Master's Thesis

Behavior science, BSCA

June 2024

Measuring the response rate of verbal statements while playing competitive and non-competitive video games

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Course code: MALK5000

Number of credits: 30

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Foreword

Firstly, I would like to give my thanks to my fellow student Sebastian S. Karlsen, for his academic partnership; if not for him, the experiment would not have gone as smoothly. I would also like to express my gratitude to Espen W. Sjøberg for supervising this paper and giving essential feedback. Lastly, I would like to give my deepest thanks to my wife, who past these last two years have been patient and held up with me during full-time studies, work and wedding planning. I would not have endured this time without you and your love.

Measuring the response rate of verbal statements while playing competitive and non-competitive video games

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Abstract

Playing video games has become increasingly popular as a leisure activity, especially among youth. Video games have become an arena for socializing on par with activities such as playing football and going swimming. For individuals who might struggle with problem behaviors such as social avoidance, mental health issues, or addiction, there is an opportunity to use this arena to learn new behaviors or maintain behaviors that may generalize to other social arenas such as school, work, or contributing to the local community. Previous research on video games has emphasized how it might be detrimental to the development of these problem behaviors, but few have commented on how using video games may be helpful for behavioral change. This paper explores which environment serves as more reinforcing for social behavior by examining the response rate of verbal statements (tacts, mands, and intraverbals) in competitive and non-competitive video games, and compares which environment leads to a higher rate of responding. There was consistently a higher response rate, higher total responses, and a higher average number of responses when the participants were playing the competitive video game compared to playing the non-competitive video game. These findings suggest that playing competitive video games reinforce social behavior more effectively than non-competitive video games; by choosing the most suitable type of video game for therapeutic gaming sessions, this might enhance the effectiveness of therapy.

Keywords: Competitive video game, Non-competitive video game, Social avoidance, Verbal statements, Applied behavior analysis, Reversal design.

Playing video games are a leisure activity, a large-scale competitive sport, and a cultural expression. It has generated workplaces in terms of the development of video games, streaming, and creating social media content. Worldwide, there are over 3 billion active video game players according to the statistics Howarth (2024) provides. A few studies have highlighted the magnitude of video game habits among adolescents. Lenhart (2008) concluded in his report that almost all teens in America play video games (97%), and according to a study conducted by Medietilsynet (2022), 92,8% of boys and 64,4% of girls between the ages of 9 and 18 play video games in Norway. Searching for scientific research on the topic of video games quickly reveals the emphasized aspects of gaming, and the discourse in the health and social sciences strongly suggests that video games lead to problem behavior and mental disorders. The majority of research papers and articles on the topic of video games highlight the negative impact of playing video games on the development of aggressive behavior (Anderson & Dill, 2000; Balci & Salah, 2015; Bartholow & Anderson, 2002). They also discuss how playing video games provide gambling mechanics (Gupta & Derevensky, 1996; Molde et al., 2019; Zendle & Cairns, 2018), trigger addiction (Plante et al., 2019; Weinstein, 2010), and cause mental disorders (Erevik et al., 2022; Finserås et al., 2022). It is, however, important to note that there are certain exceptions that comment on how video games might be beneficial (Baranowski et al., 2008; Greitemeyer & Osswald, 2010; Grinyer et al., 2022). The story of “Ibelin” is a good example of how video games serve as a social arena where stigma, labeling, and attitudes toward people is nulled and can make for a better arena to socialize for some individuals because of this way of socializing through avatars in a video game (Schaubert, 2019). Additionally, there are some studies that directly contradict the previously mentioned studies on aggression and show that violent video is not detrimental to the development of aggressive behavior (Barrington & Ferguson, 2022; Ferguson, 2007, 2018a, 2018b).

By concentrating only on the potential dangers of video games and labeling those who play video games with a diagnosis such as internet gaming disorder or gaming addiction only poses a circular explanation of the problem behavior (e.g. “you have internet gaming disorder because you excessively play video games, and since you excessively play video games, you have internet gaming disorder.”). While a diagnosis might function as an explanation in the everyday speech and accentuate a correlation in how behavior might unfold, it does not necessarily establish a functional relationship that demonstrates a specific change in a dependent variable through manipulations of an independent variable, a necessary step towards gaining control in a scientific setting (Cooper et al., 2020). While there certainly are dangerous aspects to playing video games excessively, it is equally important to recognize and conduct research on the possibilities this activity serves in terms of therapy and help with problem behavior, social inclusion, training and maintaining social behavior, and the cultural importance of video games.

Based on the magnitude of people that engage in the activity of playing video games, especially the younger generation, it is a field for socializing where one can develop social relationships and build social networks. If an individual is struggling with problem behavior such as social avoidance and isolates themselves by playing video games, there is an opportunity to conduct therapy through video games in order to learn and maintain social behavior that can generalize to other social activities such as going to school, work, and participating in the local community. For instance, Gamingkontakten AS, which is a private organization based in Norway, helps young gamers who partly or fully isolate themselves by providing a therapist that actively engages in the gaming with the youths who struggle with social avoidance and excessively are playing video games (Øvrebø & Ruud, 2023). Gamingkontakten AS employs milieu therapy, a primary therapy method in Norway, to assist individuals who struggle with various social behaviors. This form of therapy concentrates on

the environment or situation in which the therapy takes place, with the aim of enhancing social, practical, and cognitive skills (Olkowska & Landmark, 2016). A milieu therapist must therefore be actively involved in a certain activity with the subject of therapy and use the activity as a "common third" as Skjervheim (2002) puts it. This emphasis on environmental contingencies is at the heart of behavior analysis because behavior is only interesting in relation to its environment. Flora (2004) points out that behavior exists in, is a function of, affects, and is affected by the environment.

Sandaker (2010) explains human behavior as a complex adaptive system with a high degree of interaction. Behavior must be perceived in relation to the environment, not only as arbitrary occurrences of responses. This pragmatic view also posits that behavior is deterministic; human behavior is characterized by casualty, in other words, stimuli set the occasion for responses, which in turn leads to consequences, and the selection of behavior is based on previous consequences of similar behavior. Since social interactions are a key component of adaptive behavior (Harper et al., 2013), learning, and maintaining social skills also play an important role in complex human behavior. When engaging in social behavior, the magnitude of available reinforcers increases, and possessing a broad network of social nodes functions as a basis for community integration like employment or education (McGee et al., 1992, cited in Harper et al., 2013). For instance, networks can be conceptualized as a web of interactions within a social sphere, serving as the underlying structure in complex systems. Figure 1 illustrates the actual interactions graphically, which can aid in mapping communication flow and the hierarchy of the social structure (Bento et al., 2020).

If an individual is struggling with avoidance of social behavior, this could occur due to events like task demands, medical procedures, noise, earlier punished behavior, or rule governed behavior that may be generalized in a way that functions as establishing operations (EOs) for the escape of social interactions. Events that could function as EOs for

escape may be numerous when negative reinforcement for problem behavior occurs (Iwata et al., 1982/1994, cited in Harper et al., 2013). As pointed out, some online video games may have gambling mechanics. Already in the 1950s, Ferster and Skinner (1957) found that reinforcing behavior on a variable ratio (VR) makes the behavior resilient to extinction and results in stable and high trends in response rates compared to other basic reinforcement schedules, as illustrated in figure 2. The individual playing a video game is receiving reinforcement on a reinforcement schedule that functions as a conditional reinforcer for the player and reinforces and maintains the behavior (Skinner, 1953). These reinforcement schedules reinforce behavior rarely and in random succession, similar to slot machines, which certainly is a dangerous aspect that could lead to problem behavior while playing video games.

