neutral approaches, as a more emotional approach was a stronger basis for social coalition (Gilin et al., 2013). While looking at perspective-taking in cooperative and competitive contexts, Epley et al. (2006) also found that prompting cognitive perspective-taking produced different results in different scenarios. When asked to consider others' goals in competitive scenario with competing interests, participants made assumptions that others would act competitively and responded with reactive egoism, choosing less "fair" options to set themselves up for success. In cooperative scenarios, cognitive perspective-taking prompts about others in the group resulted in participants acting similarly to those who didn't receive a prompt or even disadvantaging themselves to help others in the group. The use of cognitive perspective-taking in this study was highlighted as particularly important, as drawing attention to others' thoughts focuses participants on their divergent goals and may encourage cynical thoughts (Epley et al., 2006). Pierce et al. (2013) expanded on this notion and found that encouraging cognitive perspective-taking in competitive contexts induced a mindset of hypercompetition within participants. In this study, participants who were asked to consider the perspective of their competitors predicted that the others would try to sabotage them, so they proactively engaged in unethical behaviour (cheating) to succeed (Pierce et al., 2013). While perspective-taking is generally thought of as a socio-cognitive skill that encourages cooperative behaviour, the presence of competition may lead to the opposite effect.

Empathy and affective perspective-taking also appear to have a nuanced relationship with competition. Wang et al. (2014) highlighted the importance of an individual's relationship with their competitor in the context of these socio-cognitive skills. They found that, with friends, high levels of affective perspective-taking and affective empathy were both linked to a lessened

reactivity to the results of the competition. These patterns were not observed when an individual was competing with a stranger. Even in the absence of personal connection, empathetic responses are more common with in-group members than with out-group members in competitive contexts (Richins et al., 2018). Richins et al., (2018) found that, while in-group members received the most empathy by far, less competitive outgroup members were more likely to elicit an empathetic response than more competitive outgroup members. While cognitive skills are affected by the context of competitive interactions, affective skills appear intertwined with the relationship of the people involved.

**Prosociality & Aggression.** Individual characteristics like empathy and perspective-taking can also have an influence over the behaviours that adolescents exhibit. One of the key areas of social behaviour discussed relative to perspective-taking and empathy is prosociality. Prosociality refers to behaviours that are intended to benefit others or promote positive relationships through actions like sharing, comforting, etc. (Erreygers et al., 2018). Exhibiting these behaviours has been linked to a myriad of benefits for both physical and mental well-being (Hui et al., 2020). For young people, high levels of prosociality are associated with less psychological difficulties (Hui et al., 2020). While both empathy and perspective-taking have been linked to increased prosocial behaviours, the nuances of these relationships are still being researched.

Empathy and perspective-taking are both complex skills comprised of several components. Some work investigates the unique relationship between each of these components with prosociality and aggression. Brazil et al. (2023) sought to investigate its connections to prosocial and antisocial behaviours by pulling apart where each element of empathy has

influence. They found that affective empathy was only associated with higher levels of emotionality while cognitive empathy was associated with increased prosocial behaviours.

Some studies suggest that the links between empathy, perspective-taking, and prosociality may vary based on gender. Longobardi et al. (2019) found that, among younger children, boys with stronger perspective-taking abilities were more likely to engage in positive prosocial behaviours with peers. This effect was not as pertinent for girls. Another study found that decreased perspective-taking abilities in girls aged 10-12 were linked to increased prosocial behaviours (Khalili et al., 2023). Thus, perspective-taking skills may have differential effects on prosociality on the basis of gender. Affective empathy, on the other hand, has been linked to increased prosociality for both boys and girls (Longobardi et al., 2019).

In addition to increased prosociality, strong perspective-taking and empathetic abilities have also been linked to decreased verbal and overt aggression with peers in offline environments. For example, Bussey et al. (2015) found that, among Australian adolescents, high levels of both perspective-taking abilities and empathic concern were linked to reduced levels of moral disengagement and subsequent aggression. However, other studies have found that strong perspective-taking (Gantiva et al., 2018) or strong empathy (Batanova & Loukas, 2011) in isolation are sufficient to reduce aggression. Jiang et al. (2019) suggested that while both social cognitive skills relate to aggression, the means by which they do so vary. Specifically, while deficits in both perspective-taking and empathy related to increased aggression, the pattern of associations were different. Lower perspective-taking abilities directly related to elevations in trait anger, which was associated with increased aggression, while lower empathy acted as a mediator by which hostile thoughts related to aggression. Estevez et al. (2018) highlighted the cyclical nature of the relationship between empathy and aggression, detailing how lower levels

of empathy are associated with aggressive behaviour and how engaging in peer aggression progressively decreases both life satisfaction and empathy. While research continues to investigate the specifics of their roles, there is substantial evidence that these socio-cognitive abilities exhibit associations with aggressive behaviour.

Thus, there are established associations between these individual differences in empathetic and perspective-taking skills, key contextual elements, and prosocial/aggressive behaviour, including communicative behaviour. While these connections have been demonstrated in real-world contexts, they have not been examined online. Due to the prevalence of their use, the volume of understudied contextual features, and the importance of communicative tone in online games, video games serve as an important platform for exploring these connections.

## **Conclusion**

As the prevalence of online communication grows, it is essential to investigate the unique factors that impact communication in these spaces, especially for adolescents, who are undergoing significant social development while avidly using these tools. The substantial body of literature that has looked at adolescent communication via social media has produced mixed results about the factors affecting communication in that space and the downstream effects on adolescents' social development and well-being. Despite their frequent use as a communicative tool in adolescence, video games, and the communication that occurs within them, have not received the same attention. These environments have long been vilified for their connections with aggression and violence through content, but the role of their communicative systems has very rarely been explored. Recent work looking at the influences of contextual factors and individual differences has shone a light on the importance of understanding the factors that can

influence player interactions within different games. This knowledge can be used to mold the experiences of players within the social context of gaming. Future research should continue to monitor online environments and communication within them as they and their users continue to shift alongside technological developments and sociocultural changes. It should also make efforts to explore varied online environments and their specific features in terms of their relevance to communication to ensure that consumers and designers are aware of any implications.

## **Thesis Introduction**

Adolescence serves as an important period for social development as youth are expected to navigate an increasingly complex social environment (Blakemore & Mills, 2014)).

Foundational to social success are communicative skills and the ability to navigate various communicative contexts. A significant portion of adolescent communication now occurs in online contexts. For instance, one-third of adolescents indicate that they use social media sites almost constantly and usage rates have only climbed in the past five years (Rideout et al., 2022; Faverio & Sidotti, 2024). Frameworks of online communication proposed by Suler (2004) and Nesi and colleagues (2018) have identified that the unique features of online social contexts, such as cue absence and anonymity, can alter the way that individuals interact in these spaces. Thus, it is important to examine the unique features that relate to how and what adolescents communicate in these online spaces.

While there has been significant work examining adolescents' communicative experiences on social media and through instant messaging, other online social platforms have not received the same attention. Video games, despite their popularity among adolescents and unique social allowances, remain understudied within this age group. The present work examines how adolescents communicate in online games, looking at the aggressive or prosocial nature of their language. In particular, we explore how this tone is influenced by aspects of the game context (i.e., who they are communicating with, how they are conveying their message) and individual differences in socio-cognitive skills. Moreover, drawing from theories of social development (Beauchamp & Anderson, 2010), and aggressive behaviour (Anderson & Bushman, 2002), which posit an interplay between the context and the individual for understanding behaviour, we also explore the interactions between these factors.

## Video Games

Though it originated with arcade games and consoles in the 1970s (Kline et al., 2003, pp. 91–94), in modern times, the term “video game” is used to refer to three main types of games: PC games, console games, and mobile games (Yamaguchi et al., 2017). Within each of these categories there is a vast selection of games spanning genres, control systems, player compositions, perspectives, and more. Video games offer such an extensive variety of experiences that their categorization has long been a topic of debate (Clarke et al., 2015). Given the expanse of options, video games serve as an enjoyable activity for many different individuals.

Gaming is a particularly popular pastime for youth, with recent reports showing that 85% of American adolescents engage with this hobby (Gottfried & Sidoti, 2024). On average, adolescents who play video games spend 1-2 hours playing each day (Rideout et al., 2022). While gaming is a popular hobby for adolescents generally, this is especially true for boys. Boys are not only more likely to play, but are more likely to identify as gamers, spend more time playing, and play more frequently (Gottfried & Sidotti, 2024; Rideout et al., 2022).

Over the years, there has been an ongoing debate about how engaging with this activity may affect well-being. Increased aggression, decreased prosocial behavior, depressive symptoms, and academic difficulty have all been associated with video game use (Ferguson, 2015). High frequency gameplay is often associated with depressive symptoms, above and beyond those seen with other types of high frequency media use (Carras et al., 2017). These games can also lead to a multitude of positive effects such as reducing anxiety, improved mood management, and physical health benefits (Barr & Copeland-Stewart, 2022; Ferguson & Rueda, 2010; Pallavicini et al., 2021). For most of these effects, both positive and negative, there is also

work supporting the opposite relationship. For instance, Chen et al. (2022) found that video game use increases anxiety symptoms and Poppelaars et al. (2021) found that video games decreased depressive symptoms. The differential results regarding gaming behaviours and well-being may be attributed to other important factors, such as differences among the individuals playing, their motivations, and differences in the content they are engaging with (Vuorre et al., 2022).

### ***Socialization within video games***

In the wake of the COVID-19 pandemic, when many youth used video games as a means of socializing, the social elements of online gaming have garnered increased research interest (Wiederhold, 2021). Most adolescents who play games report doing so in a multiplayer context that allows for social interactions (Gottfried & Sidoti, 2024). Online games are used as social platforms both for maintaining real-world social relationships as well as developing new relationships within these online spaces (Cole & Griffiths, 2007; Domahidi et al., 2016). While higher gameplay rates are often associated with negative outcomes and serves as a key diagnostic criterion for the proposed Internet Gaming Disorder (American Psychiatric Association, 2013), using games for long periods for the purpose of socialization has been shown to reduce or eliminate these effects (Carras et al., 2017; Razum & Huić, 2023). Given the rate at which these spaces are used socially and the important consequences of using online games as a social space, it is important to acknowledge their value as a social context when discussing communication in games.

### ***Aggression within video games***

Aggressive behaviours have been at the forefront of online gaming research for decades. While these behaviours often include aggressive communication, they also extend to aggressive

actions taken in the virtual world (i.e., griefing (stealing or destroying for the sole purpose of doing so), spawn camping (repeatedly killing a player before they are able to play), and emoting (using a games' emote function to make rude gestures)). Among adolescents who play video games, 43% have been on the receiving end of harassment in these spaces, including name-calling, physical threats, and sexual harassment (Gottfried & Sidotti, 2024). Looking at communication specifically, the Anti-Defamation League (2019) found that almost three-quarters of video game players had experienced severe aggression while communicating in-game through verbal abuse, harassment, hate speech, or discrimination. Over time, exposure to these behaviours can lead players to perceive them as normative (Hilvert-Bruce & Neill, 2020; Tang & Fox, 2016). Given the ever-evolving landscape of online social contexts and the vast definition of video games, these patterns of aggressive behaviour have been examined from many angles with contradictory results. For example, while some studies have identified a link between violence and aggression (Ferguson, 2015), others have found that these effects are dependent on the social context in which an individual plays the game (Ewoldsen et al., 2012).

