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Increasing Practical Verbal Behavior in Esports Players

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by

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Abstract

Increasing Practical Verbal Behavior in Esports Players

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Verbal behavior, sports, and performance skills have been targeted in behavior analytic research in the past. However, no research to date has targeted Esports as a setting, nor has there been a substantial focus on communication as a target as opposed to more technical skills in sports, organizations, or similar settings. Esports is a large, growing industry of competitive videogaming, with a variety of games represented at different levels, many of which are team-based and require significant coordination and cooperation between players on a team. Thus, in this study we targeted verbal responses in a team of collegiate Esports players in a southeastern United States university using task clarification, goal setting, and individual graphic and verbal feedback. The results showed visible increases in verbal behavior such as objective statements and request statements for Esports players.

Keywords: communication, Esports, goal setting, graphic feedback, individual feedback, mand, tact, verbal behavior

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Chapter 1
Increasing Practical Verbal Behavior in Esports Players

In 2019, more than 1,100 National Collegiate Athletic Association (NCAA) schools spent a total of over $18.8 billion on athletics (NCAA, 2020). More than $3.6 billion is provided annually in athletic scholarships to student athletes (NCAA, 2020). In contrast, according to the National Association for Collegiate Esports (NACE), nearly $9 million in scholarships was provided by NACE institutions as of the end of 2017 (NACE, 2021).

In 2020, Esports generated $947.1 million in revenue, and is expected to grow to exceed $1 billion in revenue by 2024 globally (Newzoo, 2021). In 2020, the Esports audience comprised 435.9 million people globally, with many new viewers of major Esports events from lockdown measures (Newzoo, 2021). Streaming, defined by an individual or group of people presenting live video feed of themselves playing a game through social media, had an audience of 662.7 million people globally. Recent numbers have increased from previous years, and were likely accelerated due to the pandemic (Newzoo, 2021). The League of Legends World Championship was the biggest event on Twitch and YouTube with a viewer-combined total of 91.9 million live viewership hours (Newzoo, 2021).

As an example Esports game, League of Legends is a team-based multiplayer online battle arena game, with two teams of five players (Riot, 2021a). The game starts with a champion selection menu, where each player takes turns selecting one of over 140 champions (Riot, 2021a). Objectives in the game involve taking down enemy towers, securing kills and resources, and, ultimately, destroying the enemy base (Riot, 2021a). Throughout the game, each player has a separate role, must level up and gain abilities throughout the match, and earn gold by defeating monsters and enemy players to strengthen their in-game statistics (Riot, 2021a). Similar to other team-based sports, players must be knowledgeable about the game and fluent in the skills required for their role. While individual skill is important to victory, players must also be able to coordinate plays together and communicate information across different areas of the map in order to be successful in achieving objectives.

Last year, a design director for League of Legends suggested prioritizing deliberate game-ruining behavior, meaning reducing the occurrences of players intentionally sabotaging one's own team or leaving the game before it is over (Meddler, 2020). Riot, the makers of League of Legends, addressed public concerns in a blog writing with a summary of updates made to the game to make improvements about what they call "game ruining behavior" (Meddler, 2020). Most solutions currently in place involve report systems and honor and social recognition systems, which allows each player to reward a team member at the end of a game (Riot, 2017). Of the most recent updates to target behavior in League of Legends, Riot announced they will disable chat with enemy teams, stating that "verbal abuse has been a rising problem" (Riot, 2021b). While this may reduce the problem by preventing opportunities to respond, removing in-game functions may not always be desirable, nor does it change the community.

Communication and Social Skills and the Gap in the Literature

Perhaps one reason little has been done on teamwork and communication is that these concepts are vague. Behavior analysts have suggested conceptualizing teamwork and communication through an interlocking behavior contingency (Glenn et al., 2016). An interlocking behavior contingency refers to behavior changes in groups of people wherein an environment is created in which individuals reinforce each other and may produce an aggregate product which may reinforce the cooperative behaviors, creating a metacontingency (Glenn et al., 2016). Verbal behavior is required to participate in these contingencies and produce cooperative behavior (Glenn et al., 2016).

Many appropriate and inappropriate gaming behaviors are communicative, and can be described through Skinner's analysis of verbal behavior. In this analysis, Skinner describes and defines the appearance and controlling elements of each of the behaviors that make up the interlocking contingencies between listeners and speakers, sometimes referred to as language or linguistics (Cooper et al., 2020, p. 457). The elementary verbal operants are broken down into five different classifications: mands, tacts, duplics, codics, and intraverbals (Cooper et al., 2020, p. 459). The application of Skinner's analysis of verbal behavior has received considerable attention in the behavior analytic literature in targeting skill acquisition in children with Autism Spectrum Disorder (ASD; DeSouza et al., 2017).

DeSouza et al. (2017) examined interventions targeting verbal behavior in children with ASD and included over 172 studies on verbal behavior interventions, 56 of which targeted tacts specifically.

Verbal behavior, sometimes referred to as language, is inherently important to social interactions. Certain types of verbal behavior are especially important socially, such as giving and accepting compliments, which may respectively be categorized as tacts and intraverbals. Hood et al. (2020) targeted complimenting behaviors in three adolescents with ASD. Compliments included statements of praise for another individual's appearance or performance. In this study, the participants improved and maintained these skills following an intervention involving Behavioral Skills Training (BST) and altered discriminative stimuli (SDs) in the environment to evoke compliments (Hood et al., 2020).

Social skills have also been targeted for adults with ASD for job-related skills. As ASD is associated with various social challenges, teaching social skills in a job setting could improve work performance (Grob et al., 2019). In this case, authors targeted skills such as asking for clarifying instruction, notifying one's supervisor of task completion, and responding to corrective feedback. Three adults with ASD were successfully trained using BST and stimulus prompts on seeking help, making confirming statements, and appropriately responding to feedback (Grob et al., 2019).

Matsumoto et al. (2014) improved the social skills of twenty beauticians in an organizational setting (Matsumoto et al., 2014). Participants were trained using BST on behaviors including smiling, providing explanations, and active listening; behaviors targeted teaching performers how to build rapport (Matsumoto et al., 2014). The researchers also collected data on customer requests for beauticians and found that the more active listening increased, the more customers requested that beautician (Matsumoto et al., 2014). This study demonstrates that teaching social skills can impact business results. The increase in customer requests could lead to an increase in revenue which has social significance for both performers and the respective business.

Applied behavior analysis (ABA) targets behaviors of social importance (Baer et al., 1968). As such, social skills and communication may be targeted in the literature, though

much of the focus of this research concerns individuals with ASD. The general population, individuals in organizational settings, and individuals in team settings may benefit from interventions targeted at improving communication skills.

OBM Interventions

Organizational behavior management (OBM), a subfield of ABA, is the application of behavior principles to organizational settings (Wilder et al., 2009). The most commonly used intervention in the subfield of OBM is feedback (Wilder et al., 2009). Another common intervention is goal setting (Daniels & Bailey, 2014; Fellner & Sulzer-Azaroff, 1984; Gil & Carter, 2016; Jeffrey et al., 2012; Roose & Williams, 2017).