According to Sandaker (2010) individuals also select their behavior on the basis of their assumption of control over the consequences the behavior has. Humans therefore exploit safe behavior instead of explore unknown behavior (Axelrod & Cohen, 2000), as the latter reduces the assumption of control and increases the risk of inability to handle complex situations. From a behavior analysis perspective, the assumption of control over unknown behavior can be obtained by environmental factors such as other individuals in their network or complete explicit rules. When individuals explore complex situations, they will learn new behaviors and which consequences are most likely to happen, and thereby expand their behavior repertoire. Generalization of behavior occurs when reinforced behavior spreads to similar stimuli and can be exemplified by a pigeon pecking in discrimination training and getting reinforcements by pecking on the yellow color and also pecking on orange and red because these colors are similar to the color that provides reinforcement (Catania, 2013). By reinforcing response variability an individual might learn to improvise by emitting a variety

of responses and therethrough be able to solve problems that require a greater behavioral repertoire (Cooper et al., 2020) which prompts exploring complex situations.

When two individuals are playing video games together, their interactions are a unit of selection on their own and may be described as a social episode (Skinner, 1953). A social episode occurs when two or more individuals coordinate their behavior to produce an environmental change that would otherwise not be possible when working alone (Skinner, 1953, cited in Couto, 2019). Many video games have cooperative elements; to be able to win a game or complete missions, there must be more than one player, and the players must coordinate and cooperate their behavior. This cooperation can be viewed as behavior taking place between two individuals resulting in the production or removal of environmental consequences (Keller and Schoenfeld, 1950, cited in Couto, 2019). Cooperative and coordinative responses such as verbal statements (e.g. telling the other person what to do, asking for assistance, and calling out where you see an enemy or an object of interest) increase and decrease as a function of their effect on a selecting environment (SE). The interlocking behavioral contingencies (IBC) between two individuals playing video games will produce an aggregate product (AP) with an SE. Glenn and Malott (2004) coined the term "metacontigency" to conceptualize cultural selection. The IBCs in a dyad of two individuals playing video games may be previously planned strategies or their internal rules and norms in the game. They can produce the AP by for instance winning a game or completing a mission together. The SE might be other players they are playing against or the environment in the video game.

Verbal statements such as tacting, manding, and intraverbals are what Catania (2013) refers to as learned verbal behavior that is in contact with the environment. A tact is a verbal response occasioned by a discriminative stimulus (Skinner, 1957, cited in Catania, 2013). Tacting might seem similar to naming but differs in that it only occurs in the presence of the

tacted stimulus. This means that we cannot tact an absent stimulus, but we can name it. In Catanias words, a tact is therefore *"examples of stimulus control in which the response is verbal, and not defined by the properties of the stimuli that occasioned them"*. Verbal responses that specify their reinforcers are called mands (Skinner, 1957, cited in Catania, 2013). Examples of mands are commands or demands (e.g. "can you pass the potatoes" or "help me with this") and it needn`t occur in the presence of the reinforcer and are higher-order verbal operants. Intraverbal chains are formed when one verbal stimulus sets the occasion for another verbal response (Catania, 2013). When this occurs between two persons, the first person says something that may be a tact or a mand that the second person may respond to, this can go back and forth several times (e.g. person 1: "we should go there" person 2: "that would be fun" person 1: "yes, we could also eat there").

When conducting applied research instead of laboratory research, controlling every relevant variable is not possible. Baer et al. (1968) describe some dimensions of applied behavior analysis, which are that the study must be *applied*, *behavioral*, *analytic*, *technological*, *conceptually systematic*, *effective*, and display some *generality*. When studying behavior through experimental procedures, the behavior changes that occur are what Catania (2013) refers to as *outcomes* or *operations,* and the procedures are what the environment or experimenter *does* or *arranges*. These terms are applicable in both applied and laboratory settings. To be able to control behavior, there are multiple interventions to choose from, such as presenting stimuli or arranging consequences for responses. When playing two different videogames and measuring the response rate of verbal responses, the researcher is arranging the environment in order to establish which environment has the most or least stimuli to set the occasion for responses, which the experiment in this paper is the response rate of verbal statements emitted.

Measuring the response rate in how many verbal statements individuals are emitting in competitive and non-competitive videogames is important because it indicates which environmental settings set the occasion for social behavior. Understanding which environments serve as more or less reinforcing for social behavior is important, as it allows therapists to help individuals who struggle with social avoidance, mental health issues, addiction, or other problem behaviors by training and maintaining social behavior in environments that reinforce social behavior.

Current study

This study was an applied experiment with a N = 1 reversal design where the participants consisted of six participant dyads that had a friendly relationship, had played both types of video games previously, and volunteered to take part in the study after finding it on social media platforms. All the participant dyads played both the competitive and the non-competitive video game; with three of the participant dyads undergoing an ABAB procedure and the remaining three participant dyads undergoing a BABA procedure. The A procedure was the competitive video game, and the B procedure was the non-competitive video game. During the sessions, verbal statements were counted as responses and compared to determine if the competitive or the non-competitive video game provided more or less reinforcement for social behavior.

The expected results were that the competitive video game would produce a higher response rate of verbal statements due to the nature of having a high level of cooperation and coordination to be able to win in competitions and therefore a higher rate of verbal statements. The competitive video game also had a higher pace and more things happening simultaneously than the non-competitive video game, which might have more stimuli that set the occasion for verbal statements more often than the non-competitive video game. Since the non-competitive video game was slower-paced and had fewer things happening

simultaneously, this environment could, however, make more time for emitting verbal statements rather than the high pace of the competitive video game.

Method

Participants and setting

Study participants were randomly selected from a pool of dyads consisting of two individuals who had a friendly relationship and had shown interest in the project by contacting the researcher after finding the project on social media. To be part of the study, the participant dyads had to have a friend relationship and have played both first-person competitive video games together and non-competitive video games together. The participants ages varied from 25 to 29 years old, with an average age of 26.25 and a standard deviation of 1.13 between the participants. All the participants were male.

The study was conducted remotely, between the participant dyads and the experimenter. The participants were in their own respective homes, with their own computers running Windows™. The experimenter was also at home, with their own Windows computer. For communication, the dyads talked to each other through a voice communication software called Zoom™. The experimenter instructed the participant dyads on the experimental conditions through Zoom and used Nettskjema-diktafon to record the communication between the participants. While on a Zoom call, the dyad loaded the respective games before the procedures, and the experimenter instructed the participants which game mode to choose, and what equipment was available. The games that were played were The Finals™ as the competitive game and Minecraft™ as the non-competitive game.