### **Contextual Differences**

One approach used to investigate the connection between video games and aggression has been to examine how various game elements may contribute to or reduce these behaviours. Given the wide range of video games available, there are countless contextual elements that may influence social interactions within these environments. Despite this variability, the vast majority of the research centers around the contextual factors of violence and competition. With respect to violence, some meta-analyses support this association (Ferguson, 2015; Sherry, 2001), others find no effect (Przybylski & Weinstein, 2019). Many criticisms of the association between violent video games and aggression centered around the failure to account for other contextual

factors, especially those that often coincided with violent gameplay (e.g. player skill, Matthews, 2015). Competition, a context used in the present study as a backdrop to understand more specific contextual effects, has also received attention in past studies of video game use.

### ***Competition***

The competitive nature of many online video games has also been extensively linked to aggressive behaviours. In competitive video games, players may be particularly likely to engage in aggressive behaviours, such as targeting another player, as it can lead to in-game success (Ross & Weaver, 2012). Within this context, the outcome of the game is another important contextual factor to consider. Losing in a competitive video game has been identified as a strong predictor of in-game aggression, even beyond receiving aggressive messages from another player (Breuer et al., 2015). While competition is linked to aggression through a multitude of avenues, cooperative contexts are linked to both aggression and prosociality. Cooperation in games can lead to aggression if a teammate is perceived to be making mistakes or not adequately contributing (Tang & Fox, 2019). However, playing in a more cooperative manner can also serve as a protective factor against aggression and increase prosocial behaviours (Greitemeyer et al., 2012; Jeraback & Ferguson, 2013; Jin & Li, 2019). As with violence, additional nuanced perspectives that account for the influence of other factors may help to clarify this relationship.

Within team-based competitive contexts, players are able to interact with different social partners: teammates and opponents. During the preschool years, children exhibit more selfish behaviour with competitive peers than cooperative ones (Nilsen & Valcke, 2018), and are generally more collaborative with social partners within a collaborative versus competitive context (Nilsen & Huyder, 2012), but distinctions between youths' behaviour towards teammates/opponents has not been examined in online games. On the receiving end of in-game

communication, players are more likely to receive aggressive communication from teammates (McLean et al., 2020). As mentioned, both targeting opposing players and berating teammates are forms of aggression observed in online games (Ross & Weaver, 2012; Tang & Fox, 2019). However, the ways that communication may differ between teammates and opponents in a competitive game remain unexplored. Given the popularity of online competitive games, understanding adolescent communication towards opponents and teammates within this context, as studied in the present work, provides valuable information as to how youth navigate this social space.

### ***Communicative Mode***

Another contextual feature that may impact adolescents' level of aggression is the mode by which communication occurs. Modern online games often offer multiple means by which one can communicate with other players, including text and voice. While there is little work examining mode-based differences in gaming communication, differences in mode-based communication have been observed in other contexts. In the context of texting and talking on the phone, Holtgraves and Paul (2013) identified multiple linguistic differences between these modes of communication. More specifically, text-based communication contained simpler language, more emotional language, and more personal content. With known peers, adolescents exhibit little difference in aggression between face-to-face and text-based communication (Vollet et al., 2020). However, when asked about aggression, gamers identified that the modes by which interactions occur in games are a key factor affecting the aggression within those environments (Zhang et al., 2024). For example, one participant described how receiving aggressive comments via text felt more severe than receiving them via voice because another player had to take the

time to type it out. Thus, it is important to examine what role the method of communication may play on communicative tone in online games.

Thus, in the present study, we sought to investigate how communicative partner and mode, which can vary within the same game, can influence a player's tone during communication. These characteristics are examined in isolation as well as whether they interact to affect adolescents' communicative tone. However, recognizing the variability within online behaviour, it may be the case that youth with certain characteristics respond to contextual variations (such as communicative partner and communicative mode) differently.

### **Individual Differences**

In addition to contextual factors, aggressive or prosocial behaviours in social interactions can also arise as a result of the characteristics of the adolescents themselves. Traits such as high reactivity, high levels of anxiety, and low modesty have also been associated with aggression in games (Kashani et al., 2023; Lemerrier-Dugarin et al., 2021). Meanwhile, traits such as agreeableness have been linked with more prosocial behaviours in games (Worth & Book, 2015). Individual differences have also been shown to interact with game features to affect communicative tone. For example, while measuring aggression the day after gaming, Bushman and Gibson (2010) found that violent video games increased aggression, but only when players ruminated on their gameplay experience. Notably, despite the social implications inherent to behaving aggressively or prosocially towards others, key characteristics that reflect how adolescents consider other's internal states, such as perspective-taking and empathy, have not been examined in this context.

### ***Perspective-taking***

Perspective-taking, or the ability to put oneself in the place of another to understand their thoughts or feelings within a given context, is a key socio-cognitive skill that continues to develop in adolescence (Guazzelli Williamson & Mills, 2023; Tamnes et al., 2018). It allows for the development of more complex social relationships and the navigation of complex social situations (Guazzelli Williamson & Mills, 2023; Tamnes et al., 2018). While this skill is generally beneficial towards the development of social relationships, increased prosociality, and decreased aggression (Gantiva et al., 2018; Longobardi et al., 2019; Tamnes et al., 2018), considering which type of perspective-taking is being used and the context in which it is being used is important. Cognitive perspective-taking is the ability to infer thoughts and beliefs, while affective perspective-taking focuses on the inference of feelings or emotions (Healy & Grossman, 2018). This distinction is especially important in competitive contexts, where using different types of perspective-taking can produce different results. For example, Epley et al. (2006) found that prompting cognitive perspective-taking in competitive contexts led to reactive egoism, as participants operated on the assumption that others would react competitively. Meanwhile, Sun et al. (2021) found that prompting affective perspective-taking built interpersonal trust and increased the likelihood of cooperation in competitive contexts. Thus, while perspective-taking is usually a helpful skill for navigating social situations, cognitive perspective-taking in competitive contexts may highlight contradictory motives, leading to antisocial or selfish behaviours. While the use of this skill is well-documented within in-person interactions (Gilin et al., 2013; Van der Graaff et al., 2017), there is limited information about how individual differences in this skill relate to communication within online interactions. Given the degree to which online spaces provide fewer opportunities for communicative partners to infer each other's internal states, due to reduced cues (Nesi et al., 2018), examining the role of

perspective-taking is of importance. Within the present study, the role of perspective-taking was examined both as an experimental manipulation (i.e., cueing adolescents to reflect on their communicative partner's intentions) as well as an individual characteristic.

### ***Empathy***

Another important socio-cognitive skill for relationship-building in adolescence is empathy (Reed & Trumbo, 2020). This skill refers to the overarching ability to emotionally connect with others (Gilin et al., 2013). While perspective-taking often encourages a prosocial understanding of the differences between individuals, empathy operates by emphasizing the similarities (Gilin et al., 2013). Like perspective-taking, empathy also consists of cognitive and affective components that are helpful to define. Cognitive empathy involves understanding the emotional states of others while affective empathy involves sharing others' emotions (Healy & Grossman, 2018). These skills play an important role for prosociality and aggression across a variety of contexts. In competition with friends, affective empathy serves to decrease the aggression typically associated with loss, resulting in less aggressive behaviour (Wang et al., 2014). Cognitive empathy shows general links to increased prosocial behaviours (Brazil et al., 2023). Deficits in these skills have consistently been linked with increased aggression (Estevez et al., 2018; Jiang et al., 2019). While these skills have demonstrated positive effects for behaviour within in person interactions, they also have not been examined within online game-based communication. Building on work that has found that affective empathy related to greater endorsement of prosocial comments within a simulated social media task (Bowman-Smith et al., 2021), we examined whether adolescent empathy relates to communicative tone during video gaming.

## Present Study

While theories of online communication indicate the marked differences between online and offline communication (Nesi et al., 2018; Suler, 2004), there remain significant gaps in understanding how adolescents navigate online social contexts, especially the social context of online gaming. As an overarching goal, the present study aims to investigate how both the contextual factors of a game and the individual characteristics of a player contribute to tone of communication adopted by adolescents during interactions that occur in online games.

With respect to contextual features specifically, we will examine how game-based features such as communicative mode (voice versus text) and communicative partner (teammate versus opponent) affect communicative tone, as well as how communicative tone is affected by the presence of a perspective-taking prompt to consider the intentions of the communicative partner. In addition to looking at how these different experimental manipulations may interact, we will explore how individual differences in empathy and perspective-taking affect communicative tone, as well as how adolescents respond to the contextual variations. That is, we will examine whether associations between individual characteristics and communicative tone depends on the context in which the youth are responding (namely, who they are communicating with and how).

To address these questions, we designed a video game task that simulates a gameplay experience in a competitive multiplayer game. Participants watched a series of videos while imagining that they were the one playing. In each video, after watching the gameplay, participants were presented with either a perspective-taking prompt (to consider either their opponents' or teammates' intentions) or a control prompt, depending on their condition. Then, one of the players in the game (teammate or opponent, consistent with the prompt) would make a

mildly provocative comment towards the participant's player and the participant was asked to generate a response. Across the videos, participants communicated with teammates and opponents via both text- and voice-based communication. We were interested in examining how each of these factors and the interplay of these factors influenced the communicative tone (from prosocial to aggressive) that adolescents used to respond in this simulated online game.

As aggression has been linked to both impulsivity (Duran-Bonavila et al., 2017) and bias against outgroup peers (Reijntjes et al., 2013), it was predicted that participants would communicate more aggressively via voice and when conversing with an opponent. Further, given the differential effects of perspective-taking in competitive contexts (Epley et al., 2006), it was expected that the perspective-taking condition would have differential effects based on whether participants were talking to teammates or opponents. Specifically, we predicted that cognitive perspective-taking prompts would increase prosociality with teammates by highlighting congruent goals and increase aggression with opponents by highlighting incongruent goals. With respect to individual differences, it was predicted that those with stronger perspective-taking skills would be more aggressive with teammates and less aggressive with opponents, replicating the pattern expected in the perspective-taking condition even with the absence of the prompt. Consequently, it was expected that the perspective-taking prompt could have less of an effect among adolescents with stronger perspective-taking abilities, as we expected these individuals to exhibit perspective-taking behaviours even in the absence of a prompt. Given the role empathy plays in increasing prosocial behaviour and decreasing aggression in offline contexts (Brazil et al., 2023; Estevez et al., 2018), we predicted that those who rated themselves as more empathetic would respond more prosocially.