Goal Setting

Daniels and Bailey (2014) defined goal setting as "defining a specified, or preset, level of performance to be attained" (p. 243). The authors also pointed out that goal setting alone does not improve performance but is still useful when applied appropriately. This is likely because goals may function as antecedents, and thereby may set the occasion for behavior but would require reinforcement to maintain progress towards the goal or goal attainment (Fellner & Sulzer-Azaroff, 1984). Daniels and Bailey (2014) suggest setting lower, more attainable goals, (rather than goals that may be too challenging) to allow performers to access reinforcement and increase the likelihood of success. In setting the goal line, the performance of high performers can be used as a guideline (Daniels & Bailey, 2014).

In participative goal-setting, individuals for whom the goal is set do the goal-setting themselves. In contrast, assigned goals are goals set by someone else, such as a manager. Fellner and Sulzer-Azaroff (1984) found inconsistent findings when comparing participative and assigned goals. Daniels and Bailey (2014) suggested that performers may not have adequate experience or knowledge of a reasonable goal to set the goal themselves. If a performer does not have knowledge of a reasonable goal and sets the goal too high, they may risk potentially putting their behavior on extinction if they cannot reach the goal.

Alternatively, if a manager, leader, or researcher assigned the goal to their performers, they can approach it one of two ways: one goal for all, wherein the same goal is applied to all

individuals, or ability-based approach, wherein goals are set based on individual ability (Jeffrey et al., 2012). Jeffrey and colleagues (2012) tested these approaches by randomly assigning participants to these conditions, with one of three levels of goal difficulty prescribed to participants based on ability in the ability-based approach condition. In the one goal for all condition, participants were provided the highest goal difficulty in the ability-based condition. In both conditions, participants were provided incentives, both a flat "salary" for each completed computer task, and a bonus for reaching the goal, with different payouts for the three different goal difficulty levels. Researchers found that lower-ability individuals benefited more from the ability-based approach and experienced larger decreases in performance over time in the one goal for all condition (Jeffrey et al., 2012). The latter is indicative of extinction, where a one goal for all approach sets too high of a goal for those individuals, as can happen when unreasonable goals are set.

Regarding goal difficulty, Roose and Williams (2017) evaluated the impact of goals set between different levels above baseline performance in a data entry task. Participants were randomly assigned to groups where they either had a goal of 150% above baseline, 175% above baseline, or no-goal conditions (Roose & Williams, 2017). Feedback was provided to participants in the form of percent of goal completion in one condition or, in the other condition, percent of goal completion in addition to whether or not their progress would allow them to reach that goal, displayed on the screen (Roose & Williams, 2017). The researchers found that the lower goal condition provided greater increases in performance than the higher goal condition (Roose & Williams, 2017). In this study, no additional feedback such as praise was provided, and feedback was provided verbally, either by an experimenter or by the text on the computer screen, and no graphic feedback was provided (Roose & Williams, 2017). It is likely that too high of a goal functioned as an extinction-signaling stimulus when a performer was continually unable to achieve the goal, while a lower goal allowed the performer to access reinforcement and functioned as a discriminative stimulus. However, this study did not provide reinforcement for progress towards the goal. Daniels and Bailey (2014) suggest establishing sub-goals for shaping towards a larger goal, so that the performer may access reinforcement for improvement.

Feedback

In addition to goal setting, another common OBM intervention is feedback. Daniels and Daniels (2004) define performance feedback as "information about performance that allows a person to change his/her behavior" (p. 171).

According to a literature review on feedback, there are several characteristics which are most critical to increasing its effectiveness (Alvero et al., 2001). Feedback is most effective when a manager or researcher is delivering it. Additionally, graphic feedback combined with either written or verbal feedback was the most effective delivery medium. Concerning frequency, while weekly feedback was the most common, higher levels of effectiveness were found when feedback was delivered daily, and was still more effective when combined with other frequencies, as well. Typically, the subjects of feedback were individuals, however, higher consistency of effects were found for groups.

Feedback has been successfully used to improve a variety of workplace behaviors such as cleaning (Doll et al., 2007; Rose & Ludwig, 2009), correctly completing calculations (Johnson et al., 2015; Palmer et al., 2015), and off-task behavior (Brown et al., 1981). It is likely that feedback can also be used to increase communication and cooperative behaviors such as teamwork. Considering the current literature, some research has examined the effects of feedback on social behavior. Specifically, authors evaluated the effects of feedback on decreasing off-task behavior and increasing social interactions between staff and patients in an in-patient facility. While feedback alone produced visible changes in one dependent variable for one group, the effects were only temporary, and were minimal for the other group (Brown et al., 1981). The addition of supervisor praise increased behavior to desired levels (Brown et al., 1981). Thus, feedback may be an ideal intervention to promote social behavior with more apparent effects if praise is added.

Goal setting has also been used in conjunction with feedback. In a study evaluating group graphic feedback and goal setting, Gil and Carter (2016) targeted data collection compliance for 13 groups of up to 25 direct care providers across a large residential facility. While the group graphic feedback intervention alone increased compliance with data collection procedures, compliance increased to sufficient levels only after the

antecedent intervention of goal setting was added. Goal setting consisted of monthly goals set by supervisors and did not include any consequences. While in this case, they provided feedback to a group, it can also be provided to individuals, and sometimes additional components are needed to increase the effectiveness of feedback.

Feedback and Task Clarification

Along with goal setting and praise, other interventions may also help improve the effects of feedback. For instance, with the addition of antecedents, it appears the effects of feedback are more apparent and consistent (Alvero et al., 2001). In particular, studies have evaluated the benefits of task clarification as an antecedent (Doll et al., 2007; Palmer & Johnson, 2013). Doll et al. (2007) found that a combination of task clarification with graphic feedback visibly improved all target cleaning behaviors and generalized responses in a ski shop. In this study, task clarification was delivered in the form of a meeting held with an example checklist that included desired behaviors (Doll et al., 2007). This study also found that, while posted graphic feedback was accepted by the participants on a social validity measure, publicly posted task-specific feedback that listed the specific behaviors not completed the previous day reportedly made participants feel defensive (Doll et al., 2007). While some parts of the intervention may have been effective, procedures should still be acceptable to the community in behavior-analytic practices (Baer et al., 1968).

In another study evaluating task clarification, Palmer and Johnson (2013) targeted following work policies to solve a financially costly problem of early clock-ins. The authors combined task clarification with aggregate group graphic feedback to successfully reduce early clock-ins in multiple staff (Palmer & Johnson, 2013). This study is meant to demonstrate the effects of task clarification and group graphic feedback on performance and suggests that graphic feedback, while a critical intervention, can also be supplemented with other interventions such as task clarification to further enhance its effects.

Another study evaluated a packaged intervention that included task clarification and group graphic feedback to improve multiple behaviors (Rose & Ludwig, 2009). In this study, Rose and Ludwig (2009) attempted to improve seventeen closing tasks performed by lifeguards at a swimming pool facility. Examples of tasks included vacuuming and tidying.

The intervention package included individual, task clarification in the form of a half-hour meeting, self-monitoring using a checklist, and publicly-posted graphic feedback of the self-reported scores alongside researcher scores. For the graphic reports, the researcher scores were reported as manager scores so that the feedback appeared to come from them. With the implementation of the treatment package, researchers were able to increase task completion in targeted tasks as well as two of four generalized tasks (Rose & Ludwig, 2009). This study demonstrates an effective combination of task clarification with graphic feedback, not only in changing targeted behavior, but other behaviors as well.