Response measurement and interobserver agreement

The dependent variable was the rate of verbal statements emitted by the participants. The researcher operationally defined these statements as the participant's tacts, mands, and intraverbals in a verbal exchange. A verbal statement includes both one-word tacts or mands,

and a chain of words in the verbal response. Verbal behavior such as outbursts, laughter, or reactions with a one-word verbal response (e.g. “wow” or “damn”) was not counted as a verbal statement and was not recorded unless the other participant in the participant dyad verbally responded, and it developed into an intraverbal episode. Consecutively repeated phrases that filled these criteria were counted only once. The onset of the statements was when either participant in the dyad began talking and the offset was one second of pause when the participant stopped talking or when there was no answer from the other participant in the dyad after initiating a verbal exchange. If the participant had less than one second of pause between the words that were assessed as a verbal statement, it was counted as one response. There was done sound recording from the sessions and to collect data on the dependent variable, the researcher transcribed the recordings, manually counted the responses, and plotted the results in Excel™. The dependent variable was reported as responses per minute, which the researcher calculated by dividing the total number of statements within a session by the number of minutes in the session. The average number of responses, and total number of responses were also reported.

A second observer collected data for the respective sessions in the same fashion. Each session was divided into one-minute intervals, and interobserver agreement (IOA) was calculated for each participant dyad. In each interval, the smaller frequency of verbal statements was divided by the larger frequency of verbal statements. The results for each interval were multiplied by 100 and averaged across intervals to obtain a mean IOA percentage for each participant dyad.

SIKT, the service provider for the Norwegian knowledge sector and an organization under the ministry of education, approved this experiment. They reviewed the ethical and privacy concerns in this project and assessed that this project had sufficient ethical and privacy security for the participants.

Independent variable

The video game the participants played served as the independent variable. The participant dyads played two video games together, the first being The Finals, a first-person shooter game. The game took place in a virtual combat game show, featuring commentary from AI hosts who observed and commented on the players' actions and game events. The environment was dynamic and destructible, which the players could take advantage of by destroying buildings, jumping on jump pads to roofs, or getting away from the other contestants. The game mode that was used for this experiment was referred to as "Quick Cash", in this game mode the players were in teams of three who compete against two other teams to be the first team to gather 20 000 coins. For the sake of the experiment, the third player on the team was the same individual throughout all sessions, selected identical equipment, and remained mute. This allowed the player to function as a *bot*, eliminating the possibility of random players with varying play styles and access to communication with the participants. To gather coins the players had to open a vault that contained 10 000 coins; this took 30 seconds to open. Then the players had to transport the vault to a "cash-out" location that took 2 minutes to "cash out". While transporting the vault, the other teams could intercept and grab the vault, other teams could also steal the cash out while waiting for it to finish by standing beside the cash out and pressing down and holding the button "E" on their keyboard. Two vaults could be cashed out simultaneously, which meant that one team was always required to either steal the vault or steal the cash out of the other teams. Before initiating a game, the players had to choose one of three classes, which were light, medium, and heavy. Each class was privy to different equipment and abilities, and certain weapons, moves, and features are class-specific. For the sake of the experiment, the participants had to choose the same class with the same preselected loadout. There was no blood spatter or dead player

ragdolls in the game; however, there were coins scattered upon death, and the players turned into a small statue that their teammates could carry and revive.

The second game was first-person sandbox, adventure, and survival game called Minecraft. The game world is built out of a variety of square blocks, such as stone, dirt, and sand. For the purposes of the experiment, the participants had to play an adventure mode where the goal is to finish an obstacle course by jumping between blocks and working their way to the top of the course. The same obstacle course was used in all sessions.

Experimental design

The experiment was conducted as a N = 1 ABAB reversal design for each of the participant dyads. This entailed four phases in which two different conditions were introduced and then reversed. Traditional reversal design measures the relevant behavior on a baseline level and then introduces the independent variable to observe if the intervention that is introduced produces a behavioral change between the conditions. There was no "baseline video game" in this study design, the A condition was The Finals and the B condition was Minecraft. This design therefore compared the intervention condition (B); the non-competitive video game, with the A condition; the competitive video game. Six participant dyads were involved, with three that was undergoing an ABAB procedure and the remaining three undergoing a BABA procedure. The conditions of the A procedure were playing The Finals, and the conditions of the B procedure were playing Minecraft.

Procedure

During the time period of the experiment, the researcher conducted one session per participant dyad, each session containing the entire procedure of ABAB or BABA, there was conducted 1 to 3 sessions per week. Each session lasted between 50 minutes and 1 and a half

hours, with all the experimental conditions conducted consecutively. All the sessions included a 5-minute break after 30 minutes to allow the participants to use the restroom. The experimental conditions lasted for 10 minutes, pausing the session time when the participant dyads were not in a game session (e.g., waiting for a game to start), and starting the session time only when the participants actively started playing the game.

Design pilot

In preparation for the experiment, the researcher conducted a pilot of the experimental design with students from OsloMet. The researcher conducted this to verify the design, assess its practicality, and identify any design flaws prior to the experiment. This pilot resolved minor issues before the experiment began, provided the researcher with training, and prepared the researcher for the experiment.

Results

When examining the responses, the results show that there was generally a higher response rate of verbal statements when the participants were playing the competitive video game (A) in comparison to the non-competitive video game (B). During the A condition the participants had an average response rate of 16 responses per minute and during condition B, the participants had an average response rate of 12.8 responses per minute. There was also a relatively low variation in the standard deviation between the conditions; the standard deviation during condition A was 4.346 and the standard deviation during condition B was 2.593 (figure 3). The overall average number of responses during condition A was 161.4 responses, while during condition B it was 134.7 responses. The total number of responses during condition A was 1553 and the total number of responses during condition B was 1347.

There was consistently a higher response rate, higher total responses, and a higher average number of responses when the participants were playing the competitive video game (A) compared to playing the non-competitive video game (B). When examining the average number of responses within the participant dyads, all the participant dyads except for participant dyad 6 had a higher average number of responses during condition A. Participant dyad 1 had a somewhat concise response rate but a lower response rate the second time in condition A than all the other sessions. Participant dyads 2, 3 and 5 had a consistently higher response rate in condition A compared to condition B. Participant dyad 4 had their highest response rate in their first session, which was condition B; however, they had a higher response rate in both sessions with condition A compared to the second time in condition B. Participant dyad 6 had the overall lowest response rate in both conditions and had a severe dip in responses in the last session (figure 5). Participant dyad 1, dyad 4 and dyad 6 had a low standard deviation between the responses, and participant dyad 2, dyad 3 and dyad 5 had a higher standard deviation between the responses (figure 6).

There was generally a higher variation in the responses when the participant dyads played the competitive video game compared to the non-competitive video game, with a standard deviation of 54.1 responses in the competitive video game, and a standard deviation of 24 responses in the non-competitive video. When playing the competitive video game, the participant dyad with the highest number of responses had 224 responses, and the participant dyad with the fewest number of responses had 61 responses. When playing the non-competitive video game, the participant dyad with the highest response rate had 175 responses, and the participant dyad with the fewest responses had 95 responses (figure 6).

During the experimental conditions, some of the participant dyads had a higher response rate than other participant dyads. Participant dyad 6 had the fewest average

responses with an average of 88.75 responses during the experimental conditions, and participant dyad 3 had the highest average responses with an average of 191 responses during the experimental conditions (figure 6). There was a larger difference between the responses in the competitive video game, with a total difference of 106 between the participant dyad with the most responses and the fewest responses, and a difference of 41 in the non-competitive video game. The participant dyad with the highest difference between the procedures while playing the competitive video game was participant dyad 1 with a difference of 30 responses. The participant dyad with the highest difference between the procedures while playing the non-competitive video game was participant dyad 4 with a difference of 33 responses (figure 5). All the participant dyads had a steady response curve in both conditions; there were no significant spikes in responding or any long pauses between the responses (Figure 7).