## Methods

### Participants

Older adolescents (aged 15 – 19) were recruited through the University of Waterloo psychology department, a lab database comprised of families within the local community interested in participating in research, and local community centres. The study procedures were approved by a University of Waterloo Research Ethics Board. Following consent (including parental consent for community participants who were under the age of 18), adolescents completed the study online through Phonic (Infillion, 2024). Upon completion, participants were remunerated with either participation credits (university students) or a \$5 gift card for Tim Hortons, Starbucks, or Amazon.

Data from 238 participants,  $M_{\text{age}} = 18.07$ ,  $SD = 0.98$  (118 girls, 111 boys, 8 gender diverse individuals, and 1 individual who did not disclose their gender identity) were included in the analyses. When reporting their ethno-racial backgrounds, participants identified as Black or African ( $n = 10$ ), East Asian ( $n = 37$ ), Southeast Asian ( $n = 13$ ), South Asian ( $n = 43$ ), Hispanic or Latine ( $n = 6$ ), Middle Eastern ( $n = 11$ ), Caribbean ( $n = 1$ ), White or European ( $n = 74$ ), Mixed ( $n = 13$ ), other ethno-racial identities ( $n = 14$ ), or chose not to respond ( $n = 16$ ). The composition of participants in the control condition did not differ from that of the perspective-taking condition by age or gender ( $ps > .35$ ).

This final sample is smaller than the total group of individuals who completed the study due to exclusion criteria. Specifically, data was not included if individuals were older than the age criteria for the specific research purposes of this part of the study ( $n = 77$ ), failed embedded attention checks ( $n = 23$ ), had insufficient audio quality ( $n = 22$ ), misunderstood instructions (e.g., described the game play instead of responding to comments,  $n = 2$ ) or, in response to

questions regarding data quality at the end of the study, indicated that they provided false answers ( $n = 1$ ) or that researchers should not use their data ( $n = 47$ ). Exclusions left 238 participants from a total sample of  $N = 410$ .

## **Procedure**

Following completion of the demographic questionnaire, participants completed the video game task, responded to questions about their perceptions within the task, then completed self-report measures on their socio-cognitive skills and peer relationships, and finally answered questions regarding the quality of their data. Only measures included in the analyses for this study are reported below. Overall, the study took approximately 45 minutes to complete.

### ***Video Game Task***

As mentioned above, the video game task consisted of a 2 (condition: perspective-taking or control) x 2 (communicative mode: verbal or text) x 2 (communicative partner: teammate or opponent) design, where condition was between subject and communicative mode and source were within subject manipulations.

Participants were informed that they would be watching a series of gameplay videos and that they should imagine themselves as the person playing the game. The video game chosen for the video vignettes was Rocket League, a 2015 game from Psyonix that recreates arcade-style soccer matches with vehicles as the players. It has a large player base and remains a popular esports game. This game was selected due to its competitive, multiplayer, team-based layout and simple to understand premise. The premise of the game was explained to participants, and they were provided with visuals to orient them to game features, such as the soccer ball and team colours.

Participants viewed 8 videos, each beginning with a minute of gameplay, then showing the scoreboard, followed by a loading screen, and then returning to the scoreboard screen and receiving a message from another player that they responded to. Throughout the videos, their “player” showed a lack of skill in the game (e.g. missing shots, interfering with their own teammates), with this lower performance also reflected in their player’s score. The scoreboard also reflected other players’ scores, including the superior score of the player that made a comment towards them. These design features were implemented to ensure consistency across videos from which to interpret comments from other players and to account for potential effects of player skill on aggression, as identified by Matthews (2015).

Participants were randomly assigned to either the control or perspective-taking condition. Those in the control condition were presented with a gameplay tip when viewing the loading screen, while those in the perspective-taking condition were asked to consider another player’s tactics and goals. This perspective-taking prompt encouraged participants to consider another player’s perspective from a cognitive point of view, focusing on their thoughts and motivations within the game.

After viewing the loading screen, participants were presented with the scoreboard in the post-game lobby. Within all videos, the scoreboard clearly showed that the player they were imagining themselves to be had not performed well. A visual cue then appeared, indicating that one of the other players was going to speak or type a message, depending on the condition of communicative mode (counterbalanced across participants). The visual cue made it clear whether the message was coming from a teammate or an opponent (i.e., there was a speaker icon or “...is typing” message beside the players gamertag, with this player being on the same team or a different team (as indicated by colour and location of gamertag in the scoreboard). After the

message was either played by audio (for verbal messages) or shown in text (for text messages), participants were prompted to respond to this message using the same modality.

All messages consisted of a slightly aggressive provocative comment about the participants' player's gameplay (see Appendices). Messages were generated based on real gameplay communications and piloted to ensure they were perceived as tonally similar to each other (i.e., rated by 15 graduate students and adolescents). Audio messages were edited with a voice filter to render them as gender neutral as possible without distorting the audio. Each message was presented in all conditions, counterbalanced across participants; each participant only saw/heard each specific message once. That is, across the 8 videos, participants received two verbal messages from teammates, two verbal messages from opponents, two text messages from teammates, and two text messages from opponents.

### ***Coding***

Participants' responses to the video game vignettes were double-coded on a scale from -3 to +3 based on their aggressive or prosocial nature. Comments that contained abusive language or derogatory remarks were coded as extremely aggressive (-3), those that directly attacked the sender with less severe language as moderately aggressive (-2), and those that were dismissive or sarcastic about the sender's gameplay or comment as mildly aggressive (-1). Comments that did not elicit any emotional reaction towards the sender were coded as neutral (0). If participants responded with lighthearted banter or joking, this was coded as mildly prosocial (+1), taking accountability or apologizing for their performance was coded as moderately prosocial (+2), and complimenting the sender was coded as extremely prosocial (+3; See Appendices for more details on coding criteria and examples of participant responses that were coded in each category). Coders, who were unaware of study hypotheses, and perspective condition were

trained in the coding scheme. They remained aware of communicative mode and partner as they coded messages in the mode they were sent and partner information was sometimes critical for interpreting responses (i.e. “we’ll win the next one”, “who won?”). Training involved coding responses from five participants collectively with a researcher and then proceeded to complete an additional five participants individually. These were reviewed and any discrepancies of two points or greater were examined and discussed. Coders then coded 25% of the remaining data. After sufficient interrater reliability was established, coders went on to code the remainder of the data. Inter-rater reliability for the data was absolute ICC = .74, suggesting reasonable reliability.

After viewing and responding to each of the videos, participants were provided with screenshots or audio files of the prompts they had responded to and were asked to rate the meanness and seriousness of each player they spoke with. They were also asked about how they perceived the gender of that player and how willing they would be to play another game with that player. Data from this aspect of the procedure is not reported in the thesis here.

### **Self-report Measures**

The demographic questionnaire asked about participants’ age, gender, education level, parental education, first language, and ethnicity.

### ***Video Game Experience***

Participants were also asked about their prior experience with video games including average playtime during school and breaks (weekends and holidays), experiences with friends and strangers, and most played games. They were not asked about their specific experience with Rocket League, though several participants indicated it was a preferred game. For the purpose of this research study, a participant’s video game experience was calculated as an average of their weekly playtime during school and weekly playtime during breaks. This variable was

significantly different between conditions  $t(1902) = 4.87, p < .001$ , with those in the control condition ( $M = 8.93$ ) reporting more experience than those in the perspective-taking condition ( $M = 7.08$ ).

### ***Perspective-taking***

To assess individual differences in relation to perspective-taking generally, we asked adolescents to report specifically on their reflective functioning using the Reflective Functioning Questionnaire (RFQ-Y-13; Martin-Gagnon et al., 2023), a self-report measure designed for individuals between the ages of 12 and 21. Reflective functioning is conceptualized as an aspect of perspective-taking in that it refers to individuals' ability to interpret the internal mental states of themselves and others, including goals, desires, and feelings (Fonagy et al., 2016). In terms of measurement, past work has found that this measure shows good psychometric properties, including adequate reliability and validity among both clinical and community samples (Martin-Gagnon et al., 2023). This measure consists of 13 items across two scales, which reflect Certainty, assessing participants' confidence in their interpretations of mental states (6 items, e.g., "I usually know exactly what other people are thinking"), with higher scores indicating hypermentalizing, and Uncertainty, assessing their (difficulty with) understanding of what causes emotions and reactions (7 items, e.g., "I don't always know why I do what I do"), with higher scores indicating a lack of understanding. Lower scores on both subscales are thought to reflect more genuine perspective-taking abilities (Lund et al., 2023). Participants responded to items on a 1 (Strongly disagree) to 7 (Strongly agree) scale. Cronbach's alpha coefficient in this study was .81 for the certainty scale and .80 for the uncertainty scale.

### ***Empathy***

Empathy was measured using the Empathy Questionnaire for Children and Adolescents (EmQue-CA; Overgaauw et al., 2017), a self-report measure initially designed for youth ages 9 to 16<sup>1</sup>. The scale has demonstrated reliability and validity across various cultural contexts and with youth up to 18 years of age (Lin et al., 2021). This scale consists of 14 items across three subscales: Cognitive empathy, reflecting youths' understanding of what elicits emotional reactions in others (3 items, e.g., "When a friend is angry, I tend to know why."), affective empathy, reflecting how much someone feels the emotions of others (6 items, e.g., "When a friend is upset, I feel upset too."), and intention to comfort, reflecting youths' inclination to help someone in need (5 items, not included in analyses). Participants responded on a 1 (Not true) to 3 (True) scale. Cronbach's alpha coefficient in this study was .71 for the affective empathy subscale, and .76 for the cognitive empathy subscale.

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<sup>1</sup> Items were reviewed to ensure they were appropriate for older adolescents. Past work has used this measure with older populations (e.g., Lin et al., 2021)

## Analytic Plan

All analyses were conducted using R version 4.1.2. and IBM SPSS Statistics.

Linear mixed effects modeling was used to examine the research questions. This method allows for the simultaneous examination of individual and contextual variables, as well as their interactions with one another. Specifically, it allows us to address how contextual factors (experimentally manipulated) affect tone, how individual differences relate to tone, and how these factors interact. As it was hypothesized that some individual differences may only have an effect within certain contexts, it was important to investigate this possibility within our models. These models can also determine whether individual differences have an effect on communicative tone beyond the effects of context. Due to the nature of the experimental design, the model also needed to account for both between- and within-subjects manipulations, resulting in the mixed effects approach.

The coded communicative tone scores were analyzed using linear mixed effects modeling, using the *lme4* package (Bates et al., 2015) and the *lmerTest* packages (Kuznetsova et al., 2017). The codes across the 8 video trials were nested by participant. We considered there to be adequate power within the analyses in terms of estimating unbiased regression coefficients, standard errors, and variance components, as more than 50 units were available at the participant level (Maas & Hox, 2005; Paccagnella, 2011). Participant condition (Control vs. Perspective-taking, coded  $-1$  vs.  $1$ ), Mode (Voice vs. Text, coded  $-1$  vs.  $1$ ), Partner (Opponent vs. Teammate, coded  $-1$  vs.  $1$ ), and interactions were included as fixed effects, along with the reflective functioning and empathy measures. Along with the fixed effects, the model included a maximal random effects structure which involves random intercepts by participants' random slopes for

mode, partner, and the interaction between mode and partner. To fit the models, the *bobyqa* optimizer was used.