Task clarification can also be effectively combined with individual feedback. For instance, researchers combined task clarification with individual supervisory feedback to target performance of animal trainers in an East African nongovernmental organization (Durgin et al., 2014). This study used a job aid to provide task clarification and to act as a prompt for the supervisor to provide feedback. Researchers provided individual verbal feedback immediately, within 10s, following trainer error. Average performance improved for both supervisors and trainers (Durgin et al., 2014).

Feedback shows greater effectiveness when combined with antecedents such as task clarification and goal-setting. Feedback provided verbally in individual settings and graphically has been effective at producing behavior change.

Interventions in Sports Settings

Despite the massive growth and widespread popularity of Esports, techniques designed to improve performance of Esports players have yet to be studied experimentally. However, much has been assessed in the area of sports. Behavior-analytic practices have been used to enhance sports performance, decrease problem behaviors, and teach new skills (Luiselli et al., 2011; Schenk & Miltenberger, 2018). Interventions such as positive reinforcement, goal setting, modeling, and graphic feedback have been effective applications of behavior-analytic procedures in sports settings (Luiselli et al., 2011; Schenk & Miltenberger, 2018). These studies have examined interventions in 21 different sports including football, baseball, figure skating, and gymnastics, to name a few (Luiselli et al., 2011; Schenk & Miltenberger, 2018).

In one example, Brobst and Ward (2002) evaluated the effects of a packaged intervention targeting play skills in soccer, such as moving with the ball and changing positions. To target these skills, researchers combined public posting, goal setting, and oral feedback (Brobst & Ward, 2002). The experimenters found an immediate positive increase in the percentages of each of the targeted play skills for each of the three soccer players (Brobst & Ward, 2002). Additionally, participants demonstrated maintenance of each of these skills after the intervention was withdrawn (Brobst & Ward, 2002).

Communication in Sports Settings

Authors in the sports psychology literature discuss a need to study group coordination and communication in sports (Eccles & Tenenbaum, 2004; Sullivan & Short, 2011). Communication behavior has been studied in team sports settings in the social psychology literature (Sullivan & Short, 2011). In their survey, researchers found that inappropriate communication was detrimental to team performance (Sullivan & Short, 2011). While these survey results may provide an initial direction, direct observational research is needed to further substantiate the validity of the findings.

While, in general, little has been done thus far in the behavior analytic literature regarding communication behavior in sports, one study evaluated play-calling data in football players using the matching law (Reed et al., 2006). In this analysis, play-calling was measured in terms of the ratio between passing plays to rushing plays (Reed et al., 2006). Outcome data such as yards gained was gathered as a measure of reinforcement received by the teams (Reed et al., 2006). While researchers evaluated communication in a team and its effect on team success, the researchers did not evaluate communication between players themselves, but rather a coach's decisions made for and communicated to a team.

The Current Study

While there is a substantial body of research on communication outside of ABA, less has been done on increasing communicative behavior in the field of behavior analysis. There is limited work on typically-developing individuals that examines communication skills as a target for intervention, as much of the research focuses on individuals with autism.

Additionally, behavior analytic practices and research have been applied to organizational settings as well as sports settings. However, techniques intended to improve performance during Esports have yet to be explored experimentally. Moreover, while there is support for targeting communication skills in sports, more direct observational data could be collected to further validate current research findings.

The existing behavior-analytic sports literature focuses on goal setting, positive reinforcement and graphic feedback, but few studies have assessed task clarification. However, as mentioned, interventions such as feedback are more effective when combined with antecedents such as task clarification and goal-setting (Alvero et al., 2001). Furthermore, performance on video games is an appealing target given the social significance and growth of the industry (Newzoo, 2021).

Thus, the purpose of the present study was to examine the effects of task clarification, goal setting, and individual verbal and graphic feedback (delivered by researchers) on the rate of in-game communication including tacts, mands, and praise by a team of Junior Varsity Esports players. The setting was a southeastern United States collegiate Esports facility.

Chapter 2
Method

Participants

Participants were recruited from a southeastern United States university's Junior Varsity League of Legends Esports team. Four players on the team were targeted. For the purposes of this study, there were no exclusionary criteria for gender, orientation, race, or sex, but participants were required to be 18-years-old or older.

Setting and Materials

Players were provided materials by the school's Esports facility to play their designated game, which included a computer with a mouse, keyboard, stable internet connection, and a downloaded copy of the game. They could either bring their own equipment to play the game at the Esports facility or play from home. The primary researcher used her own laptop and a paper and pencil to record and graph data. The primary researcher also used her laptop or phone to record audio for treatment integrity and interobserver agreement (IOA).

Dependent Variables and Measurement

Communication behaviors were referred to as "positive communication behaviors" or "positive comms" with the players and were calculated as a sum of tacts, praise, and mands. Tacts, which are commonly referred to as labels, are preceded by a non-verbal discriminative stimulus change in the environment of the speaker, such as observing a bird fly by or feeling a stomachache (Cooper et al., 2020, p. 459). For the purposes of this study, tacts were verbal responses describing a nonverbal in-game stimulus change. Examples included statements such as "enemy missing," "I'm on my way," and "I just got [item]." To the players, they were referred to as "objective statements" in their task clarification to avoid using jargon. While any statements players make in game may be multiply controlled under other verbal operants in addition to tacts, this study included statements that were multiply controlled but focused on statements that were most

identifiably tacts. For example, a player, when asked “where are you”, who responds “I’m on my way in ten seconds” is providing a statement that is both a tact and an intraverbal. While this is a verbal response to a verbal stimulus (an intraverbal; Cooper et al., 2020, p. 460), it is also a verbal response to a nonverbal discriminative stimulus, and was included in this study as a tact by definition. Additionally, in some instances, similar statements may have functioned as mands, but for the purpose of simplicity, data collectors were trained to mark them as tacts. Repeated statements within three seconds of each other were counted as one instance of performing the behavior.

Praise, following Skinner’s analysis of verbal behavior, may primarily be controlled as tacts as they are often preceded by a nonverbal stimulus, but with a specific topography, such as “nice shot” or “good job.” As a tact, there is often a nonverbal stimulus preceding the response, such as “nice shot!” Statements made about or to the enemy players and sarcastic statements were excluded for the purposes of this study.

Mands were also included as a type of positive communication behavior for the participants. To the participants, they were referred to as requests, and included examples such as requesting information “did he flash?” or “did you get [item]?” and requesting for help or back-up.

Rate data were collected for each target behavior for each session by dividing the number of responses by the total game time. A session was one game played. Each practice day may have had multiple sessions or games. Data were collected for each player and each team, with an added total collected for the team data.

Interobserver Agreement

Research assistants independently collected data for 33% of randomly selected sessions, which were used for calculating IOA. Both the primary researcher and research assistants collected a count for positive communication behavior, then converted it to a rate based on game time. From there, total count IOA was calculated, defined as “a percentage of agreement between the total number of responses recorded by two observers and is calculated by dividing the smaller of the counts by the larger count and multiplying by

100” (Cooper et al., 2020, p. 112). The minimum IOA goal was 80%. If the calculated agreement fell below that at any time, the experimenter provided feedback to the research assistant to ensure accurate recording of data. The average IOA calculated across 33% of sessions for positive communication behaviors was 84%.

