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An Evaluation of Reactivity to Observer Presence While Self-Monitoring to Improve Swimming Performance

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An Evaluation of Reactivity to Observer Presence While Self-Monitoring
to Improve Swimming Performance

by

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A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Arts
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Table of Contents

| | |
|---|-----|
| List of Tables | ii |
| List of Figures | iii |
| Abstract | iv |
| Introduction | 1 |
| Method | 7 |
| Participants and Setting | 7 |
| Target Behavior and Data Collection | 8 |
| Materials | 9 |
| Interobserver Agreement | 10 |
| Social Validity Questionnaire | 11 |
| Experimental Design and Procedure | 11 |
| Baseline. | 11 |
| Self-monitoring | 12 |
| Observer Present | 12 |
| Observer Absent | 12 |
| Self-monitoring with Feedback | 12 |
| Results | 14 |
| Discussion | 22 |
| References | 27 |
| Appendix | 30 |

List of Tables

| | |
|---|----|
| Table 1: The participants' responses and the mean response for the social validity questionnaire..... | 21 |
|---|----|

List of Figures

| | |
|---|----|
| Figure 1: Percentage of assigned laps completed during team practices for Scott, Veronica and Lucas..... | 19 |
| Figure 2: Percentage of assigned laps completed during team practices for Xavier, Shirley, Lucy, and Rachel..... | 20 |

Abstract

The current study evaluated the effects of self-monitoring by swimmers to improve their performance at practice and assessed the effects of reactivity to observer presence on their performance. Additionally, it investigated the accuracy of the swimmers' self-reports. Seven public high school swim team members used program boards to self-monitor in order to increase the number of assigned laps completed at practice. Reactivity to observer presence was assessed by having a confederate record the number of laps completed during observer absent conditions. A series of AB replications and an ABAB reversal design were used. The percentage of assigned laps completed increased during the self-monitoring phases. The self-monitoring and feedback phase showed an additional increase in the percentage of assigned laps completed, and also showed an increase in the mean level of reporting accuracy by the participants. The effects from the reactivity assessment were mixed; the percentage of assigned laps completed was lower on days that the observer was absent compared to the days the observer is present for only some of the participants. More research is needed to examine reactivity effects in sport settings.

Introduction

According to Martin, Thompson and Regehr (2004), the first applied behavioral analytic (ABA) study with a single subject design in a sport setting (according to the review's inclusion criteria) was published in the *Journal of Applied Behavior Analysis* in 1974, by McKenzie and Rushall. Sports psychology became a growing field soon after in the 1980s, however sport studies with single subject designs did not become as common until the late 1990s (Martin et al., 2004). Behavioral interventions to improve athletic performance have since been used with multiple sports, including soccer (Brobst & Ward, 2002), football (Allison & Ayllon, 1980; Komaki & Barnett, 1977; Stokes, Luiselli, Reed & Fleming, 2010; Ward & Carnes, 2002; Ward, Smith & Sharp, 1997), gymnastics (Boyer, Miltenberger, Batsche & Fogel, 2009; Allison & Ayllon, 1980), speed skating (Wanlin, Hrycaiko, Martin, & Mahon, 1997), and tennis (Allison & Ayllon, 1980).

According to a review of single subject studies in the 1970s, 1980s and 1990s, self-monitoring and public posting are two methods that have been utilized to increase performance in figure skating, football, gymnastics, soccer, speed skating, swimming and tennis (Martin et al., 2004). Ward et al. (1997) investigated the effectiveness of public posting for increasing task performance of two repetitive tasks in football: blocking and running. A daily performance chart was displayed in a prominent section of the locker room and the players' performance of blocks and route runs improved in both practice sessions and games with this intervention. Similarly, Ward and Carnes (2002) used goal setting with public posting as an intervention to increase the use of correct reads, drops,

and tackles. The only result that was posted on the performance chart was if the player met his goals (Y) or not (N) each day. The Y/N results were posted in the locker room for all team members to see and performance of the three types of plays increased.

Part of an intervention package for soccer players to increase appropriate responses for certain soccer moves during practice also included goal setting and public posting (Brobst & Ward, 2002). The intervention improved practice performance for three target behaviors: movement with the ball, movement during restarts, and movement after the player passed the ball. The goal was set at 90% correct performance, and the percentages were posted on a chart placed on a table where the water breaks were held. Feedback and error correction from coaches for all skills were also part of the successful intervention.

A limited number of articles with respect to behavioral interventions and swimming have been published since the aforementioned article by McKenzie and Rushall in 1974 (Critchfield, 1999; Critchfield & Vargas, 1991; Dowrick & Dove, 1980; Hazen, Johnstone, Martin & Srikameswaran, 1990; Hume & Crossman, 1992; Koop & Martin, 1983; Polaha, Allen & Studley, 2004; Young, Medic & Starkes, 2009). McKenzie and Rushall (1974) publicly marked attendance in order to reduce the number of absences, tardies, and instances of swimmer's leaving practice early. The second part of the study also utilized self-monitoring program boards to increase work output during the practices. The swimmers marked on the boards when they completed a set, which is an assigned number of laps with their strokes and expected speed. This intervention led to greater independence and ultimately more completed laps, as the swimmers did not

have to wait for the next instructions from the coach as all sets for the practice were listed on the boards.