To explore how adolescent characteristics related to communicative tone, correlations for the measures and outcomes were examined as a whole as well as broken up by contextual factors. The results of these analyses are presented below in Tables 3, 4, and 5. Correlations between potential covariates, measures, and outcomes were also examined (Table 1).

## Results

### Preliminary Analyses

Data were inspected for outliers and distributions. Continuous data were assessed for normality by examining histograms, skew, and kurtosis. All variables were normally distributed according to the cutoffs established by Kline (1998). Each variable was then converted to standardized scores, and a z-score greater/less than 3 was used to identify any outliers. The certainty subscale of the RFQY-13 had two outlier scores and the measure of video game experience had four outliers. These scores were windsorized to fall within 3 standard deviations above or below the mean. Descriptive statistics and correlations between individual characteristics are presented in Table 1.

After methodological exclusions, less than 1% of data at the item level was found to be missing. Trials with insufficient data for coders to assign a tonal rating (i.e., no response, technical difficulties) were excluded from analyses. As the self-report measure subscales and ratings of communicative tone used for analyses were calculated averages for individual participants, variable scores were calculated excluding missing data. There were no missing data at the participant level.

Adolescents' responses were varied, and the communicative tone represented the full range of prosocial (i.e. "Thanks! You played really well out there." to aggressive (i.e. "b—ch you f—king lost ten nothing"). On average, participants' communicative tone across trials was found to be  $-0.28$ , which reflected a rating between neutral and mildly aggressive.

**Table 1***Descriptive Statistics and Bivariate Correlations for Individual Characteristics & Overall Tone*

Variable	Mean	SD	Skew	Kurtosis	1	2	3	4	5	6	7
1. Age	18.07	0.98	-1.49	2.30							
2. Gender <sup>a</sup>	-	-	-	-	.10***						
3. Gaming Experience	8.11	8.50	1.54	2.17	-.24***	-.39***					
4. Communicative Tone	-0.28	1.35	0.61	-0.04	.01	.02	-.04				
5. Reflective Functioning Uncertainty (RFQY-U)	3.80	0.91	-0.26	-0.22	-.03	.13***	.02	.02			
6. Reflective Functioning Certainty (RFQY-C)	3.84	0.91	-0.40	0.25	.06*	-.01	-.06*	.06**	.10***		
7. Cognitive Empathy (EmQue-C)	2.41	0.51	-0.59	-0.27	.02	.24***	-.16***	-.04	.11***	.42***	
8. Affective Empathy (EmQue-A)	2.37	0.44	-0.47	-0.41	.08***	.33***	-.15***	.04	.13***	.14***	.41***

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ ;  $N = 238$

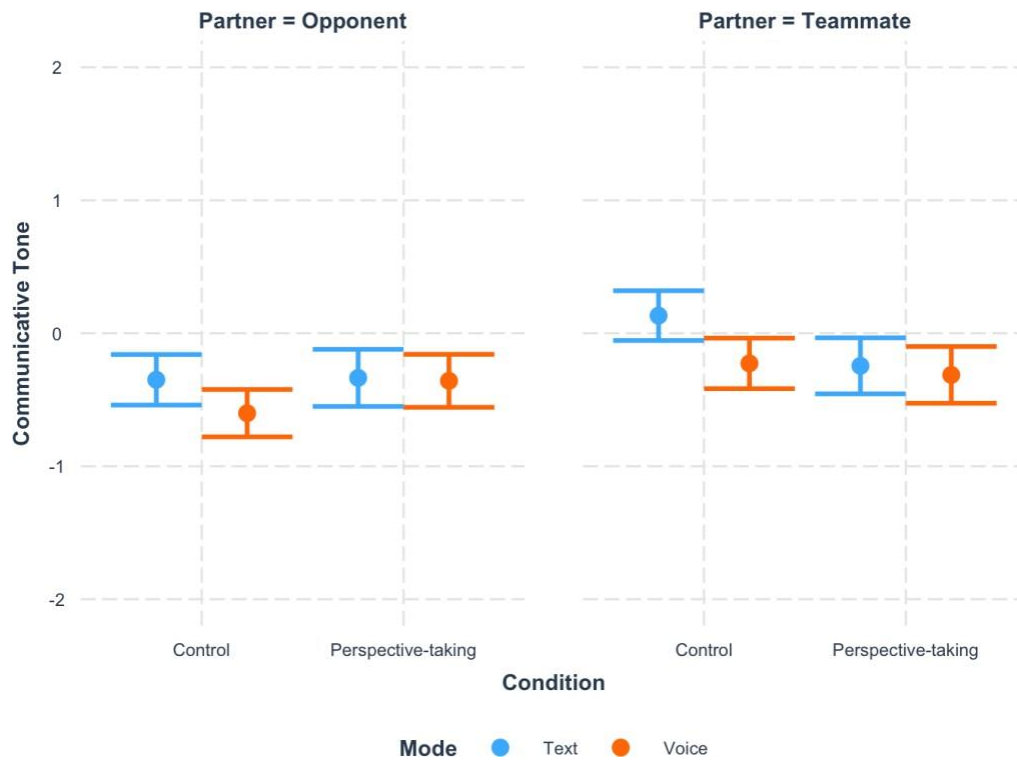
<sup>a</sup>Youth with diverse or undisclosed gender identities were excluded from gender analyses ( $n = 8$ ). The correlation with gender was run as a point-biserial correlation ( $N = 229$ ), with girls coded as (1;  $n = 118$ ) and boys coded as (0;  $n = 111$ ). All other correlations reported are bivariate correlations.

## **Effects of Contextual Factors on Communicative Tone**

To examine the effects of the experimental manipulations in the game on communicative tone, we ran a context-only mixed effects multilevel model. The context-only model looked at condition (perspective-taking versus control), mode (verbal versus text), communicative partner (teammate versus opponent) and their interactions. Earlier iterations of this model included gender, age, and video game experience as control factors. However, these variables were dropped due to their lack of marginal or significant main or interactive effects and because inclusion did not improve the model. (age/gender) and because inclusion did not improve model (all control variables). Figure 1 illustrates communicative tone scores from the model as a function of condition, communicative mode, and communicative partner, and the summary of the results is provided in Table 2.

### **Figure 1**

*Mean Communicative Tone Across Contextual Factors*



*Note.* Higher communicative tone represents a more prosocial style of communication. Error bars represent a 95% confidence interval.

**Table 2**

*Multilevel Model Results for a Context-only Model*

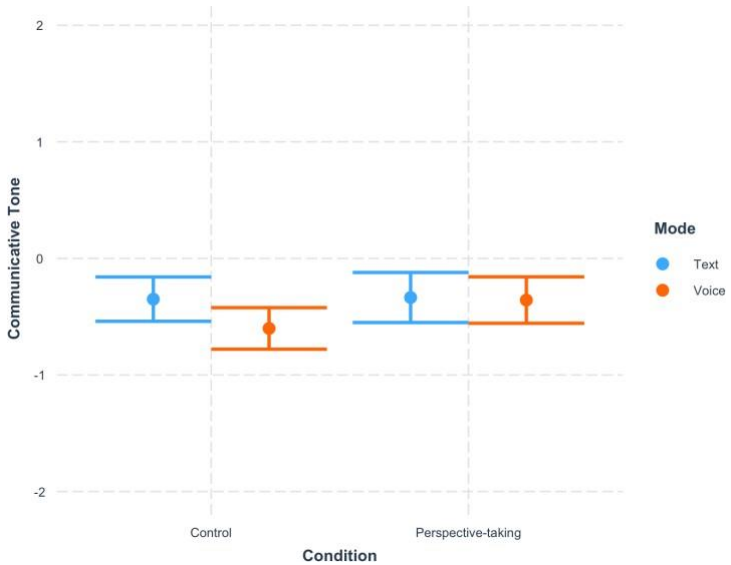
Variable	<i>B</i>	<i>SE</i>	<i>p</i>
Intercept	-0.29	0.05	<.001
Condition	-0.03	0.05	.598
Mode	0.09	0.03	.002
Partner	0.12	0.03	<.001
Condition*Mode	-0.07	0.03	.026
Condition*Partner	-0.09	0.03	.004

Mode*Partner	0.02	0.03	.524
Condition*Mode*Partner	-0.01	0.03	.799

Consistent with our hypothesis, the results indicated a significant main effect of mode ( $F(1, 236.34) = 9.12, p = .003$ ), such that, when participants received and responded to messages verbally, they were rated as more aggressive in tone than during communication occurring via text. There was also a main effect of partner ( $F(1, 233.64) = 15.94, p < .001$ ), in which participants' communication was rated as more aggressive when communicating with opponents than with teammates. However, there were also significant two-way interactions between condition and mode ( $F(1, 236.34) = 5.03, p = .026$ ; Figure 2), and condition and partner ( $F(1, 233.64) = 8.44, p = .004$ ; Figure 3). These interactions were explored further using plots and  $t$ -tests. With respect to the first interaction, in the Control condition, participants were rated as significantly more aggressive when communicating via voice (versus text;  $t(1033.5) = 3.65, p < .001$ ), but this effect did not emerge within the Perspective-taking condition ( $p = .60$ ). This effect was driven by increased aggression in text-based communication ( $t(919.23) = 1.98, p = .048$ ) in the Perspective-taking condition compared to Control, but not voiced based communication ( $p = .36$ ) between conditions. Similarly, in the Control condition, more communicative aggression was demonstrated towards an opponent (versus teammate;  $t(1025.9) = -5.14, p < .001$ ), with this not occurring in the Perspective-taking condition ( $p = .44$ ). This effect was driven by increased aggression with teammates ( $t(911.28) = 2.57, p = .010$ ), but not opponents ( $p = .14$ ) in the perspective-taking condition (versus control).

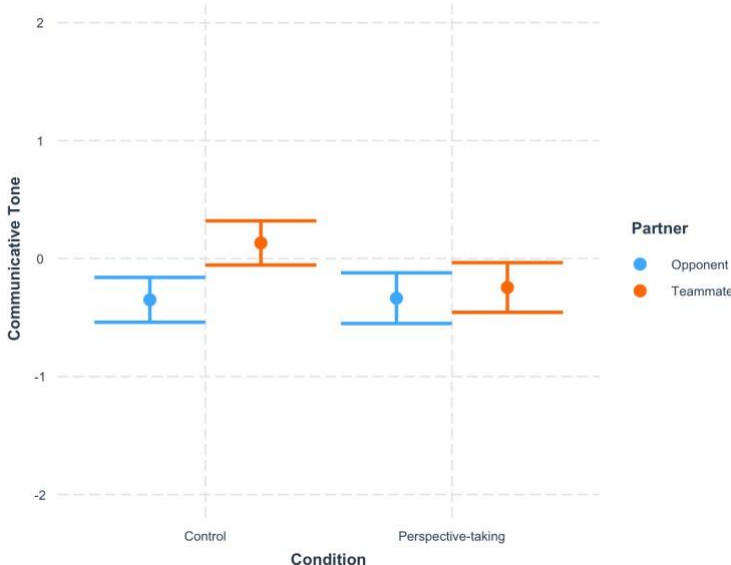
**Figure 2**

*Communicative Tone by Mode Within Perspective-taking and Control Conditions*



**Figure 3**

*Communicative Tone by Partner Within Perspective-taking and Control Conditions*



**Individual Characteristics and Communicative Tone**

To examine whether adolescent characteristics related to their communicative tone, as a preliminary step, we looked at the correlations between reflective functioning/empathy with communicative tone overall (i.e., across contexts) and within conditions. These correlation

matrices are presented in the Tables 3, 4, and 5. When looking at the pattern of correlations, it seems that individuals with higher levels of certainty in mental states communicate in a way that is more aggressive. However, contrary to our predictions, when separated by condition, this association is primarily occurring for participants in the perspective-taking condition.