Discussion

Is there a difference in the response rate of verbal statements between two individuals while playing a competitive and a non-competitive video game together? When analyzing the data, the response rate of verbal statements between the participant dyads while playing competitive and non-competitive video games had a higher occurrence while playing the competitive video game. This result indicates that the environment that serves as more socially reinforcing is the competitive video game, rather than the non-competitive video game. When the experiment introduced the independent variable of changing the video game the participants played, a difference in their responses was produced. It is, however, important to recognize the nature of this experiment in that it is an applied experiment rather than a laboratory experiment.

The responses were measured with an IOA (interobserver agreement) of 96.4% accuracy. This demonstrates that we adequately explained the response measurement and the

categorization of verbal statements, ensuring the accuracy of the response counts. There was a relatively high quantity of data points, which gives confidence in the accuracy of the experiment, however, the experimental conditions had a relatively short duration; 10 minutes might not be sufficient time in the experimental conditions to provide valid results. If the participants' time in the experimental conditions had been longer, such as 20 or 30 minutes, the experiment might have produced different results. By only being in the experiment for 10 minutes, the participants may not have had sufficient time to obtain a stable response rate; however, if the session duration had been longer, the participants may have experienced fatigue, which may have produced response pauses. The experiment did produce stable and concise response rates between the experimental conditions.

If the researcher had chosen different video games as the experimental conditions, this could lead to different results. The reversal design, which exposed half of the participant dyads to an ABAB procedure and the other half to a BABA procedure, provides confidence that the independent variable was responsible for the behavior change. Therefore, it was not the sequence of conditions that produced the behavior change, but rather the experimental conditions that produced the behavior change. Replicating this experiment is necessary to confirm the results, identify potential variables that could yield similar outcomes, and determine the feasibility of replicating these results. The responses are logical for participants to perform and do not raise any ethical concerns, as they are merely verbal statements between two individuals and do not involve destructive or self-injurious behavior.

The duration of the responses is something that could produce a difference in response rate. This experiment did not have the means to measure the interresponse time (IRT). If the IRT is longer in the non-competitive video game, this could be a variable as to why the response rate is lower, since more time is used on a response rather than a shorter duration of

responses that occurs at a higher rate. Examining the number of words emitted during a statement in relation to the IRT would also be intriguing to examine. This measurement could provide insight into which environment that influences an individual's speed of emitting verbal statements, as well as any variations in the number of words emitted across conditions. The decibel of the verbal statements would also be an interesting variable to measure; this could show a difference in volume while emitting verbal responses during the sessions and the different conditions.

There may be other video games that are better suited for this type of experiment and that might produce different antecedents for responses. However, the reasoning for choosing these video games is based on the assumption that they would be similar between the sessions. First, the non-competitive video game, Minecraft, featured a single map with no differences between the games, except for the participants' progress in the obstacle course. The competitive video game was chosen because it had short respawn times if the participants died in the game, which made the responding less likely to be affected by long pauses while in the experimental condition. Given the nature of online video games, which in some ways self-organize and are characterized by numerous extraneous variables that are impossible to control, the competitive video game was the condition most likely to produce higher variance in the responses. However, this did not appear to significantly affect the results, which remained consistent within the participant dyads.

Since there was a higher variability in the responses in the A condition (playing the competitive video game), this might have meant that the experiment has insufficient control over the variable influencing factors of the behavior that is measured. However, the variability is not concerningly high within the dyads, with the highest variability between the conditions in the same participant dyad being 33 responses. The variability was higher between the

dyads, which meant that some of the participant dyads were talking to each other more than other participant dyads. It is expected to see a difference in response rate between the participant dyads, and it should not be concerning that it may indicate inadequate control over other variables, especially given the relatively low variability within the dyads. All the participant dyads except one participant dyad had an overall higher response rate in the competitive video game (figure 6). This result gives confidence in the results from the experiments, as it demonstrates a high level of consistency among the participant dyads who have a higher response rate in the competitive video game. When examining the data path trend, there are no obvious trends, spikes, or response pauses. The celeration in the cumulative responses during all the sessions had a steady curve and no clear spikes in responding or any long response pauses (figure 7). There are some overlaps between the conditions within the participant dyads, which indicate that the result might not be significant in all the dyads, but there are some dyads where the data path has less overlap than others, which shows a more significant change in behavior (figure 5).

Regarding the experimental conditions, it's possible that there are extraneous variables that could influence the physiological effects of competitive and non-competitive video games, including heart rate, blood pressure, and motoric movements in the arms and eyes. A study by Baldaro et al. (2004) showed a significant increase in systolic blood pressure (SBP) while playing violent video games compared to non-violent video games and a general decrease in diastolic blood pressure (DPB) after playing video games. Their results also show a general trend toward increased heart rate while playing video games. Additionally, research suggests that verbal interactions may lead to variations in blood pressure (Näring et al., 1988).

There are both some obvious confounds and some that are more hidden. Some of the obvious confounds are that since this is an applied setting, it is not possible to create a highly controlled environment, there will be other players in the games that are impossible to have

control over, the subjects are in a free operant state and there are many options of behaviors they may engage in at any given time. The competitive video game requires a higher level of action execution and are characterized by their fast-paced nature. These differences might set the occasion for different behaviors, and there are certainly different stimuli between the video games that might lead to some differences in the measured behavior. Human behavior is complex, by controlling as many variables as possible so that all the different participants have the same contingency between them will make the experiment more reliable than if they were free to choose the game, the equipment, the game modes, and the software. “The Hawthorne effect” should also be noted as a possible confound, this refers to the fact that being in an experiment might have an effect on the results of the study, the participants might have had an behavioral change due to the awareness of being observed (Wickström & Bendix, 2000). This effect, however, is highly debated, and it is argued that many other aspects might have caused the effect in the original study. If this had an effect in this study, it would apply to both conditions since the participants were observed in both, which makes it unlikely to have made a difference. There are also different preferences in which types of games individuals choose to play over other games, some individuals may choose to play one type of game more (or less) than others. In future research, it would be interesting to also conduct a survey to assess video game preferences.

The results from this experiment provide the field of behavior analysis with research on the topic of human behavior in the environment of playing video games. Since the environment where behavior takes place is to be accentuated to understand behavior (Flora, 2004; Sandaker, 2010; Skinner, 1953, 1981), doing research to understand human behavior in the context of playing video games is important. Research like this might help to understand how video games influence social structures (Cerezo-Pizarro et al., 2023; Obreja, 2023), how

to learn and maintain social behavior, and how to use video games in a therapeutic setting to build a therapeutic relationship.

By selecting a setting or environment where social behavior has a higher occurrence, individuals can expand their repertoire of behaviors, expand their social network, and develop a higher assumption of control (Sandaker, 2010) particularly in situations where one may need to explore unfamiliar behavior (Axelrod & Cohen, 2000). The presumption that video games are detrimental to the development of aggression, provide gambling mechanics, prompt addiction, lead to mental disorders, and cause problem behavior and mental disorders might not be the whole truth. Through this research, the importance of understanding the benefits that video games may serve in terms of therapy and social behavior is highlighted. Therefore, it is crucial to conduct reliable and valid scientific research on the topic of human behavior while playing video games. This research should not only acknowledge the potential negative effects, but also recognize the potential benefits for certain individuals, such as those who struggle with social avoidance and engage in the activity of playing video games.