Critchfield and Vargas (1991) completed a systematic replication of McKenzie and Rushall's (1974) study, removing the variable of social interaction. Participants swam in a separate pool, with the absence of interaction from their coach and other team mates, to better allow the results of the study be attributed to the self-monitoring. The results of Critchfield and Vargas replicated those of McKenzie and Rushall, as higher swimming rates were seen during the self-recording phase.

Critchfield (1999) completed a study to investigate self-monitoring under different recording schedules. Similar to Critchfield and Vargas (1991), two swimmers marked the number of pool lengths swam during the self-monitoring phase and then marked it on a graph. The recording frequency (every two laps, every four laps, and end of session only) was alternated within the intervention phase. Unexpectedly, recording at the end of the session (the less frequent self-monitoring method) showed the greatest pool laps completed. Critchfield suggests that when the swimmers had to stop and record laps throughout the swim, they would talk and waste time along the pool's wall, as opposed to when they were able to swim continuously and only had to record the laps at the end of the allotted swim time.

Polaha et al. (2004) recognized that self-monitoring had only been used to improve performance, and had not been used to alter athletic skill technique. Coaches can ask swimmers to take a stroke count, which refers to the number of strokes it takes to complete a lap in the pool. Fewer strokes typically reflect a more efficient swim. The authors investigated the use of self-monitoring the stroke count through verbal reports to

the coach (study 1) and found the stroke counts reduced, with greatest improvements in the least experienced swimmers. When the self-monitoring ended, the stroke counts began to rise.

The studies utilizing self-monitoring to improve swimming performance have shown that the procedures result in increases in performance or skill execution. However, one of the common limitations among these studies is that the effects of participant reactivity to the studies' observers were not measured. In other words, it is not clear whether the performance changes observed in these studies would be the same in the absence of the observer. Reactivity can be a potential confounding variable in a study that involves direct observation of its participants. Kazdin (1979) defined reactivity as "the influence that the assessment procedure exerts on the subject's performance" (p. 714). He suggested that participants be observed unobtrusively in order to record the most accurate behavioral data that results from the change in the procedure. Possible ways to record unobtrusively in a naturalistic setting include recording surreptitiously behind a one way mirror, having an individual routinely in the settings take the recordings, or watching and scoring videotapes from a concealed camera.

Few studies have actually investigated the effects of reactivity by intentionally manipulating the presence or absence of an observer within the study (Brackett, Reid & Green, 2007; Mowery, Miltenberger & Weil, 2010), and none of them have been in a sports setting. Brackett et al. (2007) examined the effects of reactivity during conspicuous and inconspicuous observations of job coaches' performance in a vocational setting, and found that the coaches performed at desired levels only during conspicuous observations. The job coaches also learned self-recording procedures to document their

work. Self-recording was shown to be successful, and data collected through inconspicuous observations while the coaches were self-recording showed desired results. However, it is not known if the self-recording procedures were themselves reactive. The self-recording forms were collected by the job coaches' supervisors, who had previously given feedback on the job coaches' performance during the conspicuous observations.

Mowery et al. (2010) further explored reactivity to observation by staff in a group home setting. The study investigated the influence of the supervisor's presence on the occurrences of staff's positive interactions with clients. The authors found that none of the staff participants increased the desired behaviors after the staff training intervention if a supervisor was not present. These results, along with those of Brackett et al. (2007), suggest that changes in staff performance following intervention may be in part due to the presence of an observer. However, no sport studies were found that investigated participants' reactivity to the observer's presence as a variable that may have influenced the results.

It is not known if the improvements in the swimming and other sports performance studies mentioned were due to the intervention being administered, the effect of the presence of the observer, or a combination of both. It will be important for future studies to investigate the effects of reactivity to the observer's presence in sport settings. Although participants in the previously mentioned swimming studies knew they were being "watched" in a study, usually the experimenters were also their coaches (Critchfield, 1999; Critchfield & Vargas, 1991; Polaha et al., 2004). This procedure does not allow the opportunity to examine the effects of participant reactivity to experimenter/observer presence. No study in swimming, and possibly even in all sports,

has systematically removed the observer to determine if the participants' performance will change if the known observer is absent during parts of the intervention phases. The purpose of this study was to evaluate the effects of self-monitoring on swimmers' performance at practices and the influence of the experimenter's presence on the swimmers' performance. Additionally, it investigated the accuracy of the swimmers' self-monitoring to evaluate the correspondence between the participants' reports and the experimenter's observations of the behaviors.

Method

Participants and Setting

The swimmers were members of a public high school's co-ed swim team in Hillsborough County, Florida. Although all members of the swim team were exposed to the intervention, data were collected on seven swimmers. They were chosen at the beginning of the swim season, after direct observations and discussions with the coaches, because they skipped laps at practice. Parental consent and swimmer assent to participate were acquired before the study began. Scott was a Caucasian male in his freshman year. Max and Thomas were Asian males in their freshman year. Shirley and Lucy were Caucasian females in their freshman year, and Veronica was an Asian female in her freshman year. Rachael was a Caucasian female in her junior year.