Additionally, both cognitive and affective empathy seem to relate to tone with a particular type of partner. While affective empathy correlates with more prosocial responses to opponents, cognitive empathy correlates with more aggressive responses to teammates. Split by condition, we can see that these associations are primarily within the control condition.

**Table 3**

*Correlations with Communicative Tone in Various Contexts Across Conditions*

Individual Difference	Tone - Overall	Tone - Text	Tone - Voice	Tone - Teammate	Tone - Opponent
RFQY-U	.01	.01	-.00	.00	.01
RFQY-C	-.06**	-.09**	-.04	-.09**	-.03
EmQue-C	-.04	-.06	-.03	-.09**	.01
EmQue-A	.04	.03	.05	-.01	.09**

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

*Note.* Reflective Functioning Uncertainty (RFQY-U), Reflective Functioning Certainty (RFQY-C), Cognitive Empathy (EmQue-C), Affective Empathy (EmQue-A)

**Table 4**

*Correlations with Communicative Tone in Various Contexts in the Control Condition*

Individual Difference	Tone - Overall	Tone - Text	Tone - Voice	Tone - Teammate	Tone - Opponent
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RFQY-U	-.02	-.02	-.01	-.05	.02
RFQY-C	-.02	-.03	-.01	-.06	.03
EmQue-C	-.04	-.01	-.08	-.11*	.03
EmQue-A	.04	.05	.04	-.01	.11*

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

*Note.* Reflective Functioning Uncertainty (RFQY-U), Reflective Functioning Certainty (RFQY-C), Cognitive Empathy (EmQue-C), Affective Empathy (EmQue-A)

**Table 5**

*Correlations with Communicative Tone in Various Contexts in the Perspective-taking Condition*

Individual Difference	Tone -	Tone -	Tone -	Tone -	Tone -
	Overall	Text	Voice	Teammate	Opponent
RFQY-U	.04	.06	.01	.09	-.01
RFQY-C	-.12***	-.16***	-.08	-.13**	-.11*
EmQue-C	-.04	-.10*	.03	-.06	-.01
EmQue-A	.03	-.01	.06	-.02	.07

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

*Note.* Reflective Functioning Uncertainty (RFQY-U), Reflective Functioning Certainty (RFQY-C), Cognitive Empathy (EmQue-C), Affective Empathy (EmQue-A)

Next, to examine main effects and interactions between individual characteristics and contextual factors, we also examined a maximal model that built upon the context-only model and included participants' self-reported empathy and reflective functioning, as well as control factors, such as gender and age. Following Snijders and Bosker's (2011) model specification

recommendations, predictors that did not produce marginally significant effects were trimmed from final models to avoid overfitting. Thus, the final trimmed model (Table 6) did not contain gender, age, video game experience, or measures of affective empathy. Video game experience was also removed as a covariate, as it did not improve model fit. With the added individual differences in the trimmed model, the results still indicated significant main effects of mode ( $B(SE) = .09 (0.03), p = .002$ ), with vocal communications coded as more aggressive, and partner ( $B(SE) = .12 (0.03), p = <.001$ ), with responses to opponents coded as more aggressive. Each of these contextual variables also retained a significant two-way interaction with condition with the interactions between mode x condition ( $B(SE) = -.06 (0.03), p = .030$ ) and partner x condition ( $B(SE) = -.09 (0.03), p = .006$ ), both following the same patterns as in the context-only model.

**Table 6**

*Multilevel Model Results for Models Including Individual Differences*

Variable	Trimmed Model $\beta$ (SE)
Intercept	-0.29 (0.05)***
Condition	-0.02 (0.05)
Mode	0.09 (0.03)**
Partner	0.12 (0.03)***
RFQY-U	0.03 (0.05)
RFQY-C	-0.09 (0.06)
EmQue-C	-0.07 (0.11)
Condition*Mode	-0.06 (0.03)*
Condition*Partner	-0.09 (0.03)**

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Mode*Partner	0.02 (0.03)
Condition*RFQY-U	0.05 (0.05)
Mode*RFQY-U	0.03 (0.03)
Partner*RFQY-U	0.02 (0.03)
Condition*RFQY-C	-0.10 (0.06) <sup>+</sup>
Mode*RFQY-C	-0.04 (0.03)
Partner*RFQY-C	-0.01 (0.04)
Condition*EmQue-C	0.06 (0.11)
Mode*EmQue-C	-0.02 (0.06)
Partner*EmQue-C	-0.12 (0.07) <sup>+</sup>
Condition*Mode*Partner	-0.01 (0.03)
Condition*Mode*RFQY-U	0.04 (0.03)
Condition*Partner*RFQY-U	0.07 (0.03) <sup>+</sup>
Mode*Partner*RFQY-U	0.03 (0.03)
Condition*Mode*RFQY-C	0.01 (0.03)
Condition*Partner*RFQY-C	0.01 (0.04)
Mode*Partner*RFQY-C	0.01 (0.04)
Condition*Mode*EmQue-C	-0.15 (0.06) <sup>*</sup>
Condition*Partner*EmQue-C	0.04 (0.06)
Mode*Partner*EmQue-C	-0.04 (0.07)
Condition*Mode*Partner*RFQY-U	0.04 (0.03)
Condition*Mode*Partner*RFQY-C	-0.03 (0.03)
Condition*Mode*Partner*EmQue-C	0.06 (0.07)

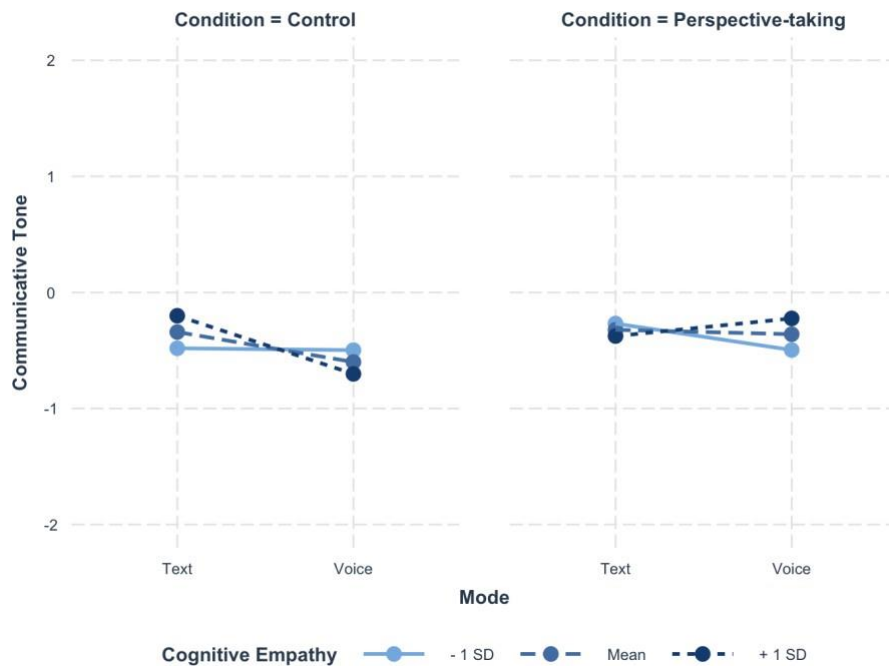
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<sup>+</sup>  $p < .1$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ ;  $N = 238$

With respect to adolescent characteristics, there was a significant three-way interaction between cognitive empathy, mode, and condition ( $B(SE) = -.15 (0.06)$ ,  $p = .014$ ). In the Control condition, high cognitive empathy was associated with more aggressive responses via voice ( $b = -.27$ ,  $p = .14$ ), while there was little difference in aggression across modes for those with low cognitive empathy ( $p = .97$ ). In the Perspective-taking condition, high cognitive empathy led to increased aggression when communicating via text ( $b = -.17$ ,  $p = .30$ ) but decreased aggression when communicating via voice ( $b = .17$ ,  $p = .34$ ). Thus, this interaction is indicative of cross-over interactions within each condition. This interaction is illustrated in Figure 4.

**Figure 4**

*Communicative Tone as a Function of Condition, Mode, and Self-reported Cognitive Empathy*

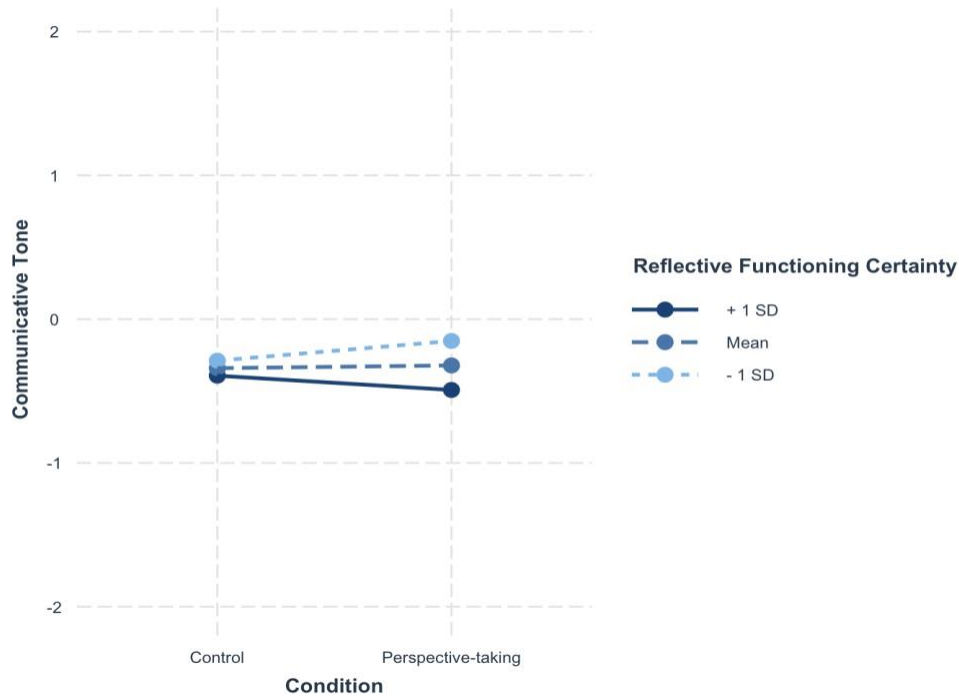


*Note.* Higher communicative tone represents a more prosocial style of communication. Error bars represent a 95% confidence interval.