Knowing which types of games reinforce social behavior, a therapist who conducts milieu therapy might choose to use these types of video games as a common third so that the threshold for actively engaging socially is lower than if the therapist had chosen a different type of video game. Organizations like Gamingkontakten AS and youth leisure clubs, which offer gaming activities, stand to benefit from this research's result, even if the result would have been reversed. Given the result that playing competitive video games set the occasion more social behavior than non-competitive ones, individuals who struggle with social avoidance, mental health issues, and other problem behaviors may find that playing these types of games can be beneficial in training and maintaining social behavior.

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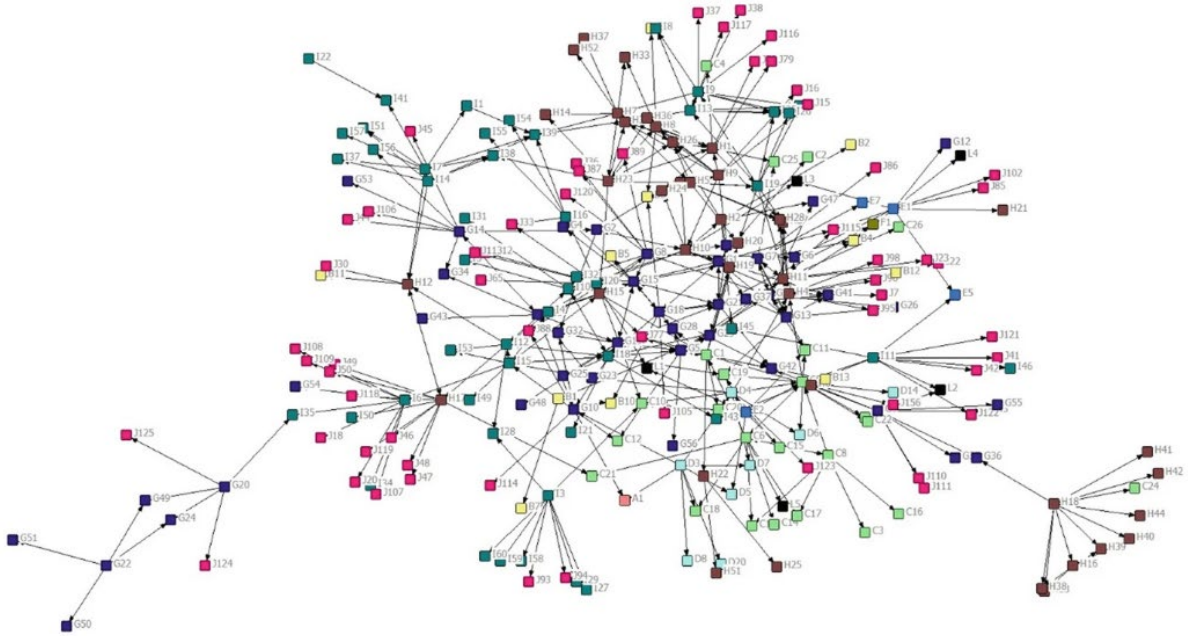
Figure 1

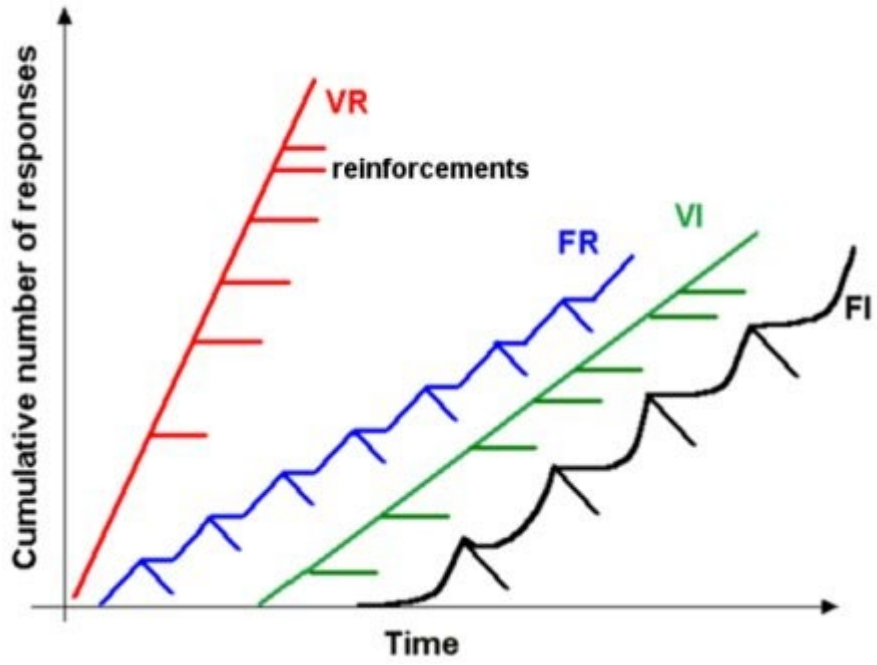
Example of a social network



Note. An example of a sociogram depicting interaction channels. The lines and arrows represent the direction of communication. The nodes represent individuals in the system. The colors represent the formal organizational units they belong to. The letters and numbers are used to code and anonymize participants (Bento et al., 2020).

Figure 2

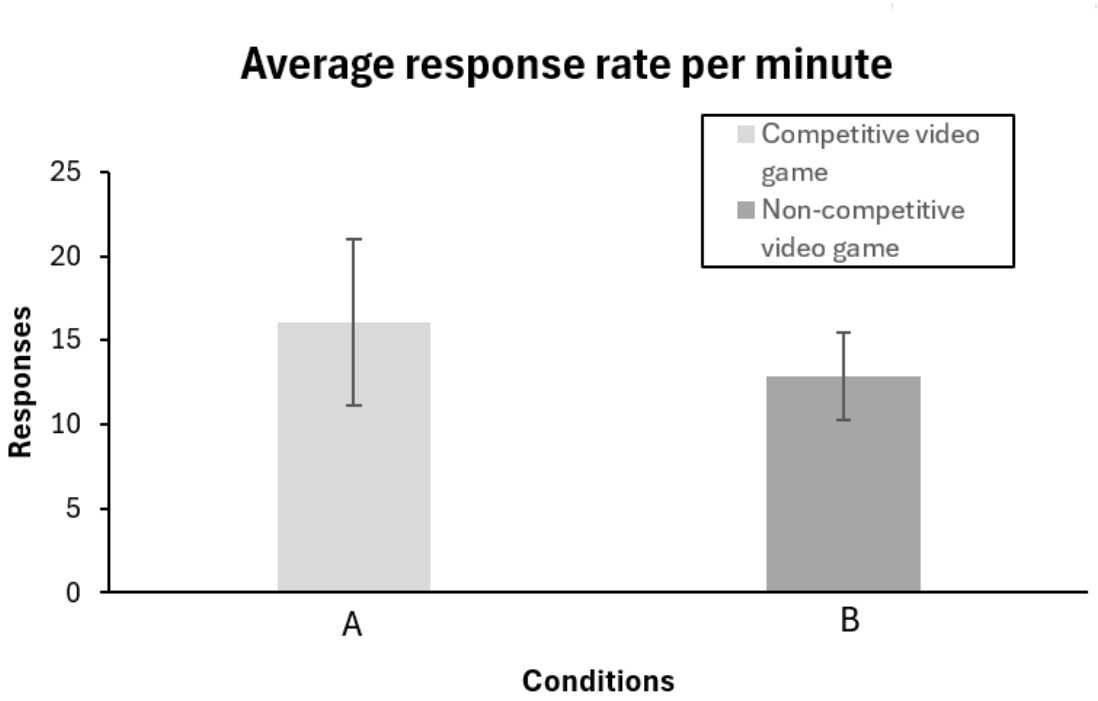
Examples of the basic forms of reinforcement schedules



Note. An example of the four basic forms of reinforcement schedules. The Y-axis represents the cumulative number of responses, and the X-axis represents time passed. The red line illustrates reinforcement on a variable ratio (VR), the blue line illustrates fixed ratio (FR), the green line illustrates variable interval (VI), and the black line illustrates fixed interval (FI).