Swim team practice was held Monday through Friday in the afternoons, except on days when there were meets. Meets occurred about once a week starting a few weeks into the season. The public high school swim season ran from the end of August to the end of October.

The team practiced in a pool that was closed to the public during the fall swim season while it is used for practices and meets. The pool was divided into nine lanes that were 25 meters in length, and swimmers on the team were typically placed into lanes during practice based on skill level, and occasionally were divided based on swim stroke.

Target Behavior and Data Collection

The dependent variable was the percentage of assigned laps completed during practice. Measuring the percentage of assigned laps completed is useful for coaches who have members on the team skip sets for “water breaks,” “bathroom breaks,” or other excuses. Coaches are more likely to choose to implement interventions that have low response effort; swimmers’ self-monitoring and public posting are opportune approaches to potentially increase practice completion. The percentage of assigned laps completed was chosen as the dependent variable because the different lanes of swimmers were assigned different sets of laps to swim, based on skill level. Different sets also took different amounts of time to complete (sprint sets versus distance sets), so time was not a factor to be measured. A lap was counted as swimming two lengths of the pool (swimming to the other end and back). The experimenter recorded how many laps the participant swam and how many laps were assigned in order to determine the percentage of assigned laps completed. During intervention, swimmers reported the number of laps they swam on their program boards, and the experimenter recorded these numbers. For example, one assigned set for lane one could have been an 8 x 100. If a swimmer were to complete the entire set, he would write 8 x 100 on the program board next to his name. The experimenter converted the reported completed set written by the participant on the board to a number of laps. There are two laps in a 100, so the swimmer would have completed 16 laps in this example. Included sets were those that began and ended with the swimmer in the same lane, and that had a distinct assigned number of laps. Other assignments, such as swimming a “snake” (when the entire team begins in one end lane

of the pool and swims up and down each lane to then end in the opposite end lane) or a free swim (swim non-stop for 15 minutes) were not included.

The swimmers were told that there were two simultaneous but unrelated studies happening with the two different graduate students present at their practices; the experimenter was there to observe the swimmers and the confederate was there to observe the coach. The swimmers knew that the experimenter's study was to improve their swimming performance (per the consent/assent forms) and they were told that the confederate's study was to observe the coach's interactions with the swimmers. The confederate also did not attend practices for the first week while consent and assent forms were being collected and for the first few days of data collection. The confederate was not present at the beginning of the study to aid in making it seem as if the purpose of the two graduate students' presence was unrelated. If swimmers had asked (and none of them did), they would have been told that the coach's training and role playing takes place outside of swim team practice hours and that the results of one study would not have an effect on the other. This story was established to ensure that the swimmers were not reacting to the presence of the confederate. Data was collected by the experimenter and/or confederate during every practice.

Materials

Each of the lanes of swimmers in the pool had a white dry erase program board. Horizontal lines were drawn across each board and one name of a swimmer in the lane was written on the left side of each row. Markers were tied to string and the string was taped to the back of the boards. Boards were placed on the pool deck within arm's reach of the edge of the water by every lane; the physical location of the boards did not

interrupt practice. This placement of the boards allowed the swimmers to record their laps without leaving the pool between sets. The program boards were locked in a storage room at the pool overnight. It was the team's senior captains' responsibilities to get the program boards out at the beginning of practice and place them at the end of their corresponding lanes and to put them away after practice. The coaches reminded the senior captains if necessary.

The observer used a clipboard and paper and the confederate used a notebook to record the sets assigned to each of the participants and the number of laps completed and reported by each of the participants.

Interobserver Agreement

Both the observer and the confederate were present at the pool to collect interobserver agreement (IOA) data for 10 out of the 28 practices (35.7% of the time), with an overall mean IOA at 92.7%. The confederate's data from the first day of practice, not included in the 10 days above, was not used toward the IOA calculations as the confederate was training. They each independently recorded the number of laps swam by each of the participants. The percentage of IOA was calculated by dividing the smaller number of laps reported by one observer by the larger number of laps reported by the other observer, multiplied by 100. Scott had 31.3% of his practices (5/16) scored with a mean IOA at 91.6%. Lucas had 42.9% of his practices (6/14) scored with a mean IOA at 91%. Xavier had 33.3% of his practices (7/21) scored with a mean IOA at 90.9%. Shirley had 47.4% of her practices (9/19) scored with a mean IOA at 95%. Lucy had 47.1% of her practices (8/17) scored with a mean IOA at 94.5%. Rachael had 38.9% of

her practices (7/18) scored with a mean IOA at 93.9%. Because of her minimal attendance, Veronica had 14.3% of her practices (1/7) scored at 78.3%.