The trimmed model also indicated several marginally significant (i.e.,  $p < .1$ ) two- and three-way interactions, which were examined due to their relevance to our research questions. For reflective functioning, there was an interaction between condition and the certainty subscale ( $B(SE) = -.10 (0.06)$ ,  $p = .096$ ; Figure 5). Similar to patterns observed in the correlation analyses, in the control condition, participants' responses were rated as similarly aggressive regardless of their certainty about their interpretation of mental states ( $p = .86$ ). However, in the perspective-taking condition, participants' communicative tone differed based on their certainty around mental states ( $b = -.18$ ,  $p = .03$ ). Those with higher certainty gave responses that were coded as demonstrating a more aggressive tone, and those with lower certainty gave more prosocial responses.

**Figure 5**

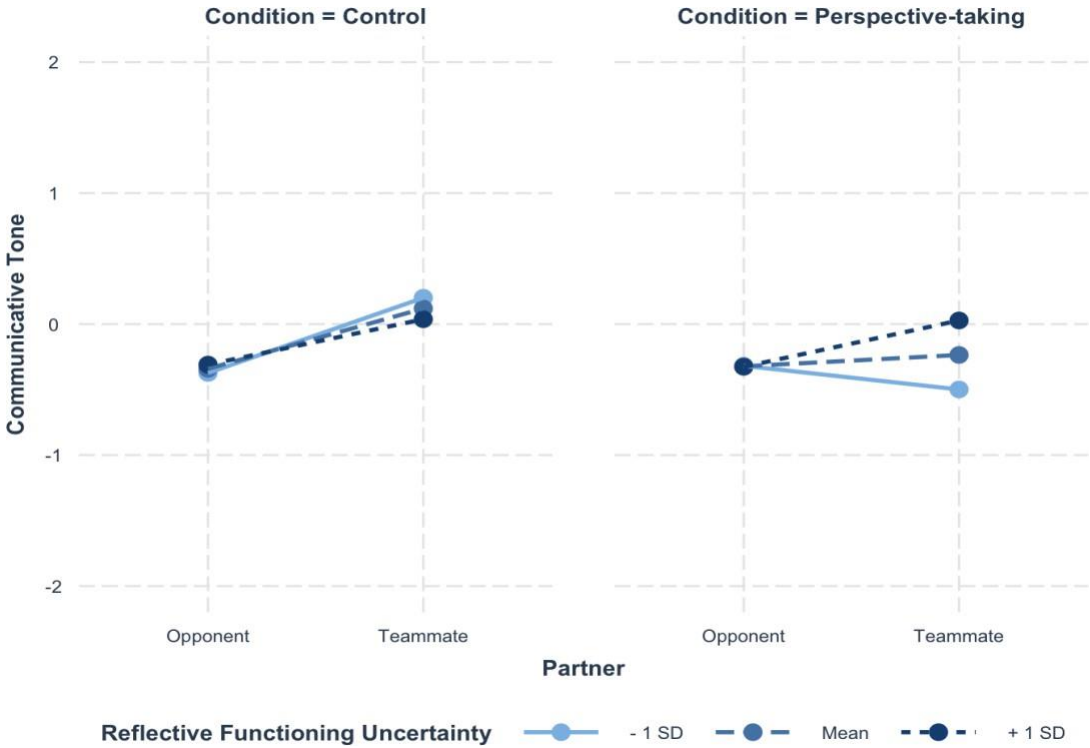
*Communicative Tone as a Function of Condition and Certainty in Reflective Functioning*



Results also showed a marginal three-way interaction between condition, partner, and the uncertainty subscale of the reflective functioning measure ( $B(SE) = .07 (0.03)$ ,  $p = .056$ ). For those with high uncertainty about mental states, whether they viewed the perspective-taking prompt before conversing with another player had little effect on how they differentially communicated with teammates or opponents ( $ps > .56$ ). These participants responded to teammates more prosocially and opponents more aggressively across conditions. For those with lower uncertainty, their responses towards opponents did not change between conditions ( $p = .34$ ). However, those who were less uncertain about mental states displayed the opposite pattern to those with high uncertainty with teammates in the Perspective-taking condition, responding more aggressively with teammates than they did with opponents ( $b = -.43$ ,  $p = 0.01$ ). This interaction is depicted in Figure 6.

**Figure 6**

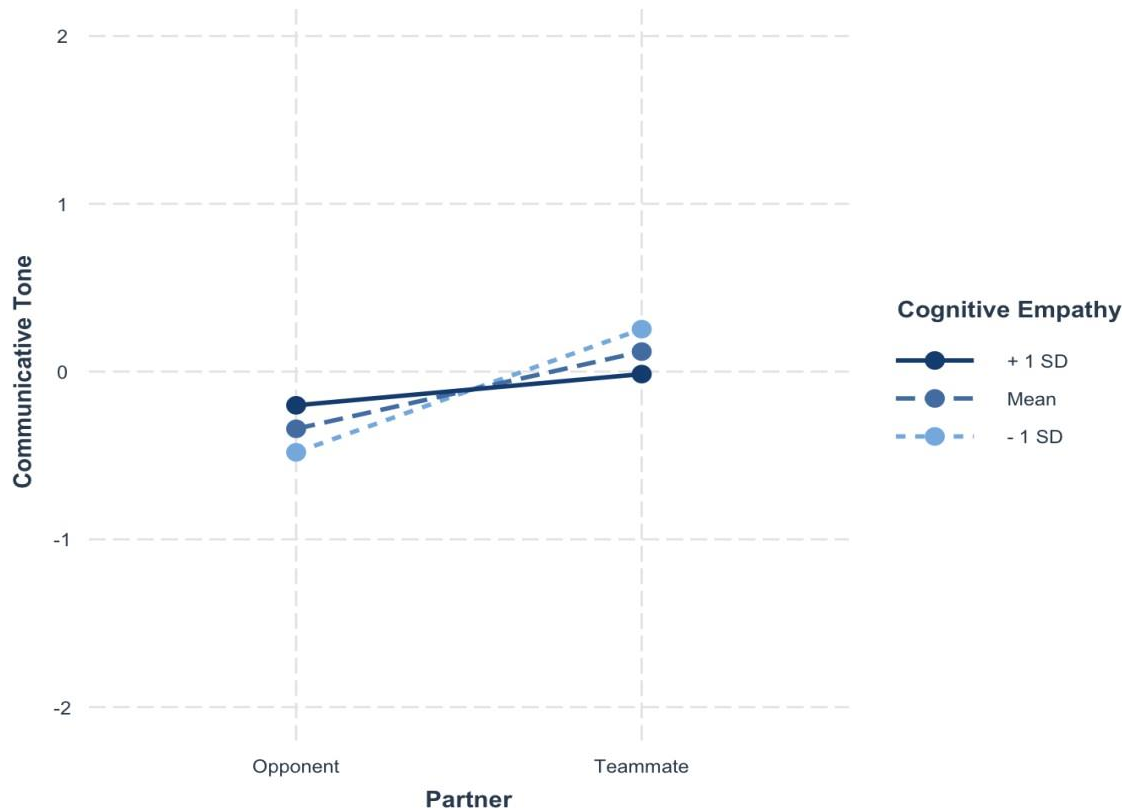
*Communicative Tone as a Function of Condition, Partner and Uncertainty in Reflective Functioning*



A marginally significant interaction between cognitive empathy and partner ( $B(SE) = -.13$  (0.07),  $p = .061$ ) also emerged (Figure 7), wherein those with lower cognitive empathy displayed a larger difference in communicative tone between responses to teammates and opponents ( $b = .29, p < .001$ ) than those with higher cognitive empathy ( $p = .07$ ). No other variables had any significant effects or interactions

**Figure 7**

*Communicative Tone as a Function of Partner and Cognitive Empathy*



To explore whether the context-only or trimmed model (with individual differences) was the most representative of the data, we compared the context-only model including condition, mode, partner, and their interactions with the complex model including additional control factors, individual differences in reflective functioning and empathy, and their interactions with the contextual factors. The complex model did not significantly improve the model fit ( $\chi^2(2) = 34.76, p = .34$ ). This pattern persisted even when non-significant control factors and individual differences were removed ( $\chi^2(2) = 13.38, p = .099$ ).

## Discussion

Despite 85% of adolescents indicating that they play video game (about 40% of whom play daily), and over 89% of those who play do so in a multiplayer setting (Gottfried & Sidotti, 2024), little is known about how they communicate within these unique online social contexts. This study examined this topic through the use of a simulated video game task wherein adolescents were asked to respond to mildly provocative comments. Contextual features of the game, namely, who made the comment, whether adolescents responded via text or verbally, and whether there was a prompt to consider players' perspectives were found to have an effect, or interact to have an effect, on the degree to which communicative tone was more aggressive (versus prosocial). Additionally, there was some, albeit limited, support for the notion that adolescent characteristics relate to the tone with which they communicate online. Together this work provides information about key considerations for what elements of both the game and individual may impact or interact to impact adolescents' tone of communication in online games.

### Contextual Features and Communicative Tone

When looking at *how* adolescents were communicating their responses, namely the mode of communication, we found that voice-based communication tended to take on a more aggressive tone than text-based communication. While the ability to convey more emotion via voice is sometimes highlighted as a benefit of using voice-based communication in games (Ictech, 2021), it may be that these emotional cues also encourage more aggressive responses to aggressive comments from other players. The immediacy afforded by voice-based communication may also contribute to the more aggressive nature of responses occurring in this context. When William et al. (2007) interviewed gamers about their experiences, one participant reported that it was “too easy” to respond aggressively when communicating via voice while it

was easier to “hold [their] tongue” when communicating via text. Consistent with this notion, coders rated the communicative tone of participants’ messages as more aggressive than their texts. Precisely why there may be more aggression is difficult to ascertain in the present results, as we purposely held the communicative channel for receiving a message consistent with how participants responded. Thus, it may be the case that, even though the content of messages were counterbalanced, participants perceived verbal messages as more aggressive and responded accordingly. For instance, it could be the case that through the addition of acoustic features in the messages there were additional cues to the aggressive nature of the messages. Alternately, it could be that they perceived them similarly, but that the tone in their responses differed.

Who adolescents are talking to or their communicative partner in these contexts also had an effect on communicative tone. Specifically, we found that adolescents generally responded more aggressively when replying to a provocative comment from an opponent, and more prosocially when it was a teammate. Although previous findings have indicated that more negative responses are received from teammates in competitive online spaces (McLean et al., 2020), it appears that negativity from opponents provokes a more aggressive response. This pattern occurred despite counterbalancing prompts to ensure that teammates and opponents were responding with the exact same mildly negative comments. This adheres to the notion of teammate identity or in-group/out-group bias, wherein in-group members or teammates, in this case, are evaluated more positively than outgroup members (Brewer, 1979). It also maps on to patterns found in studies investigating this phenomenon in a sporting context, wherein aggression towards opposing teams is most common, but aggression towards teammates is also seen, especially in highly competitive settings (Danioni et al., 2021).