Independent Variables

The intervention consisted of a packaged intervention including task clarification, goal setting, and individual graphic feedback. Each is described in detail below.

Task Clarification

A task clarification meeting was scheduled at the start of intervention to describe the behaviors of interest using layman’s terms, with examples of when the behaviors should occur. A handout, specific to League of Legends communication behaviors informed by coaches, was provided to the participants with the details of each behavior of interest for their reference (see Appendix A). For example, “we’re looking for call outs to your teammates when you’re on your way”, “jungler, it’s your job to inform other teammates of where the enemy jungler is when possible”, and “callout ‘enemy missing’ if your lane opponent has been missing so your teammates can know what’s going on across the map.” The participants were also shown to a simplified version of this handout during each feedback session, next to their graph, to remind them which behaviors to engage in, attached in Figure 1.

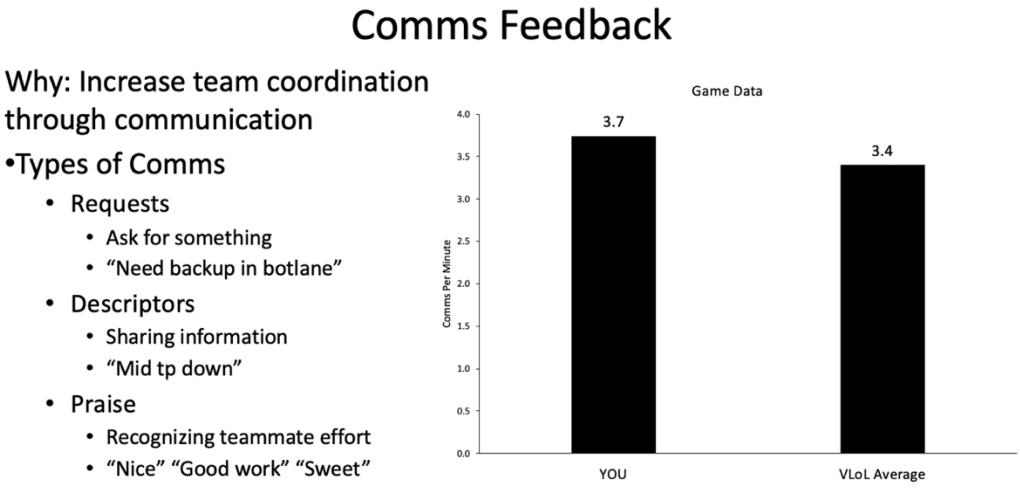

Figure 1: Individual Feedback Visual

Feedback and Goal Setting

The individual feedback was response-contingent and provided by the experimenter after each session. A session began when the game began, noted by a timer in the corner of the screen displaying zero seconds, after champion selection and a loading screen. A session was considered complete when the game ended with victory or defeat and the timer stopped. Each practice day may have included multiple sessions, depending on the number of games played by the participant. During each session, the data collectors tallied each occurrence of tacts, mands, and praise statements as positive communication behaviors.

The feedback was centered on goal attainment or progress towards the goal. This study used a one-goal-for-all approach and set the goal based on player average of positive communication behaviors from the Varsity League of Legends team, as assessed in a pilot study preceding the present study. The average positive communication behaviors set by the Varsity team was 3.4 responses per minute, which, for some players on the Junior Varsity team, may have been well above baseline. The goal was provided as a visual bar graph next to the participant's score, also as a bar graph, from the previous game, an example can be seen in Figure 1. The researcher praised both progress towards the goal, based on an *increase* in rate of positive communication behaviors from the previous game, or achieving the goal.

As mentioned, immediately following each session (i.e., game), the researcher briefly met with each participant on an individual basis. These feedback meetings lasted approximately 2 minutes per player and were arranged prior to implementation of the intervention so that coaches and players were informed. Appendix B is a script and visual representation that illustrates what was said and displayed in the meetings. Every feedback meeting began with the experimenter orienting the player to the graph, including the goal line, and providing an objective feedback statement concerning the participant's performance during the previous game. The objective feedback statement consisted of providing the participant's overall rate of positive communication statements per minute. The researcher also provided a contingent praise statement if the participant's performance showed an improvement compared to their previous session. If the performance decreased or showed no improvement, then no praise statement was offered, and a reminder to focus on communication in the next game was given.

Research Design

This study used a multiple baseline design across participants. The phases in the multiple baseline were a baseline followed by treatment, with treatment introduced in a staggered fashion across participants. Once data achieved stability in baseline for a participant, the independent variable was introduced to that participant while the other participants remained in baseline.

Procedures

Sessions were conducted remotely using Discord, a social platform used for video game players, during regularly-scheduled practice, scrims, or tournament games. Participants either played remotely from their home computers or at the university's Esports facility. Data were collected for each game played as a session. All players included in this study provided informed consent to the procedures described and to the publication of their data.

Once the intervention phase began for a participant, a task clarification meeting was held for the participant. Individual goal setting and feedback meetings began to be held as

described above. IOA and treatment integrity were collected throughout for 33% of the sessions, either in vivo or using recordings.

Treatment Integrity

Treatment integrity was measured using percent correct in following a script based on a checklist for the individual feedback sessions (see Appendix C). A second observer calculated percent correct on whether the experimenter delivered the objective statement of positive communication statements per minute for that game, the goal of the comparative average of the Varsity team communication statements, and a contingent praise statement if there was an increase or the participant exceeded the goal. If the participant did not show improvement nor exceeded the goal, the researcher was evaluated on whether she provided a statement of encouragement to work on communication in the next game. If the experimenter errored on the script or did not provide accurate feedback in one of the areas in the script, that was scored as a miss. The second observer determined integrity based on the audio recordings as well as the data. Identical to the IOA procedures, treatment integrity was calculated for at least 33% of sessions. The minimum treatment integrity was 80%. If the score fell below that at any time, additional feedback and training were provided. Treatment integrity was calculated for 58% of sessions. The final treatment integrity across the sessions calculated was 100%.

Social Validity

After the completion of the study, the authors provided a questionnaire consisting of a series of Likert scales regarding aspects of the study's goals, procedures, and outcomes to the targeted players (see Appendix D).

Chapter 3
Results

Treatment Effectiveness

Figures 2 and 3 show individual participant communication data across games. Figure 2 highlights each targeted communication behavior, and Figure 3 provides the total added communication behaviors. Between the communication behaviors, tacts were the highest in rate, followed by mands, then praise. Most participants had near-zero rates of praise statements, with many sessions having no recorded praise responses. In baseline, Lydia's tacts and mands were on a downward trend, with no more than 0.81 tacts and 0.24 mands per minute. In intervention, Lydia showed an upward trend in each communication behavior in intervention, showing as many as 2.61 tacts and 0.96 mands. There was no overlap in tacts or mands, ranges for tacts were from 0.60 to 0.81 in baseline then 0.96 to 2.61 in intervention, and ranges for mands were from 0.13 to 0.24 in baseline then from 0.27 to 0.96 in intervention. Pierre showed minimal overlap in mands, from 0 to 0.19 in baseline and 0.07 to 0.39 in intervention, and no overlap in tacts, from 0.39 to 0.62 in baseline then from 0.89 to 1.77 in intervention, with stable responding and a higher level of both mands and tacts in intervention. Praise responses showed no improvement for Pierre, with most sessions close to or at 0. Kim showed greater variability in baseline in all communication responses. Tacts had a low of 0.33 in baseline, while in intervention the lowest recorded rate was 1.17. Tacts did show a downward trend at the end of baseline while mands started to show an upward trend. Mands, like tacts, had a higher floor in intervention of 0.38 responses per minute, with a low in baseline of 0.05 responses per minute. Praise responses also showed some improvement, with a slightly increased mean from 0.06 in baseline to 0.12 in intervention, and an upward trend in intervention. Senua showed no overlap in tacts, ranging from 0.59 to 1.94 in baseline to 2.94 to 3.38 in intervention. Senua's tacts were variable and on a downward trend in baseline, but in intervention showed more stable responding at a higher level, at a mean of 3.19 in intervention, compared to a mean of 1.34 in baseline. Mands showed a higher level in

intervention at a mean of 0.81, and a higher floor level at 0.54 than in baseline at 0.14. Praise was on an upward trend in intervention.