Social Validity Questionnaire

A social validity questionnaire was distributed to the participants after the completion of the study (see appendix). The participants used a six-point Likert scale to answer nine questions. The questionnaire addressed the participant's feelings about the use of self-monitoring, how easy it was to use self-monitoring, how disruptive self-monitoring was to practice, the number of laps they swam, and whether the participants believed that the confederate was observing them.

Experimental Design and Procedure

The effects of self-monitoring were evaluated in a series of AB designs for three participants and an ABAB design for four participants, with probe data collected by the confederate for the days that the experimenter was not present. There were observer present and observer absent conditions within both baseline and intervention phases. The coaches were instructed not to act differently than usual throughout the entire study. The participants were unaware of one intent of the study (assessing reactivity to observer presence), but were debriefed at the conclusion of the study.

Baseline. Practice was carried out as usual. The percentage of assigned laps completed by the participants was recorded by the experimenter (observer present condition) or the confederate (observer absent condition). Days that both were present were used to calculate IOA, and the experimenter's data was presented. Swimmers did not receive any feedback from the experimenter, or confederate, and the coach provided feedback per usual. Baseline data should not have been reactive, as the consent form

only reported that the study would improve performance, and swimmers did not know if that meant speed, technique, or some other aspect of their swimming performance.

Although it did not, if it had appeared that having the observer there was reactive (even without the intervention), then baseline would have been extended until the percentages of assigned laps completed were stable among the participants.

Self-monitoring. At the beginning of the intervention phase, the experimenter introduced the program boards and explained the purpose of the program boards to the entire team. The team was told that each member would utilize the program boards to record the amount of the assigned set that s/he completed once s/he was finished with the set. The swimmers were instructed to be honest when recording the amount they had swum, even if they did not complete the set. The senior captains set the boards up at the beginning of every practice and the coach reminded the swimmers to be honest and record what they had swum at the end of each set.

Observer present. During these days, the experimenter was present on the pool deck to record the number of laps the participants had swum, the number of laps they reported that they had swum, and the total number of laps assigned. The observer remained by the end of the pool where the program boards were located.

Observer absent. During these days, the confederate, who the swimmers believed to be recording the coach's performance, recorded the number of laps assigned, the number of laps the participants swam, and the number of laps they reported to have swum. The confederate remained in close proximity to one of the coaches.

Self-monitoring with feedback. This phase was implemented as the second intervention phase. Some change had occurred with self-monitoring, but it was thought

that the addition of feedback could lead to even greater changes. This phase was the same as the self-monitoring phase except with an added feedback component. The experimenter provided feedback in the form of positive comments after each participant completed a set and recorded the number of laps swam on the program boards. Positive comments included statements such as, “I noticed you completed the entire set; nice work” or “thanks for writing down the amount you swam, I appreciate it.” Swimmers were also told the percentage of assigned laps they completed from the previous practice, and they were encouraged to try to complete the entire sets.

Results

Three swimmers participated in baseline and self-monitoring phases but were not exposed to the self-monitoring with feedback phase. These three participants, as seen in Figure 1, showed an increase in the mean percentage of assigned laps completed between baseline and intervention phases. There was no overlap in the data between baseline and intervention as the highest data points in baseline for all three participants were still below the lowest data points during intervention. For Scott, his percentage for assigned laps completed during baseline during the observer present condition was 50.9%. Using the self-monitoring boards, his percentage of assigned laps completed during the observer present condition increased to 85.7%. Veronica's mean percentage of assigned laps completed during observer present conditions increased from 61.3% in baseline to 82.4% during self-monitoring, and Lucas' mean percentage increased from 53.3% to 83.6%. Although there was an increasing trend in Lucas' baseline, the last four data points were stable at 59.5%, well below the intervention mean.

The other four participants completed the self-monitoring phase, and also participated in the enhanced self-monitoring with feedback phase. As seen in Figure 2, the mean percentage of assigned laps completed for these four participants increased in the first intervention phase, decreased in the second baseline, and increased even more in the second intervention phase when they received feedback. During baseline, Xavier completed 76.2% of the assigned laps during the observer present condition. The data's increasing trend stabilized and the last four data points had a mean of 88.4%. During

intervention with the self-monitoring boards, the data were more stable and slightly higher, with a mean of 89.2% of assigned laps completed. His return to baseline data point was lower than any intervention points at 81.3%, and the second intervention phase showed an increasing trend with a mean of 95.3% of assigned laps completed.

Shirley's initial baseline data showed greater variability and an increased trend at the beginning of the phase. However, the data stabilized and there was less variability among the last five data points. The overall baseline mean of assigned laps completed during observer present conditions for Shirley was 84.6%, and the mean among the last five data points was 88.3%. The mean percentage of assigned laps completed during the first intervention was 95%, and the second baseline saw a drastic decrease to 60.4% of assigned laps completed. The percentage of assigned laps completed during the second intervention phase with the self-monitoring and feedback increased to 97.7%.

The data for Lucy showed an increasing trend in baseline. The mean percentage of assigned laps completed in baseline was 68.6%, and the mean percentage of the last four data points was 71%. There was an increase in the percentage of assigned laps completed to 77.3% in the intervention phase, and a decrease back to 71.4% in the return to baseline. The second intervention showed dramatic increases in the percentages of assigned laps completed. Every data point in this phase was higher than all previous data points. The mean in this phase was 91.7% of assigned laps completed.