However, interestingly, both the main effects noted above were qualified by an interaction with the perspective-taking condition. Specifically, when participants were asked to consider the motivations of a teammate or opponent (versus a control message about the game function), there were no differences in the communicative tone between messages sent verbally versus text or towards a teammate versus opponent. Thus, this prompt, which cued cognitive perspective-taking, seemed to nullify the context-based differences observed in the control condition. These interactions will be considered in turn.

First, being prompted to consider the goals of others reduced the difference in communicative tone between voice- and text-based communication. Within the control condition, verbal messages were rated as being more aggressive than text-based messages. Above, we speculate that this difference may be due to increased cues to the provocative/aggressive tone. However, we do not find this difference in mode when participants are asked to reflect on perspective, suggesting that the prompt to consider the goals and motivations of others may have encouraged participants to more actively consider the tone of text-based messages, which due to the reduced acoustic cues may be more ambiguous. Thus, through receiving a prompt and perceiving more aggression in text-based messages, they may have responded in kind (i.e., more similar to how they responded to the verbal messages). Additionally, and more likely given the pattern of results, perspective-taking (which depends on inhibitory control to overcome an egocentric bias; Long et al., 2018; Yuan et al., 2023) may prompt players to pause and think before responding, potentially reducing the immediacy and associated aggression that occurs with voice-based communication (i.e., more similar to the text-based messages). This possibility also aligns with the literature on aggression, as direct

aggression, which encapsulates both physical and verbal aggression, is linked to impulsivity (Duran-Bonavila et al., 2017).

Second, when considering the role of perspective-taking on in-group (teammate) and out-group (opponent) interactions in a competitive environment, the differential interpretations of players' initial comments may explain the reduced difference in the communicative tone of responses. That is, when prompted to think about a teammate's goals, players' attention is drawn to the fact that those goals should overlap with theirs in the context of the game (i.e., they should be trying to work together to win). Thus, when a teammate makes a somewhat aggressive comment towards them, they may perceive a discrepancy between this player's role (as teammate) and their behaviour towards them, thereby, provoking a more aggressive response. Likewise, when thinking about an opponent's goals in the game, participants' attention is drawn to the fact that these goals are contradictory to their own. Thus, mildly aggressive comments from these players may be perceived as more contextually appropriate in reference to these differential goals (e.g., "trash talk"), resulting in a less aggressive response. This mirrors the connections observed with social norm violations in the offline world, wherein violations of social norms, as perceived in terms of their intent to harm the recipient, lead to increases in anger (Kam & Bond, 2009).

### **Adolescent Characteristics and Communicative Tone**

Given past work finding that adolescent characteristics relate to communicative approaches during online activities such as social media (Angelini & Gini, 2024; Bowman-Smith et al., 2021), we had speculated that the individual characteristics of the youth would relate to their communicative tone during video games. We focused on perspective-taking and empathy due to their relevance for prosocial behaviour generally (Brazil et al., 2023; Longobardi et al.,

2019) as well as the degree to which competitive contexts may moderate how perspective-taking affects behaviour (Nilsen & Valcke, 2018).

Individual differences in perspective-taking abilities were gathered through self-report of reflective functioning, broadly referring to adolescents' ability to interpret mental states, such as feelings and goals, in themselves and others. Reflective functioning is measured in terms of an individual's confidence that their interpretations are correct (certainty) and their lack of awareness or confusion around interpreting mental states (uncertainty). Correlation analyses suggested that the degree to which adolescents viewed themselves as being able to accurately infer the mental states of others was related to communicative tone overall (i.e., more certainty related to more aggression), but especially within the perspective-taking condition (see Tables 3, 4, and 5). When prompted to use these abilities (i.e., through the experimental prompt), certainty about mental states was significantly correlated with more aggressive tone in text, as well as among teammates and opponents. Consistent with these patterns, the trimmed multilevel model showed a marginal interaction between condition and the certainty element of reflective functioning. In the perspective-taking condition, there was a marginal effect wherein adolescents who reported more certainty about the mental and emotional states of themselves and others were more aggressive in their responses. In line with previous work, these results show that perspective-taking abilities vary on the basis of context (Wolgast et al., 2020). However, these results run contradictory to our hypothesis that differences in perspective-taking abilities would have reduced effects within the perspective-taking condition. Rather, it seems that those with more certainty in their abilities have a greater response to the prompt in terms of altering their tone. This pattern aligns with clinical findings that these skills are contextually dependent and

creating an environment which encourages their use is key to increasing these abilities (Kasper et al., 2024).

Uncertainty about mental states did not correlate with communicative tone generally or in any specific contexts. Despite the lack of significant correlations, the multilevel model yielded a marginally significant interaction involving uncertainty in reflective functioning, partner, and condition. While those who were highly uncertain about their own and other's mental and emotional states were more prosocial with teammates and more aggressive with opponents across conditions, those with low uncertainty who were prompted to consider the goals of a teammate were more aggressive with those teammates. This pattern may have emerged because adolescents with better perspective-taking skills (lower uncertainty) were more sensitive to the aggression within the provocative messages. Thus, ambiguous communication from teammates, who others may think are joking, is viewed as more aggressive and, in turn, responded to more aggressively. This increased perception of aggression in ambiguous circumstances may also account for the associations between high certainty and increased aggression. While this led to reactions that more closely matched the stimuli (i.e., messages were indeed designed to have insulting elements), higher certainty may result in hypermentalizing, leading to an overestimation of negativity or aggression in ambiguous contexts (Sharp & Venta, 2013). The phenomenon of hypermentalizing or the over-attribution of mental states, which has largely been explored in the context of borderline personality disorder (BPD), has been linked with negative interpretations of neutral facial expressions (Mitchell et al., 2014). These types of socio-cognitive deficits in BPD are particularly apparent in emotionally charged contexts (Sharp & Vanwoerden, 2015). While hypermentalizing is not often studied in non-clinical populations, it may be that these patterns of overattributing negative thoughts and feelings to ambiguous

contexts apply to hypermentalizing more generally, leading to more aggressive responses in the context of this study

Self-reports of individual differences in empathy, particularly cognitive empathy, also appeared to exhibit some association with how adolescents communicate with others in online gaming. Correlations analyses (see Tables 3, 4, and 5) indicated that empathy was related to communicative tone in the control condition. Specifically, with teammates, cognitive empathy was associated with increased aggression and with opponents, affective empathy was associated with increased prosociality. The finding with affective empathy aligns with research indicating that empathy increases prosociality (Lockwood et al., 2014). However, affective empathy did not yield any effects in the multilevel model.

Contrary to the findings with affective empathy, the correlational results for cognitive empathy do not align with findings that both forms of empathy increase prosociality (Lockwood et al., 2014). This pattern is also reflected with a significant interaction between cognitive empathy, condition, and mode in the multilevel model. When prompted to consider the perspective of others, those who were better able to understand the emotions of others were inversely affected by communicative mode compared to other contexts. While adolescents were generally more aggressive when communicating via voice, adolescents who were high in empathy were more aggressive in text-based contexts in the perspective-taking condition. Those with high cognitive empathy were also marginally less likely to differentiate tone on the basis of partner, leading to more aggressive communication with teammates. While this could be related to the competitive context, even in the offline competitive context of sports, cognitive empathy has been linked with more prosocial responses (Mahmoudi et al., 2022). However, other sports-based studies have indicated that such effects may be diminished for men in the midst of high

interpersonal provocation (Stanger et al., 2016), a common feature of game-based communication that was utilized in this study. Alternatively, increased cognitive empathy may have facilitated more empathy towards the player participants were imagining themselves as, thus feeling more protective and retaliatory when aggressive comments were made towards them. This reflects patterns observed in bullying research, where empathy has been linked to an increased willingness to defend victims among adolescent females (Barchia & Bussey, 2011).

While both contextual factors and individual differences exhibited some influence over youths' communicative tone in online gaming, a comparison of models made it clear that the influence of the contextual elements was much stronger. While contextual factors like mode and communication partner exhibited strong effects on tone across the board, individual differences in empathy and reflective functioning only seemed to influence tone in some situations. While these socio-cognitive skills are important for successful communication and social development in adolescence (Tamnes et al., 2018), their role in the social context of competitive online gaming may be less pronounced or produce different responses than in face-to-face peer interactions.

## **Implications**

This work provides foundational information about online gaming as a social context for adolescents. By simulating conversations within a gameplay environment, the responses gathered may offer a more ecologically valid insight into interactions in these spaces than previous self-report data. Additionally, while previous work looking at game-based socialization focuses on adult populations or lacks age considerations, this study focuses on adolescent populations, where social development is key. The study highlights the importance of considering both contextual factors and individual differences when evaluating aggressive and prosocial

communication within these settings. It identified contextual features, such as the mode of communication, and who players are communicating with, as particularly influential on communicative tone. Such associations provide a foundation for future work investigating how other contextual factors may contribute to aggression or prosociality in games. In terms of individual differences, this study adds to the literature around how important social skills in adolescence translate to online environments, especially competitive online environments. While some of the patterns between characteristics and communicative tone resemble those found in offline research, others present alternate patterns in this online environment. This knowledge may provide helpful guidance for future studies examining socio-cognitive development in online environments.

Information about how contextual features are associated with prosociality and aggression allows parents, players, and game designers to consider how the use of certain game elements may shape the communicative environment in an online game. This study does not attempt to label prosocial or aggressive communication styles as beneficial or harmful but rather intends to provide insight that allows players to shape their experiences. Indeed, for some youth, trash-talking is part of the experience, especially within particular types of games, such as first-person shooters, or crime-based games (Kaye et al., 2022). By identifying that voice-based communication tends to facilitate more aggression than text-based communication, both players and developers can choose to implement or use communicative modes in a manner that aligns with their desired experience. Likewise, given that communication is more aggressive with opponents, developers can make informed decisions about implementing team-only or whole-game communication channels. Players can also choose which other players they choose to engage with through a game's communicative channels.

## **Limitations and Future Directions**

Although this study provides novel insights into adolescent communication in the context of online gaming and uses video simulation to bridge the gaps of ecological validity created by using self-report measures, there are still limitations to acknowledge and various avenues for additional research on this topic.

In this study, in order to control for other confounding factors, players only responded to a singular comment in each game video, without additional back-and-forth commentary from other players throughout the game or within the post-game lobby. This may not be as accurately representative of the online gaming experience as having multiple other players with which to communicate. However, these more complex, group-based communicative patterns were beyond the scope of this study. Likewise, players were not playing the game themselves, which may have impacted their immersion. Recent work in online gaming suggests that immersion may be another important individual factor to consider when examining how players communicate, especially with the advent of virtual reality games (Blackman, 2024; Chen et al., 2023). This disconnect in perspective may have also led to patterns like the players empathizing with the player they were pretending to be, rather than perceiving that player as themselves. As aforementioned, this may have influenced the results around the effects of individual differences in empathy.