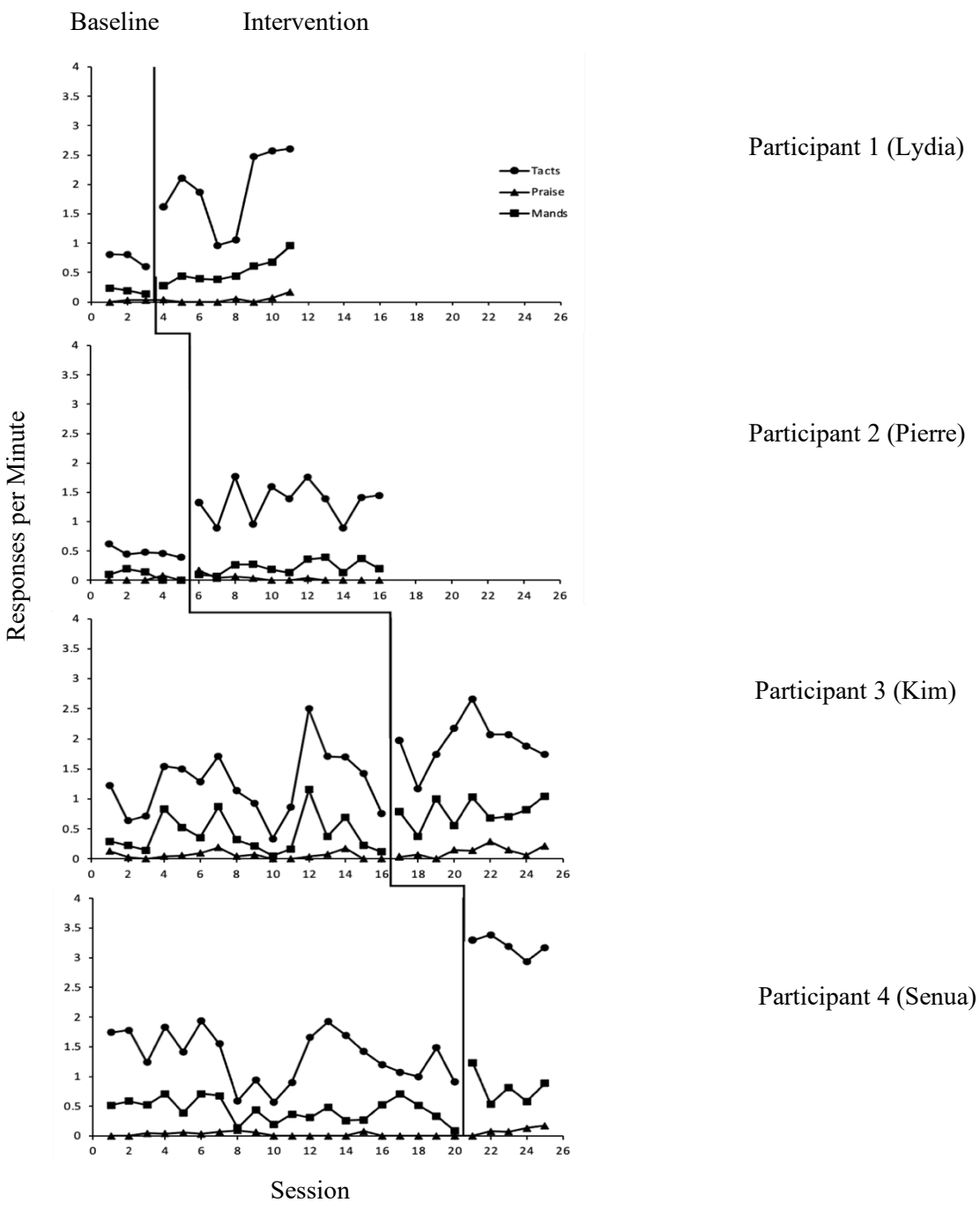

Figure 2: Multiple Baseline Across Participants for Rate of Communicative Responses Across Games