Rachael's baseline saw the greatest variability, with a mean of 63.1% of assigned laps completed during the observer present condition. The last two data points in the baseline phase had a mean of 81.7%. Intervention using the self-monitoring boards saw an increasing trend during the observer present conditions, with a mean percentage of

assigned laps completed at 85.2%. The return to baseline showed the lowest percentage of assigned laps completed at 32.2%. The second intervention, the self-monitoring with feedback, showed consistent performance with Rachael completing a mean percentage of 91.4% of the assigned laps.

The second interest of this study was to investigate the effects of reactivity. On days the observer was not there, the confederate collected data. The evaluation of reactivity showed mixed results among the participants. For four of the six participants who had data collected in the observer absent condition during baseline (Scott, Lucas, Xavier and Rachael), the percentage of assigned laps completed during observer absent conditions in baseline was within the range of the percentage of assigned laps completed during the observer present conditions. Data points for Lucy from her observer absent conditions were the highest and the lowest data points in the baseline phase. For Shirley, her one data point in the observer absent condition in baseline was slightly above all other data points. Veronica was not present at practice any of the days that the confederate was there to collect data during the baseline phase. During the intervention phases, the observer absent data points for four of the seven participants (Scott and Veronica – Figure 1; Shirley and Rachael – Figure 2) were below the observer-present data points. The data showed reactivity to observer presence for these four participants. The one observer absent data point for Lucas (Figure 1) is within range of the observer present data but below three of the four data points. Therefore, there is just a suggestion of reactivity for Lucas. Reactivity was not shown in the data for Xavier and Lucy (Figure 2); their observer present and observer absent data overlap greatly.

The percentages of assigned laps completed for each day during the observer present condition, as reported by the swimmers, are also presented in Figures 1 and 2. Xavier and Shirley consistently reported swimming 100% of their assigned laps. Scott, Lucas and Veronica sometimes reported swimming 100% of their assigned laps and sometimes reported swimming less. Rachael and Lucy always reported that they did not complete all of the assigned laps. An evaluation of self-monitoring accuracy (how accurate the swimmers' reports were compared to how many laps they actually completed, counted by the observer) showed that across participants in the first intervention phase, the mean level of accuracy was 89%. For individual participants, the mean reporting accuracy in the first intervention phase was 86.8% (range 79.3% to 92.9%) for Scott, 88% (range 84.6% to 90.2%) for Veronica, 88.5% (range 78% to 92.5%) for Lucas, 89.2% (range 83.3% to 96.4%) for Xavier, 95% (range 92.5% to 100%) for Shirley, 83.7% (78.4% and 88.9%) for Lucy, and 88.3% (range 82.7% to 92.9%) for Rachael. The mean level of accuracy increased to 94.5% in the intervention with feedback phase. For individual participants in the second intervention phase, the mean reporting accuracy was 95.3% (90.6% and 100%) for Xavier, 97.7% (only data point) for Shirley, 93.7% (range 91.4% to 98.1%) for Rachael, and 93.6% (range 84.5% to 100%) for Lucy.

At the competition of the study, the researcher interviewed all participants and asked them to complete a social validity questionnaire. Six of the questionnaires were returned. Table 1 shows each participant's rating for each item and the mean rating for all items on the instrument. The six points on the Likert scale were strongly disagree (1), disagree (2), slightly disagree (3), slightly agree (4), agree (5), and strongly agree (6).

The results of the social validity assessment show that the participants generally liked the self-monitoring procedure, thought it was easy to use, and did not believe that it interfered with practice. The participants believed it was important to complete all assigned laps at practice and that self-monitoring helped them in doing so. The answers to the final two questions suggested that four of the participants did not know they were being observed in the absence of the experimenter (Xavier, Shirley, Lucy and Rachael) and four of the participants did not believe they swam more when the experimenter was observing them (Lucas, Xavier, Shirley and Lucy).