In addition to a lack of immersion, the data we collected may have also been impacted by social desirability. Participants were aware that they were participating in a study and thus, may have modulated their responses to be more prosocial or more aggressive (i.e., giving a performance) than natural. However, there was still variability in the responses and there was

substantial aggression withing the data, indicating that this limitation may have had limited effects within this study.

This study focuses on online gameplay with strangers. While video games are one of the primary online contexts where interactions with strangers or unknown peers are common (Cole & Griffiths, 2007), they are also frequently used alongside friends (Domahidi et al., 2016). Given the important role of peer relationships in adolescence (Veenstra & Laningra-Wijnen, 2023), these communications may help shape how adolescents communicate in online gaming more generally. As such, it remains important to investigate how game-based communication may be altered when speaking with friends or when speaking with strangers in the presence of friends. As identified throughout this study, small changes in context can have notable effects on communicative tone.

Given the results of this study indicating a strong influence of contextual factors, future research can continue to collect information about other contextual factors that may influence communicative tone, such as playing with friends rather than strangers and the perspective from which the game is played. Future research should also investigate how other socio-cognitive factors, such as inhibitory control, may interact with contextual features and impact communicative tone. As this study used self-report measures of empathy and reflective functioning, future studies could also examine these abilities using task-based measures to confirm findings regarding the role of these individual characteristics for communicative tone. Furthermore, additional investigation could help parse apart whether the differences in communication tone across contexts are due to how the message is received or how it is responded to, as this study only examined communication occurring in a consistent format across conversations.

## Conclusion

Communication plays a key role in adolescent social development, and online games sometimes serve as a social context for the development of those skills. However, the aggressive communication associated with these environments, especially competitive multiplayer games, is not uniform. Contextual differences, such as choosing to communicate via voice instead of text or communicating with an opponent rather than a teammate, can lead to a more aggressive tone. Asking players to consider the goals of another player prior to speaking with them reduced these contextual differences, producing more aggressive tones in contexts that are typically more prosocial (i.e., with a teammate or via text). While individual differences in socio-cognitive skills like empathy and reflective functioning showed some associations with adolescents' communicative tone in this environment, these influences were not as predictive as contextual factors. Within the MLM model, the effects of self-reported perspective-taking and empathy as individual differences were largely marginal, more contextually dependent, but interestingly, when present, produced results contrary to their typical function. Namely, higher reported levels of these abilities resulted in more aggressive styles in competitive online games.

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## **Appendices**

### **Communication Prompts**

Prompt 1 – “WhAt A gReAt BLOcK ghost”

Prompt 2 – “wow that was a rllY FiRe pERforManCe on that one ghost”

Prompt 3 – “howd u miss that many shots ghost? can u even see the net?”

Prompt 4 – “ghost what was that? ive nvr seen someone miss that much in my life”

Prompt 5 – “look ghost only has 4 points lol”

Prompt 6 – “no way. Ghost how r u not at the bottom of the leaderboard?”

Prompt 7 – “im so fast its not even funny. No wonder u couldn’t keep up ghost”

Prompt 8 – “idk how u missed that last shot ghost. i would’ve scored that easy”

## Detailed Coding Scale

### ( - 3) Extremely aggressive

Harsh insults; abusive language; derogatory remarks.

The participant's response is overtly degrading or aggressive/abusive towards the sender.

For example, they may use cuss or swear words to describe or attack the sender. The response appears to carry a clear intent to hurt, demean, or provoke the other person on a personal level. The response may appear to be highly emotional or otherwise raging. Or, the response may be in the form of a blatant threat.

### ( - 2) Moderately aggressive

Insults, blame, or counter-attacks directed towards the sender... but the language of any insulting statements is less severe/derogatory in nature.

Insulting or hostile language towards the sender, directly attacking their character but without the use of overly harsh or abusive language.

The participant's response includes directly insulting language but lacks harsh or abusive language. For example, they may assign negative attributes to the sender but without the use of overtly degrading language. Or, the participant's response comes off as a form of blatant bullying but without the use of harsh insults.

The participant may respond in an insulting manner or state negative attributes towards the sender such as "you suck", or they may assign negative but not overly harsh attributes towards the sender by, for instance, calling them a "joke", "clown", "useless", etc. - The participant may overtly attack or insult the sender's own performance or behaviour through vague yet clearly insulting attributes such as 'terrible', 'awful', 'horrible' etc.

The participant criticizes/insults the sender personally because of the statements being made

Some examples may be “You care too much about a game it’s embarrassing”, “You are getting too worked up about this it’s funny”, “Do you have anything better to do than trash talk?”, etc. The participant may state sarcastic statements or questions such as, “you must be fun at parties”, “you must be proud of yourself,” etc.

Participant may indirectly poke fun at the sender through undermining statements such as “this is your entire personality I see”.

Or, the participant may mockingly repeat what the sender said.

Overt blaming and counter-attacks directed towards the sender’s character, behaviour, or gameplay. The statement may be, but is not always necessarily defensive.

The participant is defending their poor performance by shifting the blame on the sender (e.g., “That’s because you kept doing so and so” or “It’s not like you were being helpful”).

Or, the participant may **overtly** insult the sender’s own performance (e.g., you play like \*\*\*\* too!)

(- 1) Mildly aggressive

Dismissive, non-accepting, or negative sarcasm but without the use of direct insults and is not directed towards the sender’s character per se but towards their behaviours, statement, and/or gameplay.

The participant may respond with phrases that dismiss the sender’s remarks in a negative manner, signalling irritation and rejection of any playful banter.

The participant may disrespectfully shun the sender by telling them to ‘shut up’, ‘get lost’, ‘take a seat’, ‘leave me alone’, ‘whatever’ ‘So what?’, etc.

The participant may resist the sender's comment by counter-criticizing the sender's own performance or comments. However, the participant does not use direct hostile language in doing so.

The participant may comment negatively about the sender's game play and behaviours, but does not use insulting language. Some examples may sound like, "you still lost," "you are not a pro either", "look who's talking", "cry about it".

Or, the participant may attempt to undermine the situation in an attempt to shift the power dynamic or defend themselves but without insulting the sender (e.g., "You care way too much, it's just a game").

The participant's response is passive aggressive or sarcastic of the sender's own performance or their statement, but is not directly attributing negative statements towards the sender's character per se.

The participant's response may be sarcastic in a negative or passive aggressive manner, for instance, they may make a statement such as "Lovely comments from you" or by responding "wow this is so helpful" to a message that is clearly criticizing them or is negative.

The participant's response is not accepting of the sender's behaviour or statement, without attacking the sender.

The participant voices objection to the situation in which they are addressing the negative/sarcastic comment made by the sender, but without assigning negative attributes towards the sender per se. For example, they may say something like "There is no need to talk this way", "You are being disrespectful", "I don't appreciate the way you keep picking on me", etc.

(0) Neutral
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Does not affirm nor challenge the sender; ambiguous; indifferent; or unengaged

The participant's response lacks emotionally charged language. The response neither affirms (e.g., agree with or validate) nor challenges the sender in any way.

The participant's statement may lack emotionally charged language (e.g., "okay", "mhm", etc.)

The participant is refusing to engage with the sender but does not display negative or positive emotions.

Statements that indicate the participant is choosing not to engage/respond (e.g., "I'm not going to respond" - or "I would not respond to this");

(rationale: the participants intentions are clear here that they would not respond to such messages, as opposed to providing no response at all where we do not know whether this was intended, mistake, or tech issues)

Statements that reflect not knowing how to respond – e.g., "I'm not sure what to say here"

\*\*such responses should be coded ONLY IF there are other responses within the game play that differ from a 'don't know' response. (but if this is the only response and/or response type then you would not code it).

The participant's statement may be emotionally charged but not towards the sender per se. Or, the participant may make a defensive statement based on factual aspects of the game (as opposed to blaming others or the sender).

“LOL”, “dang it”, etc. would count as emotionally charged language (e.g., funny, frustrated, etc.) that is neither prosocial nor aggressive.

The participant’s objection or negative statement may be directed towards aspects of the video game itself—they may say that they dislike the game, that they hate the colour of their car, etc. But are not necessarily being negative or hostile towards the sender or their gameplay.

Or, the participant may defend themselves by stating factual claims such as “this is a team effort, why are you blaming me?” or “but we still won so no need to blame me”, etc.

( + 1) Mildly prosocial

Sarcastic or playful comments, banter or chirping that are harmless and/or light-hearted. Excuses without blaming the sender or other players.

Light-hearted sarcasm, playfulness, banter or chirping

The participant’s response is sarcastic or playful with no signs of anger, hostility or serious defensiveness. For instance, the participant may respond with a sarcastic statement towards the sender or the sender’s performance, but the sarcasm seems to be light-hearted rather than inviting conflict. For example, they may say things such as “Okay boss!”, “teach me your ways”, etc. Or, they may poke fun at the sender’s attitudes in an unharmed manner such as “yes captain!”.

Or, the participant may boast about themselves in one way or another in a playful or sarcastic manner.

Excuses for poor performance but without attacking, criticizing, or “picking on” the sender or other players in any way.

The participant finds excuses for their performance without counter-attacking or criticizing the sender and without shifting the blame towards them. The participant's excuses do not signal aggression or blame towards the sender.

The participant may state defensive statements such as "I'm not good at this because this is the first time I play this game", or "I didn't do well because I'm not familiar with how this game works". Or, their response may include aspects of defensive blame but rather towards an aspect of the game and not the sender or others. For example, they may defend their performance by blaming their car being too slow, or the game being too complicated to navigate.

( + 2) Moderately prosocial

Accountability; acknowledgement; agreeableness; apologies; balanced view

The participant acknowledges their poor performance or apologizes for it, and does not attempt to justify nor defend it.

The participant may take accountability for scoring low, admit their poor performance, or agree with the sender's sarcastic remarks. Or, the participant may admit or acknowledge that their performance was not on par with the sender's.

The participant acknowledges or takes accountability for their poor performance without trying to find excuses for it—for instance, stating "yeah I suck at this", "I'm not good at this game," etc.

They may also apologize for their poor performance by saying things such as "my bad" or "sorry I couldn't play better".

The participant may agree with the sarcastic tone of the sender by saying things such as "I know right?", "true, not gonna lie", etc.

The participant attempts to take a balanced view of the situation or attempts to have the sender take a balanced view rather than a hostile one.

The participant may attempt to take a balanced view of the situation by both acknowledging their poor performance but also acknowledging the insignificance of the game in the grand scheme of things by saying things such as “True but it’s just a game though”, “True but so what?”, “it’s just one game we can always play again” etc.

( + 3) Extremely prosocial

Gratitude; appreciation; liking towards the sender or other players

The participant expresses appreciation, admiration, liking, or thanks in general or towards the sender, their performance, or their team.

The participant may point out positive aspects of the experience, especially in regard to the sender or their team. For example, they may thank the sender for carrying the team. Or, they may show support to the sender by stating things such as “nice job, you nailed it” or “keep up the good work”. Or, they may show support towards the team as a whole, by stating things such as “nice job team”.