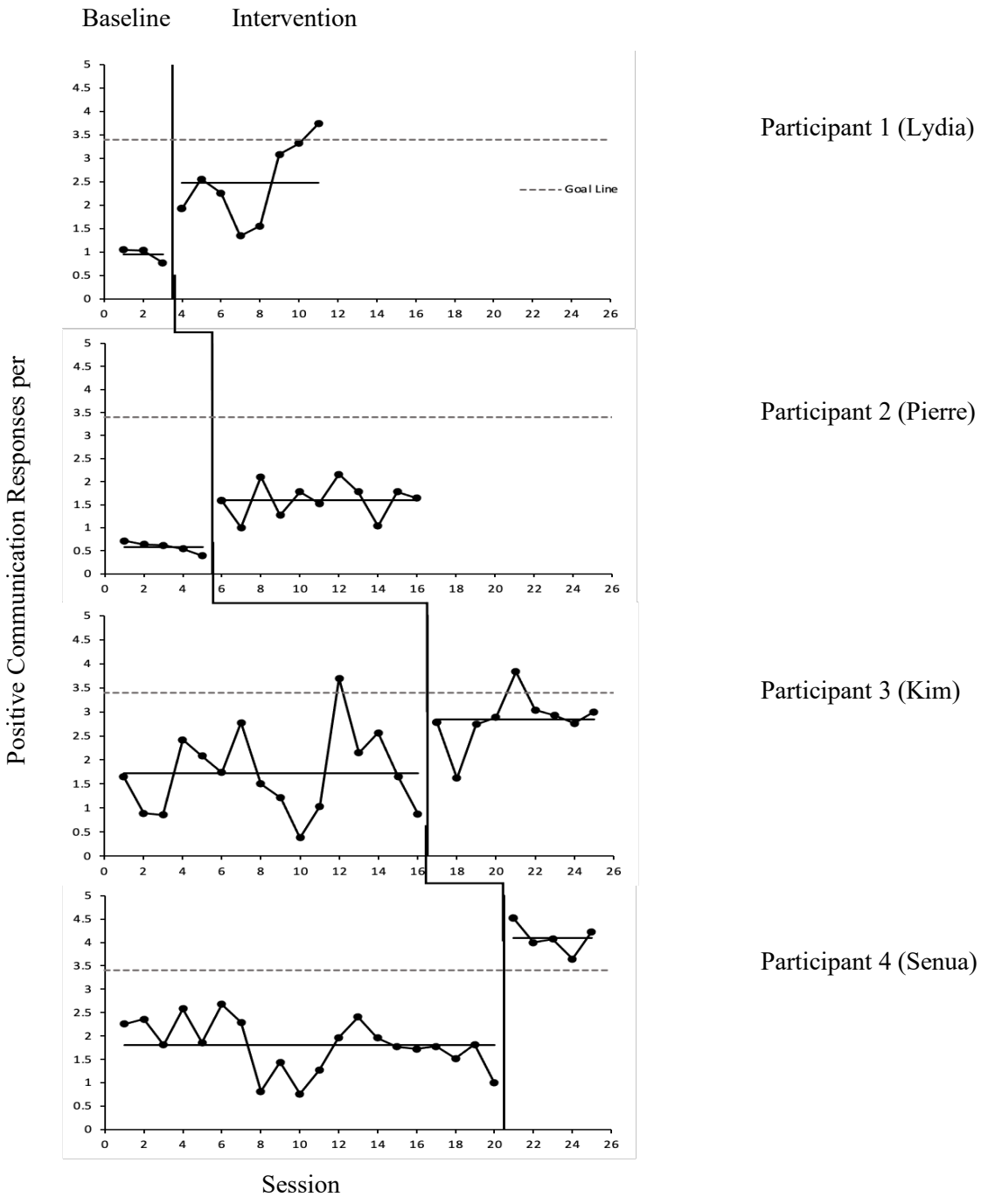

Figure 3: Multiple Baseline Across Participants for Rate of Total Communicative Behaviors Across Games

For total added communication behaviors, baseline rates were generally at a low level for all participants. Though Kim and Senua showed some variability and occasionally high rates, the mean level was low, at 1.72 and 1.80 respectively, compared to the Varsity team average and what the players later achieved in intervention, at 2.84 and 4.09 respectively. Lydia and Pierre had low mean levels of 0.95 and 0.58, little variability, and a downward trend in baseline. In treatment, rates of communication sharply increased from the previous data point, then showed higher mean levels of 2.47 for Lydia and 1.60 for Pierre and no overlap of data points. Lydia showed an increasing trend in intervention and exceeded the goal line in their last session, with a rate of 3.74. Pierre did not reach the goal line and showed stability in intervention, but intervention mean level was over 100% above their baseline level, with a baseline rate of 0.58 and intervention of 1.60. While data points for Kim overlapped more than any other player, range of data points decreased in intervention to a higher floor and less variability, with baseline ranges from 0.38 to 3.69, and intervention ranges from 1.62 to 3.83. Additionally, Kim's rate of positive communication during intervention showed a raise in mean level to 2.84 from a baseline of 1.72, achieving a higher rate on average closer to the goal line. Senua also showed less variability in intervention than in baseline, had no overlap of data points, and maintained their improvement above the goal line throughout intervention. Senua's baseline range was from 0.82 to 2.68, with a mean of 1.80, and intervention range was 3.65 to 4.52, with a mean of 4.09.

Social Validity

Social validity was relatively high for this study. A high score was considered above 30, indicating high acceptability, out of a total possible 35. The questionnaire can be found in Appendix D, and the quantitative results can be found in Table 1. Three out of four participants responded to the social validity questionnaire. In total, Lydia scored 32, Kim scored 27, and Senua scored 33. "I would recommend this feedback procedure to my teammates" was the lowest rated, on average, at 4.3, and "I feel that it was helpful to have the behavior analyst deliver feedback after each game played", "I was comfortable with the way feedback was provided", and "I feel that the feedback procedures were helpful" were the highest rated at 4.7 on average. Kim provided the lowest social validity score, at 3.9

average, and Lydia and Senua provided higher scores of 4.6 and 4.7, respectively. In terms of qualitative evaluations in the survey, participants mostly suggested more specific information in the feedback, such as breaking the communication behaviors into categories or note moments where there was a missed opportunity to make a call. Participants noted that they liked how short and concise the feedback was, they appreciated the visual to see the distance between themselves and the goal, they said they liked having the feedback sessions "as a way to clear [their] head after a tough game." Anecdotally, players, on more than one occasion, reported that they did not feel they did well, and said they were surprised to see that their data showed them that they did well. This provides support for data-based procedures, especially in providing feedback. As another anecdote, one of the participants and another player on the team who was not targeted for intervention reached out to the Esports director to ask for more training and services from the behavior analyst team. This, in addition to the qualitative feedback mentioned provides support from the community for more of these services.

Survey Item	**Lydia**	**Kim**	**Senua**	**Average**
I knew what was expected of me for communication prior to getting clarification from the behavior analyst	4	4	5	4.3
I feel that it was helpful to have the behavior analyst deliver feedback after each game played	5	4	5	4.7
I was comfortable with the way feedback was provided	4	5	5	4.7
The way feedback was presented by the behavior analyst was clear and useful	4	4	4	4
I would like to continue to receive feedback in this manner	5	3	4	4
I feel that the feedback procedure were helpful	5	4	5	4.7

I would recommend this feedback procedure to my teammates	5	3	5	4.3
Average	4.6	3.9	4.7	4.4

Table 1: Social Validity Scores

Chapter 4
Discussion

The purpose of this study was to examine the effects of task clarification, goal setting, and individual verbal and graphic feedback from researchers on the rate of in-game communication including tacts, mands, and praise in a team of Junior Varsity Esports players. The results support that this packaged intervention was effective at increasing positive communication behaviors in these Esports players. All players showed an increase from baseline in positive communication behaviors, and both tacts and mands increased for all players. Praise statements did not increase over baseline.

These findings support previous research in several ways. First, they support the effectiveness of feedback combined with other interventions. Second, this study's procedures demonstrated the reinforcing effectiveness of providing praise or recognition for progress toward goal attainment. This supports Daniels' and Bailey's (2014) suggestion to use subgoals. Despite the goal being relatively high for some players, most players achieved the goal. One exception was Pierre, who did not meet the goal but still showed overall improvement in communication. It is likely that goal setting, along with task clarification, functioned as antecedents signaling the opportunity for reinforcement. The saliency of the task clarification in its presentation with the graph, as shown in Figure 1, may have aided in the stimulus control it had over access to reinforcement. Given the increase in responding from the participants, their communication behavior was reinforced. While this study aimed to use praise as reinforcement, the visual graph showing a higher rate than the Varsity team average may have supplemented praise as reinforcement. Due to League of Legends presenting statistics and graphs following each game, these players may have been more fluent in interpreting graphic feedback and have longer learning histories conditioning such feedback as valuable. Additionally, these players were already receiving feedback often from their assigned coach.

Considering data collection, it should be noted that the way data were collected was unique. Tacts and mands were defined by the most salient presenting topography for ease

of data collection. For example, a statement that sounded like an observation of an event in the game was coded as a tact, even if it functionally may have been multiply-controlled as a mand and was on a variable schedule of reinforcement. This was for data collectors who may not have been familiar with League of Legends and could not potentially identify correspondence between what stimuli were present. For example, a player making the objective statement “there are a lot of enemies here” may receive help from teammates. In other words, while attempts were made to delineate between mands and tacts, particularly as the likelihood of multiply-controlled verbal behavior was high, topography was used to categorize behavior more consistently in the moment. It is also possible that this delineation of mands and tacts may have affected IOA, as the topography of some statements may have been ambiguous.