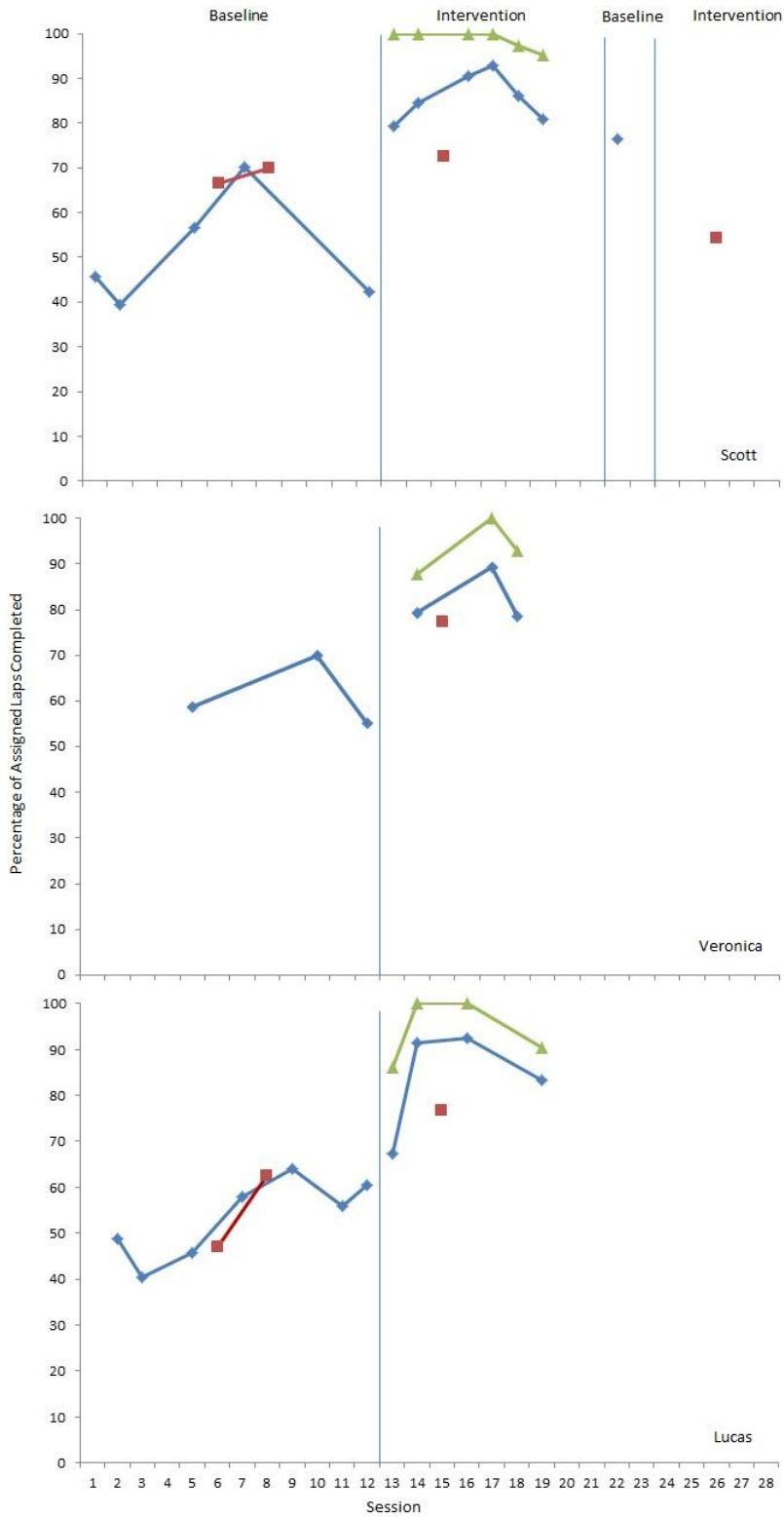


Figure 1. Percentage of assigned laps completed during team practices for Scott, Veronica and Lucas. Blue diamonds indicate the observer present condition and red squares indicate the observer absent condition. Green triangles represent the reported percentage of laps completed by the participant.