Figure 3

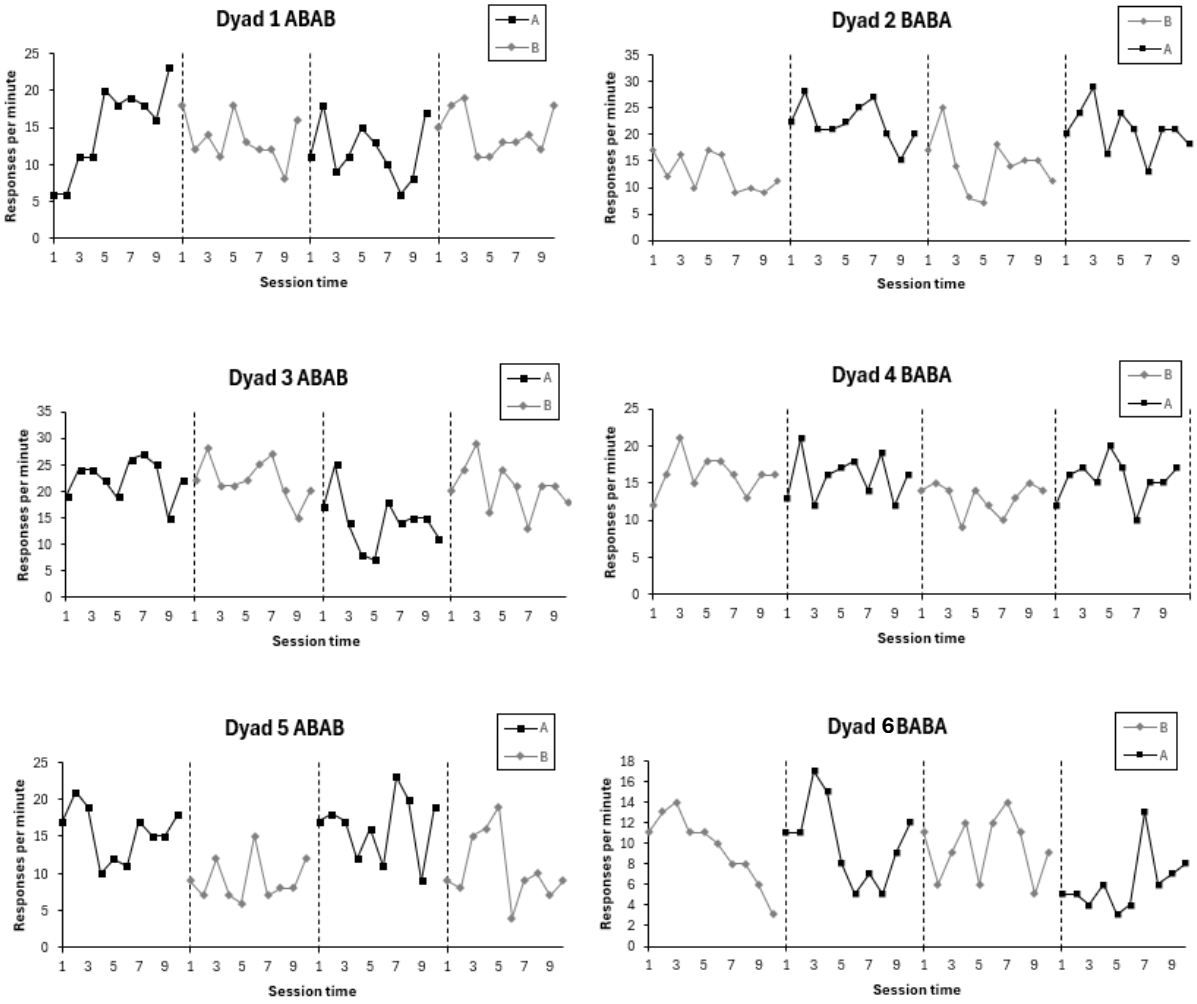
Average response rate per minute in both conditions



Note. The figure shows the overall average response rate per minute. The Y-axis represents the response rate during the conditions and the X-axis represents the experimental conditions. The A condition is the competitive video game, and the B condition is the non-competitive video game. The standard deviation in both conditions is also illustrated.

Figure 4

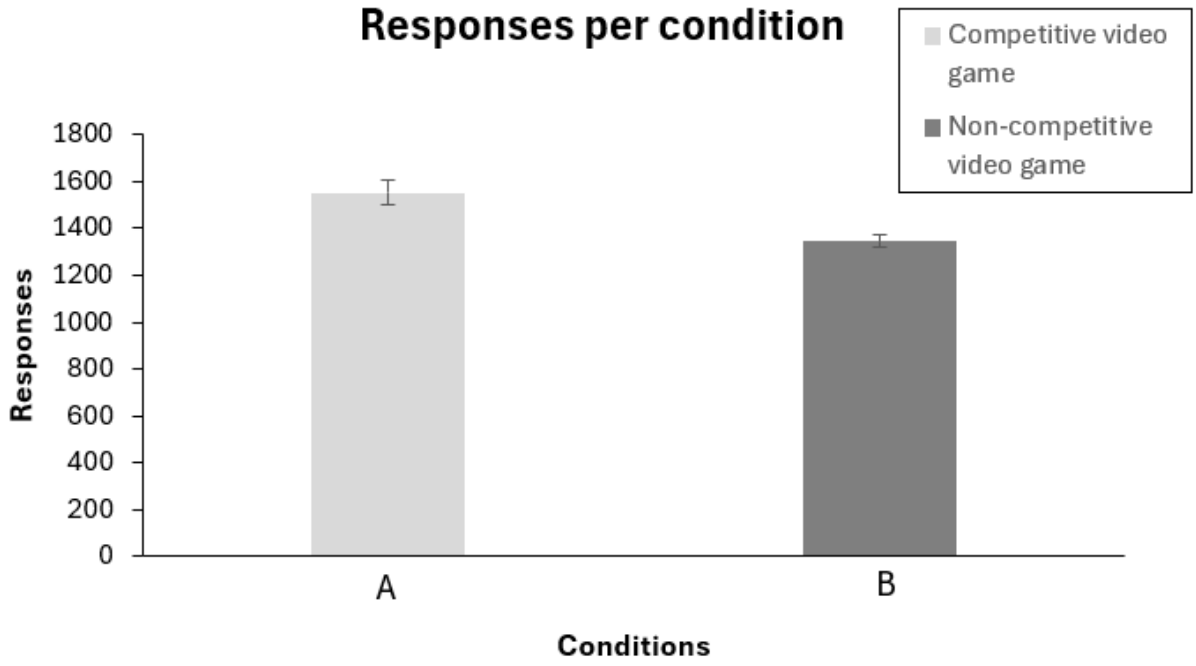
Responses during the sessions for each dyad



Note. The figure shows the response rate per minute for all six participant dyads. The figures to the left illustrate the dyads that was exposed to the ABAB condition and to the left the dyads that were exposed to the BABA conditions. The A condition is the competitive video game, and the B condition is the non-competitive video game. The x-axis represents the response rate during the condition and the y-axis represents the session time and is parted where the last session ended, and the next session started.