Other multiply-controlled statements were coded similarly as well. Most often, intraverbals were coded as either tacts or mands. Players asking other teammates questions could have increased the verbal behavior of their teammates slightly. In this study the authors wanted to recognize as many communication responses as possible in the feedback, so these were included as well, rather than only counting initiated statements.

Each of these participants had unique presentations of the skills targeted, and idiosyncratic responses to the intervention. Lydia demonstrated initial improvement at the onset of intervention, then a decrease for a few sessions, then even greater improvement and eventually exceeded the goal. Senua exceeded the goal immediately upon introduction of the intervention, and remained above the goal line, despite a comparative mean baseline to other players. In feedback sessions, this participant accessed praise often due to maintaining responding above the goal, even when there was a decrease from the previous session. While Pierre never met the goal, he still showed overall and consistent improvement, with no overlap with baseline data. Kim’s performance improved especially in variability of data, starting at a highly variable baseline to a much more stable intervention. At one point in intervention, Kim noted not requesting help enough, so some qualitative reports of requests for help were provided from then onward. He showed an improvement in mands when feedback included that as examples. It should also be noted that, in baseline, Kim muted themselves in three different games and communicated with a

selection-based verbal behavior built into the game, which was recorded following the same data collection procedures as for topography-based verbal behavior. Kim later reported, during one of the feedback sessions, that they were having a rough day during one of those, so it may be likely that the other instances they muted themselves were similarly motivated. In intervention, Kim no longer muted themselves.

Data in general were variable, which may be expected with verbal behavior, and could be due to a number of factors. External factors in a player's day, for example, could increase or decrease motivation for communication. In the pilot study, one participant communicated at a rate of 10.6 positive communication responses per minute, in contrast to a previous average of 4.7 positive communication responses per minute. The participant reported that they were more energetic because they had "exercised four days in a row". Certain stressors, such as tournament games, which the players in the study entered into near the end of data collection, may have contributed to responding. If the game is too challenging, increasing response effort, that could present abolishing operations for access to the aggregate products in the game, and abate communication responses. If the game is too easy, this could also abate communication responding due to a decrease in value of the reinforcement, also creating an abolishing operation.

Additionally, also unique to this task were potential changes such as new rules for how a character may be played. This is particularly unique to this setting, as the natural (i.e., non-virtual) world does not have as many sudden rule changes such as those that may be seen during a video game. For example, if the amount of damage a character does in game is decreased, players may adjust their strategy to playing a different but similar character. Due to these changes, individuals may need to adjust their behavior in a variety of ways. For instance, these changes may influence the amount of help a player may need to succeed in their role and the kind of information they need from fellow players. Character selection in general could affect the need to communicate. If a player is familiar with a character, they may not callout or request as often, (as one participant in the pilot noted), because they know what is needed. If a player is unfamiliar with a character, they may request information from their teammates more often concerning how to play the character or how

to overcome a challenge. The overall difficulty or ease of the game could also contribute to variability in the data, as well.

While there were no formal generalization measures, the data in this study comprised a variety of situations for all participants, such as casual games, an organized scrimmage against another school, and tournament games. Sometimes the participants had a history with the team they played against, and other times they were novel opponents. Also notable was that the team in total was comprised of ten players who swapped their roles, as only five could play at a time. How these different players worked together and responded together could have impacted the data. Most likely, certain individuals who provided help or information in the past may have functioned as discriminative stimuli signaling the availability of reinforcement in the form of help or information. However, other individuals who did not provide help or information in the past may have functioned as stimulus deltas signaling extinction from access to help or information. For example, some players may have been more likely to respond to requests than others, or to make use of information shared. The total team composition could impact the likelihood to communicate and cooperate, due to certain histories of accessing reinforcement with those teammates. These different circumstances could also impact the variability of the data, though the intervention was nevertheless effective across these situations. Occasionally the team players played from home, and sometimes from the Esports facility. Also, there were occasionally a few days or a weekend between feedback sessions, which could have impacted the effectiveness of feedback.

Limitations and Future Directions

There are several limitations to this study. The first major limitation is the minimal staggering between the first and second participant in the multiple baseline design. Also, a reversal design would be ideal in terms of demonstrating experimental control, but was deemed unrealistic for the scope of this study given the nature of the intervention in both need from the client and potential for behavior maintenance through natural contingencies. This collegiate Esports team is unique, as the campus hosts an in-person Esports facility, unlike many other Esports environments. Another limitation is the player that muted themselves in game. While Kim was still able to communicate, and data were collected on

the non-vocal verbal responses, this greatly decreased their rate of communication during those games in baseline. Last, there were a few outlier values in IOA, represented by the lower end of the range of IOA values. Upon review in feedback and re-training sessions with the data collectors, these were most likely due to idiosyncrasies of the verbal behavior. Stricter definitions could be applied in future research; however, this would restrict what could be counted. Overall IOA was still above 80% and data collectors were provided feedback for each IOA session, and occasionally provided booster training.

Future studies should address the limitations described to expand the literature. Further probes and checks in generalization and maintenance could be demonstrate how well the environment established for this intervention maintains the targeted behavior. Otherwise, a withdrawal of the intervention could be added to establish stronger experimenter control. Additionally, a more diverse population and setting would improve the external validity of future research.

Future research could expand and improve upon on the communication variables addressed in this study. Verbal behavior could be targeted beyond simply rate of responses to improve the quality of communication to be more concise and consistent. Shaping procedures could be useful in improving these communication responses. Additionally, the task clarification could include non-examples of positive communication behavior in order to possibly decrease inappropriate responses. To further target specific communication behaviors, goals could be individualized and specific to each of the players, such as focusing on requesting for help, or any one type of verbal behavior.

To provide a more complete analysis of the contingencies at work, a cumulative record could be taken to further evaluate schedules of reinforcement. Rate of reinforcement for statements that were defined as tacts and mands could be studied to conclusively determine the function of these statements. For example, whether requests get reinforced could influence the contingencies in this environment and the likelihood to continue to request in the future.

Whether increasing certain topographies of verbal behavior that are more practical and positive, such as those targeted in this study, could also decrease negative vocalizations or

unproductive topographies would be a valuable contribution to the Esports community. To the Esports community, these topographies may be as extreme as verbal abuse, such as insults, name-calling, and excessive criticism made to teammates or other players (Riot, 2021b). A potential explanation of these cases of verbal abuse is it may be an emotional response towards another teammate, which could function as a mand or another alternative response. Such verbal abuse could be prevented by manding sooner when the need occurred, for example. So, when there is a player who does not communicate mands cannot thereby receive reinforcement, they experience extinction which could evoke emotional and aggressive responses. When players appropriately mand, they are likely to access reinforcement, which makes extinction and emotional responding less likely.

Given the nature of these sports settings as a team-based environment, future research could capitalize on the social contingencies between peers. Peer feedback could be used as an alternative to manager, coach, or researcher feedback. This could also benefit the players as students learning how to properly give feedback for their professional development. Furthermore, group contingencies could be applied to these teams to impact many behaviors of interest in this setting. This could save time in providing feedback and simplify the data collection procedure. A group contingency may also have the potential to facilitate coordination and cooperation within the team.