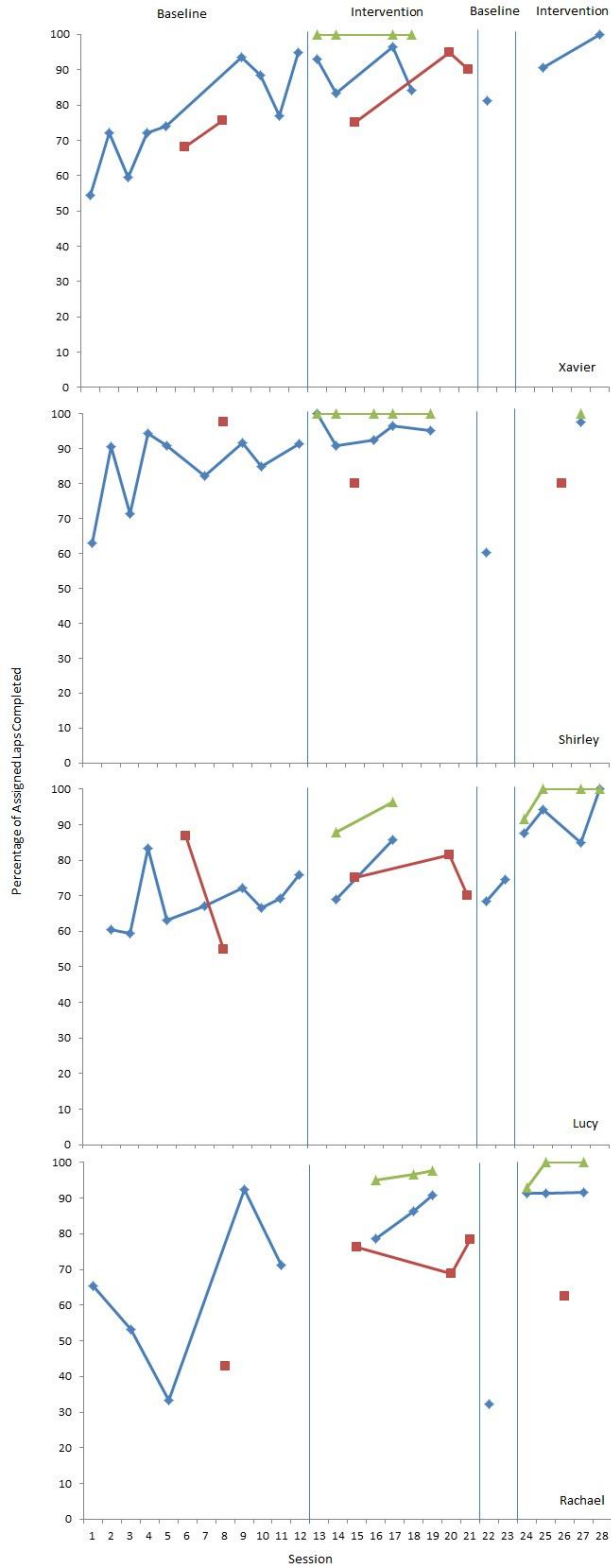


Figure 2. Percentage of assigned laps completed during team practices for Xavier, Shirley, Lucy and Rachael. Blue diamonds indicate the observer present condition and red squares indicate the observer absent condition. Green triangles represent the reported percentage of laps completed by the participant.

Table 1. The participants' responses and the mean response for the social validity questionnaire.

| | Lucas | Lucy | Xavier | Shirley | Rachael | Veronica | Mean |
|--|-------|------|--------|---------|---------|----------|------|
| 1. It was easy to self-monitor the number of laps I swam. | 5 | 4 | 3 | 4 | 4 | 6 | 4.33 |
| 2. I liked using the self-monitoring procedure. | 4 | 4 | 4 | 4 | 4 | 5 | 4.33 |
| 3. The self-monitoring procedure did not interfere with my work out. | 2 | 5 | 6 | 5 | 5 | 6 | 4.83 |
| 4. I completed more of the assigned laps when I was self-monitoring. | 6 | 6 | 3 | 4 | 5 | 5 | 4.83 |
| 5. It is important that I complete all of the assigned laps. | 5 | 6 | 4 | 5 | 4 | 6 | 5 |
| 6. I will continue to self-monitor the number of laps I complete. | 5 | 5 | 2 | 2 | 4 | 6 | 4 |
| 7. I would recommend self-monitoring to other swimmers to help them improve their performance during practice. | 6 | 4 | 4 | 5 | 6 | 6 | 4.5 |
| 8. I intentionally completed more laps when the researcher was present. | 2 | 3 | 2 | 2 | 5 | 6 | 3.33 |
| 9. I knew I was being observed on days the researcher was not there. | 5 | 1 | 1 | 1 | 1 | 4 | 2.17 |

Discussion

The results of this study showed that using self-monitoring boards increased the percentage of assigned laps completed to some extent for most of the participants. These results provide support for the findings by McKenzie and Rushall (1974) and Critchfield and Vargas (1991), which also showed that the use of self-monitoring boards increased swimmers' work output. The results also show that the addition of feedback to self-monitoring further increased performance. The added investigation of reactivity to observer presence showed mixed results, with some participants showing decreased performance in the absence of supervision. The study of reactivity in sports is important because athletes will derive the most benefit from practice when they comply with assignments and perform to expected levels in the absence of the coach as well as in the presence of the coach. Previous studies (Brackett et al., 2007; Mowery et al., 2010) showed reactivity effects in vocational and residential settings, with performance decrements in the absence of supervision. Because the findings from this study were equivocal, more studies evaluating reactivity by manipulating the observer's presence need to be conducted in sport settings. Finally, the evaluation of self-monitoring accuracy in this study showed that swimmers had a higher mean level of accuracy when they were receiving feedback.

The social validity results generally showed the swimmers had a positive view of the self-monitoring procedure and were not aware that the confederate was observing their performance. Although most of the questions had a range of similar responses,

there were a couple questions with outlier responses that are worth discussing. Question three (self-monitoring did not interfere with my workout) had one outlier. While all other participants either agreed or strongly agreed, Lucas disagreed with the statement. He was the only participant to report that self-monitoring the number of laps he swam interfered with his workout. However, he stated that he would not have changed anything about the self-monitoring procedure when asked during the interview. Rachael and Veronica both reported on the social validity questionnaire that they intentionally swam more when the observer was present (question 8), and their data and their statements from the interview concur. Lucas and Veronica reported on the social validity forms that they knew they were being observed during observer absent conditions (question 9). This response supports Lucas' comments from the interview, but not Veronica's. Lucas was the only participant during the interview to express that he noticed the confederate taking notes while watching at the pool. This awareness of the confederate's behavior could be why Lucas did not show strong evidence of reactivity.