Figure 5

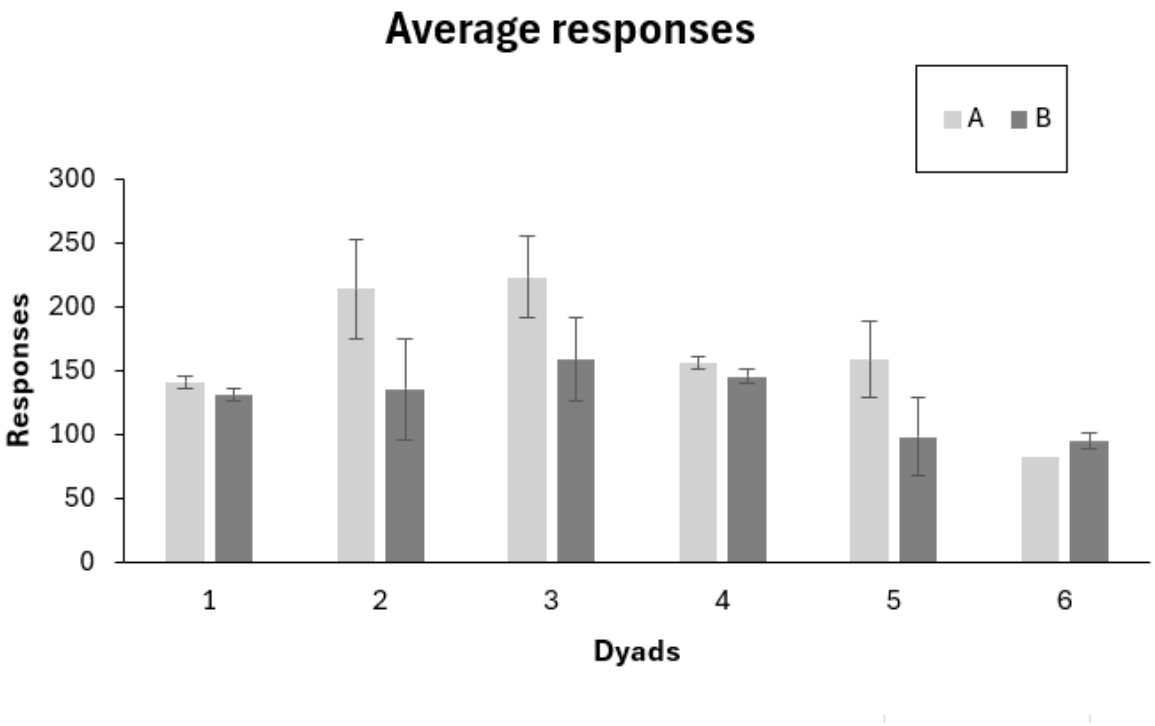
Responses per condition



Note. The figure shows the total responses in each condition. The Y-axis represents the total responses during the conditions and the X-axis represents the experimental conditions. The A condition is the competitive video game, and the B condition is the non-competitive video game. The standard deviation in both conditions is also illustrated.

Figure 6

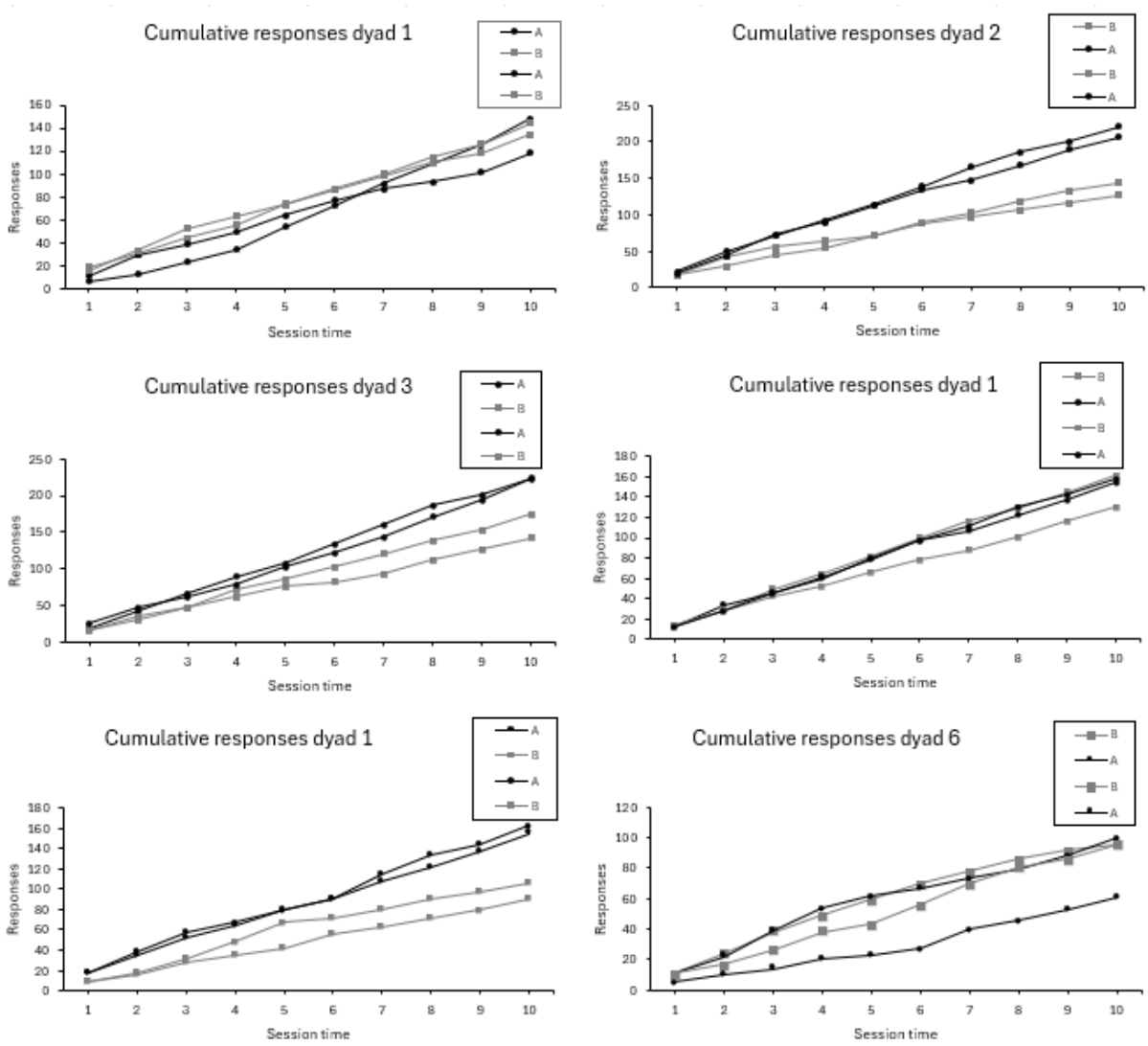
Average responses per dyad



Note. The figure shows the average responses in each condition for all six participant dyads. The Y-axis represents the average responses during the conditions and the X-axis represents the experimental conditions grouped for all the participant dyads. The A condition is the competitive video game, and the B condition is the non-competitive video game. The standard deviation in both conditions for all the participant dyads is also illustrated.