Future research could also expand on the independent variables evaluated in this study. Feedback in particular could be expanded upon, including in a comparative sense using a reinforcer or preference assessment. Feedback could be provided in game, to be more immediate. This could be accomplished using a ratio schedule, either with quick praise statements or with acoustic guidance. Feedback sessions could otherwise include corrective feedback, perhaps to decrease inappropriate statements such as swearing, insults, and other forms of verbal abuse. This would be important to address directly in the university Esports setting, as certain statements in a tournament could get players in trouble with their institution. Corrective feedback could impact the social validity of the procedures, given that it may function as a punishment intervention. However, punishment components may be preferred to extinction components (Hanley et al., 2005), which this study used in not providing praise if the player showed a decrease in responding. Prompts could be added in

game to supplement the feedback intervention, with vocal reminders to the team or a note next to the player to work on communication.

Future research could improve on the ecological validity of this study. While participants rated that well in the social validity measures, given that feedback was brief, feedback on communication could be provided by the coaches. Feedback and training could be provided to the coaches so they effectively provide feedback, possibly in a similar way to the procedures used in this study. Coaches would benefit from learning to provide feedback in a research-validated approach and could generalize to how they provide feedback on practical skills in game, such as play calling and mechanics. Additionally, different recording methods could be used, such as interval recording or event recording, rather than a continuous measure of rate. This could be easier on the data collectors, and allow data collection on more participants at a time. Coaches could be trained on collecting data in this, as well. A future study could also evaluate the comparative effectiveness of such a recording method in this setting, compared to continuous recording.

Conclusion

This study demonstrated the utility of behavior-analytic interventions in a collegiate Esports setting. Given the growth of the industry and the variety of behavioral targets, behavior analysis could provide a great deal of support for Esports. These interventions were applied remotely and efficiently. Thus, this study demonstrated the efficacy of creating behavioral change with little disruption. This allowed the researcher to continue to provide feedback when time was limited between opportunities and sessions. These results demonstrated an ecologically valid intervention that could feasibly be implemented for small teams such those in the study which could possibly generalize to similar participants and environments.

Additionally, this study demonstrated the utility of targeting communication through behavior-analytic interventions, including in a novel setting where Skinner's analysis of verbal behavior had yet to be applied. The growing interest in Esports combined with a need for verbal behavior changes within the Esports community implicated a need for behavior-analytic interventions. Producing changes in the players' verbal behavior may

provide a potential avenue for changing the current culture as well as player performance. This research is the first initial step toward addressing pervasive needs in Esports, (both performance issues and cultural). The players' responses to the social validity survey further demonstrate the need for improvement and their interest in being a part of that change. This study demonstrated not only that Esports can benefit from the support of behavior analysis, but supported the existing literature that behavior analysis can provide support anywhere there is behavior, and behavior is everywhere.

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Appendix A

League of Legends Task Clarification Handout

Positive Comms

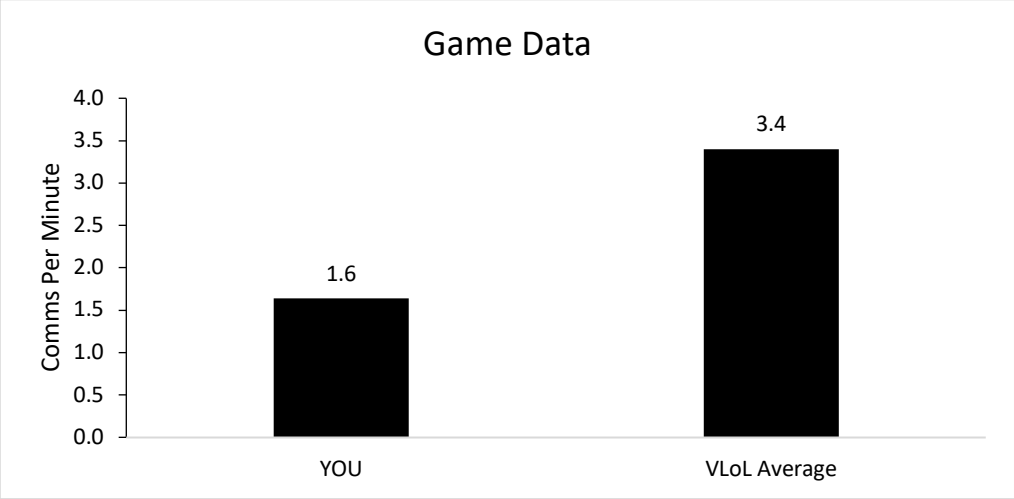
These include activity in the game that help your teammates know what is going on across the map, what you need in lane, and are helpful for setting up plays. They also include recognition statements to teammates on something they did well without sarcasm, corrections, or criticism.

- "On the way" when ganking, rotating, and teleporting
- Enemy activity, such as missing after 10 seconds out of line of sight
- In-game timers (e.g. dragon, baron)
- Enemy cooldowns (ultimate abilities, summoner spells)
- Items bought (enemy or own)
- Intent (e.g. if you go in to fight, about to use an ability on an enemy such as a stun)
- Suggestions and strategies (e.g. "build more armor", "let's stay together", champions to target)
- Requests for help (e.g. "can you come to my lane?")
- Requests for information (e.g. "did he flash?")
- Good/nice job
- Nice try

Appendix B

Researcher Feedback Script

The researcher pulls up the bar graph and orients the participant to it, alongside a simplified version of the task clarification.



"This is a graph that shows your positive communications per minute for this game compared to the average number of comms per minute made by the Varsity LoL team." Read the statement below while referring them to the graph.

Objective Feedback Statement

"See on the graph that your comms per minute for this game was _____ ."

"The average number of comms per minute for Varsity was _____."

If there was an increase in positive communications from the previous game, or the player achieved above the average, praise should be provided. If the players positive communications fall below the average, provide a statement of encouragement to keep trying to reach or exceed the team average next time.

Appendix C

Treatment Integrity Checklist

Feedback implementer:	Date of session and time stamp:		
Participant Code:	Date of data collection for integrity:		
	Yes	No	N/A
Researcher shared graph with participant			
Researcher told participant of positive comms AKA communication statements per minute for that game			
Told participant of average for Varsity/VLoL communication statements per minute (AKA goal)			
Provided praise if a) increase from previous game or b) player achieved above that average			
Provided statement of encouragement to focus on the goal, keep trying, etc. if participant did not do either of the above			

Appendix D

Social Validity Questionnaire

Please indicate the extent to which you agree to the following statements, on a scale of 1 to 5, with 1 being the strongly disagree, to 5 being strongly agree:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I knew what was expected of me for communication prior to getting clarification from the behavior analyst	1	2	3	4	5
I feel that it was helpful to have the behavior analyst deliver feedback after each game played	1	2	3	4	5
I was comfortable with the way feedback was provided	1	2	3	4	5
The way feedback was presented by the behavior analyst was clear and useful	1	2	3	4	5
I would like to continue to receive feedback in this manner	1	2	3	4	5
I feel that the feedback procedure were helpful	1	2	3	4	5
I would recommend this feedback procedure to my teammates	1	2	3	4	5

What would you change about the procedures?

What did you like about the procedures?

What feedback do you have for me regarding these procedures, goals, and outcomes?