There were a number of limitations to this study that can be addressed in future research. One major limitation is that the experimenter had little environmental control over many aspects of the study. The first major aspect was the attendance of the participants. Although attendance at practice was required by the coach, there were no consequences for being absent. Therefore, the swimmers were absent during many practices throughout the course of the study. Second, the length of the swim season greatly affected the study. The length of the study was determined by the dates of swim practice, giving the experimenter only two months to complete the study. Additionally, the swim team practiced at an outdoor pool, and some practices were canceled due to

weather. As a result, some phases were shorter than desired, in particular the second baseline phase and the second intervention phase. With a longer practice season, phases could have been extended and greater experimental control would have been shown. If there had been more time for data collection, the second baseline could have been lengthened and the final phase (self-monitoring with feedback) could have been extended and repeated after another return to baseline. Another limitation is that some initial baselines had increasing trends. However, the last half of the phase was stable for all but one participant. The lack of a reversal phase for three of the participants (Scott, Veronica and Lucas – Figure 1) constitutes another limitation. For these three participants, the effect of self-monitoring is demonstrated in a series of AB designs. Fortunately, the effect of the intervention was immediately evident for each of the three in the AB designs and a reversal was accomplished for the other four participants (Figure 2). A final limitation is the lack of replication of the final intervention phase. Although experimental control is shown as the behavior increases from baseline in the first intervention, decreases in the second baseline, and then increases with the second intervention, a more convincing demonstration of experimental control would require replication of the second intervention.

Because the study took place in the environment of the swim team and the purpose was to evaluate self-monitoring implemented by the coaches and not the experimenters, it was up to the coaches to ensure the correct self-monitoring procedure was being implemented. Both the observer and the confederate discretely reminded the coaches when necessary to tell the swimmers to correctly use their boards. Although the

coaches did remind the swimmers on occasion, there was no follow-up from the coaches. They did not walk around and ensure the boards were being used properly.

The experimenter did everything possible in this study to manipulate conditions in a manner that demonstrated experimental control. The observer and/or the confederate were present at every practice to collect data. The data were evaluated after every session to determine the best points for phase changes. Unfortunately, the phases had to be changed for all participants simultaneously because the intervention was used with the entire team. Therefore, due to the time constraints of the study, the first intervention had to be implemented even though some participants had increasing trends in baseline. In hindsight, baseline possibly should not have been extended so long, but waiting for an appropriate time to conduct a phase change concurrently among all seven participants was more difficult than expected. Changing the phases earlier would have allowed more data to be collected during the intervention phases. Perhaps in the future, using a competitive team that swims year round would grant a researcher more time to collect data and carry out longer phases. Also, as competitive club swim teams sometimes require and enforce attendance, it would be more promising to collect data every day from those swimmers. An indoor pool (although not common in the area this study took place) would prevent practice from being canceled because of the weather.

The design of the procedure with the self-monitoring boards was created as a tool to be used by the swimming coaches in order to improve work output from the team members. However, it appears that providing feedback may be necessary to achieve the greatest increase in percentage of work output, as well as self-reporting accuracy. In this study, the experimenter was the individual providing feedback. While coaches might not

be able to record swimmers' laps daily, perhaps they can "spot-check" swimmers randomly. Arbitrarily probing the number of laps completed in order to provide feedback to swimmers is a plausible way this procedure could be carried out by a coach. This procedure also could be used in a variety of sports besides swimming. With a low response effort from coaches, it is an efficient method to improve work output from athletes. If coaches consistently used self-monitoring boards with their athletes, and were to provide feedback based on the accuracy of the self-monitoring and completion of assignments, they would most likely see an increase in work output. In summary, the current research demonstrated that self-monitoring increased work output and self-monitoring with feedback produced an even greater increase in work output. However, the effects of reactivity to observer presence were mixed among the participants in the study. Additional research on self-monitoring with and without feedback and reactivity to observer presence is necessary in sports settings.

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Appendix

Social Validity Form: Post intervention

| | Strongly Disagree | Disagree | Slightly Disagree | Slightly Agree | Agree | Strongly Agree |
|---|-------------------|----------|-------------------|----------------|-------|----------------|
| It was easy to self-monitor the number of laps I swam. | 1 | 2 | 3 | 4 | 5 | 6 |
| I liked using the self-monitoring procedure. | 1 | 2 | 3 | 4 | 5 | 6 |
| The self-monitoring procedure did not interfere with my work out. | 1 | 2 | 3 | 4 | 5 | 6 |
| I completed more of the assigned laps when I was self-monitoring. | 1 | 2 | 3 | 4 | 5 | 6 |
| It is important that I complete all of the assigned laps. | 1 | 2 | 3 | 4 | 5 | 6 |
| I will continue to self-monitor the number of laps I complete. | 1 | 2 | 3 | 4 | 5 | 6 |
| I would recommend self-monitoring to other swimmers to help them improve their performance during practice. | 1 | 2 | 3 | 4 | 5 | 6 |
| I intentionally completed more laps when the researcher was present. | 1 | 2 | 3 | 4 | 5 | 6 |
| I knew I was being observed on days the researcher was not there. | 1 | 2 | 3 | 4 | 5 | 6 |