Figure 7

Cumulative responses per session



Note. The figure shows the cumulative responses for all six participant dyads. The figures on the left depict the dyads exposed to the ABAB condition, while the figures on the left depict the dyads exposed to the BABA conditions. The A condition is the competitive video game, and the B condition is the non-competitive video game. The x-axis represents the responses during the condition and the y-axis represents the session time.

Appendix 1

Vil du delta i forskningsprosjektet
” Master i atferdsvitenskap; Måling av verbale utsagn i kompetitive vs. Ikke-kompetitive dataspill”?

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å undersøke til hvilken grad en terapeut og mottaker av terapi snakker sammen når man spiller ulike dataspill. Altså responsraten av former for verbale utsagn når man spiller et konkurransedrevet spill og et overlevelsesdrevet spill. I dette skrivet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål

Prosedyren kommer til å bestå av et reverserings design, der lydopptak blir gjort av eksperimentatoren og studeres for å telle responsraten. Det vil være enten fire eller seks deltaker par (to og to), til sammen enten åtte eller tolv deltakere og alle deltakerne gjennomfører samme prosedyre. Denne forskningen kan gi innsikt i hvilke typer spill som medfører mest kommunikasjon mellom spillerne og kan peke på hvilke typer spill som innebærer mer (eller mindre) sosial atferd.

Forskningsspørsmålet jeg er ute etter å svare på er om individer snakker mer sammen i et konkurransedrevet spill eller i et ikke-konkurransedrevet spill? Dette er et forskningsprosjekt som gjøres i en masteroppgave i atferdsvitenskap ved OsloMet. Opplysningene vi samler inn, vil ikke brukes til andre formål enn dette prosjektet.

Prosjektet og datainnsamlingen gjøres i samarbeid med en annen masteroppgave, begge oppgavene undersøker verbale utsagn, men fokuserer på ulike aspekter ved verbale utsagn.

Hvem er ansvarlig for forskningsprosjektet?

OsloMet er ansvarlig for prosjektet.

Hvorfor får du spørsmål om å delta?

Utvalget er trukket fra interesserte fra sosiale medier og av de som har vist interesse vil et tilfeldig utvalg av disse bli gjort.

Hva innebærer det for deg å delta?

Hvis du velger å delta i prosjektet, innebærer det at du spiller to spill to ganger med en annen person som er i utvalget. Det vil ta dere ca. 50 minutter og spillene dere skal spille er The Finals og

Minecraft. Dere skal spille 10 minutter i hvert spill to ganger. Måten vi samler inn dataen på er gjennom lydopptak.

Oppsummert:

En gamingsession med 4 økter

1 x 10 minutter i spill 1

1 x 10 minutter i spill 2

1 x 10 minutter i spill 1

1 x 10 minutter i spill 2

Prosjektet gjennomføres i perioden 15. Mars til 15. April 2024

Det er frivillig å delta

Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Alle dine personopplysninger vil da bli slettet. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Når dere gjennomfører prosjektet er målet at dere skal oppføre dere som normalt, men under bestemte forhold som er bestemt av forskerne. Forholdene som er bestemt, er hvilke spill som skal spilles og hvilket utstyr dere kan bruke i spillene.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger

Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket. ¨

De som har tilgang til dine opplysninger, er forskerne. For å sikre at ingen uvedkommende får tilgang til personopplysningene vil vi bruke OsloMet sine retningslinjer for fjernopptak. Prosjektet gjennomføres gjennom Zoom og opptak gjøres med nettskjema-lydopptak app på mobil. Vi skal også sensurere deler av opptakene dersom navn eller andre personopplysninger som kan bli sagt gjennom opptakene.

Deltakerne vil ikke kunne gjenkjennes i publikasjon. De opplysningene som vil bli publisert er at deltakerne er i alder mellom 18 og 40 år.

Hva skjer med personopplysningene dine når forskningsprosjektet avsluttes?

Prosjektet vil etter planen avsluttes når oppgaven blir godkjent 8. juli 2024. Etter prosjektslutt vil datamaterialet med dine personopplysninger bli slettet på en forsvarlig måte.

Hva gir oss rett til å behandle personopplysninger om deg?
Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra OsloMet har Sikt – Kunnskapssektorens tjenesteleverandør vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Dine rettigheter

Så lenge du kan identifiseres i datamaterialet, har du rett til:

- innsyn i hvilke opplysninger vi behandler om deg, og å få utlevert en kopi av opplysningene
- å få rettet opplysninger om deg som er feil eller misvisende
- å få slettet personopplysninger om deg
- å sende klage til Datatilsynet om behandlingen av dine personopplysninger

Hvis du har spørsmål til studien, eller ønsker å vite mer om eller benytte deg av dine rettigheter, ta kontakt med:

- OsloMet ved Torunn Lian på epost: torunn.lian@oslomet.no eller Espen Wilner Sjøberg på epost: espenwilner.sjoberg@kristiania.no
- Vårt personvernombud: Marthe Eikum-Tang. Epost: marthe.eikum-tang@oslomet.no. Telefon: +47 672 35 459

Hvis du har spørsmål knyttet til vurderingen som er gjort av personverntjenestene fra Sikt, kan du ta kontakt via:

- Epost: personverntjenester@sikt.no eller telefon: 73 98 40 40.

Med vennlig hilsen

Prosjektansvarlig:	Student:
Espen Wilner Sjøberg	Adrian Bergstrøm Netlandet
Espenwilner.sjoberg@kristiania.no	S368320@oslomet.no

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet «Master i atferdsvitenskap; Måling av verbale utsagn i kompetitive vs. Ikke-kompetitive dataspill», og har fått anledning til å stille spørsmål. Jeg samtykker til:

- ☐ å delta i feltstudien

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet

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(Signert av prosjektdeltaker, dato)

Ethical reflections

The project has been reported to SIKT, reference number 586214

There was no need to report the project to REK, or to conduct a ROS-analysis since the project did not gather any sensitive personal data, the participants did not include any sensitive groups, the processing of personal data was based on consent, the experiment had a relatively short duration, and to record the experiments, there was used Nettskjema-diktafon. The project was, however, reported to SIKT and approved by them in advance of the execution of the experiments since the project had to gather the name, age and voice recordings of the participants.

All the participants received a consent form with information about the experiment, this form included the research question, the method for gathering data, what the data was to be used for, how their personal data would be handled, and their right to withdraw the consent at any point in time (Appendix 1).

The responses that were counted was verbal statements that was classified as tacts, mands, and intraverbals. The content of the conversation between the participants that was recorded was therefore not examined, only the rate and number of verbal statements during the sessions. The recordings were safely stored using Nettskjema-Diktafon, which were encrypted, additionally all the recordings would be deleted after the project was finished.