Using a multifaceted withdrawal design, this study evaluated the differential effects of publicly posted plus verbal feedback, goal setting plus verbal feedback, and publicly posted feedback, verbal feedback, and goal setting together on the performance of 3 collegiate football players in practice scrimmages. Also assessed was whether the changes in practice behavior generalized to games. The dependent variables were performances on three wide receiver skills. The results show that public posting with verbal feedback, goal setting, and public posting with verbal feedback and goal setting were effective in improving player performance to a 90% criterion level during practice, and these changes generalized to game performance.

DESCRIPTORS: coaching interventions, sports

Two commonplace interventions in sports are feedback and goal setting (Martin, Thompson, & Regeh, 2004). Feedback occurs when an individual (e.g., self-charting), others (e.g., peers and coaches), or equipment (e.g., heart-rate monitor, photoelectric beam) provide information about some aspect of performance (Lee, Nyity, & McGill, 1993). Goal setting occurs when a performance standard is established by the athlete or by a coach (Locke & Latham, 1990).

Reviews of feedback (Alvero, Bucklin, & Austin, 2001; Balacazar, Hopkins, & Suarez, 1986) and goal setting (Locke & Latham, 1990) conclude that there is considerable variability in the efficacy of each when used alone. These same reviews note that there are stronger effects when feedback and goal setting are combined with other strategies. Feedback appears to be most effective (a) when it is presented both publicly and privately, rather than publicly or privately; (b) when it is tied to comparison of an individual’s previous performance rather than to another person’s performance; and (c) when it is compared to a standard (Alvero et al.). Goal setting is strengthened when (a) the goals are made public, and (b) the goals emphasize short-term immediate outcomes (Locke & Latham).

To date, there has been no direct comparison of these components reported in sport settings. The purpose of this investigation was twofold: first, to examine the relative effects of three interventions (i.e., goal setting plus verbal feedback; public posting plus verbal feedback; and goal setting, public posting, and verbal feedback together) on the practice performance of collegiate football players, and second, to determine the extent to which these effects show generality to game settings.

METHOD

Participants and Setting

The participants were three wide receivers of a National Association of Intercollegiate Athletics Division 2 football team at a 4-year liberal
arts college in the midwest. At the beginning of
the season, the team was ranked third of the
seven teams in their conference. The wide
receivers’ coach selected players that he rated as
frequently demonstrating poor execution of
wide receiver skills during practice and game
play. Dave, Alex, and Mike consistently played
in games throughout the season, but were not
classified as starters at the beginning of the
season (i.e., did not start play every game).
Practice sessions were held 3 days per week for
2 hr per day. During that time, approximately
45 min were spent on the skills analyzed in this
study. The practice sessions were conducted on
the college football field. Games against other
teams in the same division were held weekly.

\textbf{Data Collection}

Three dependent variables were measured.
First, the percentage of correct blocks was used
to determine whether the wide receiver blocked
effectively. A block was defined as correct (i.e.,
effective) if the wide receiver checked the
progress of a defending player using legal
techniques (e.g., not holding or pushing the
defender’s back). Second, the percentage of
correct routes run was used to determine
whether the wide receiver ran a predetermined
path during an offensive play. The route run by
the player was compared to the coach’s
playbook to determine if it was correctly
performed. The playbook described set routes
to be performed by the wide receiver contingent
on the defense used by the defending team.
Thus, the route was defined as correct if the
wide receiver ran the route as described in the
playbook for the correct defense. Third, the
percentage of correct releases from the line of
scrimmage was used to determine whether the
wide receiver released freely from the line of
scrimmage. If the receiver avoided contact
initiated by a defender and began running the
predetermined route, the release was coded as
correct or free. Because of variability in the
number of opportunities that were afforded the
different players during practice and games
sessions, the first 10 releases, blocks, and routes
performed by each player were recorded for
analysis. Data were collected by videotape. Each
performance of a release, block, or a route was
coded as either correct or incorrect, and the
number of correct of trials performed was
converted to a percentage.

\textbf{Experimental Design and Procedure}

An ABACABC multtreatment withdrawal
design was used to assess the effectiveness of the
interventions.

\textit{Baseline.} During baseline the players met
with the coach, reviewed expectations for each
skill, and then proceeded to practice. While
practicing, players received verbal feedback and
error correction from the coach.

\textit{Public posting plus verbal feedback.} In this
condition, players were first informed of their
mean percentage correct performance for each
skill during the previous baseline session and
how the percentage was calculated. They were
informed that the results of the coming day’s
practice and each successive practice would be
posted on a daily performance chart. The chart
was located on the door leading to the locker
room. Data were posted on the chart prior to
the next practice session. During practice
sessions, players continued to receive feedback
and error correction from the coach. The chart
was removed at the end of this condition.

\textit{Goal setting plus verbal feedback.} The condi-
tion began with the lead investigator reviewing
the mean percentage correct performance for
each skill during the previous baseline session.
Because the dependent variables were skills that
the coaches expected these players to have in
their repertoire (as opposed to learning new
skills), there was an expectation that players
would meet a 90% correct performance in
practice scrimmage. Previous studies in similar
settings have shown that 90% correct perfor-
mance is a reasonable expectation (Ward &
Carnes, 2002; Ward, Smith, & Sharpe, 1997).
Prior to each session, the investigator met with
each player individually and informed him of
his performance during the previous session. He also reminded each player of the 90% criterion expectation and either encouraged him to meet it or congratulated him on having met the criterion in the previous session. During practice sessions, players continued to receive feedback and error correction from the coach.

Public posting plus verbal feedback plus goal setting. This condition combined the procedures of the two previous interventions. The chart was reintroduced, and the expectation of meeting or exceeding the 90% criterion was discussed individually prior to each practice session. As before, during practice sessions players continued to receive feedback and error correction from the coach.

The team coaches were not informed of the nature of the conditions and baselines, or when they would be phased into the practice schedule. Coaches did see the chart during public posting plus verbal feedback. They did not have access to the performance data at any other time. To control for variance in feedback, we randomly tracked six sessions to see if coaches spent more time with players in one condition or another. There were minor deviations from condition to condition, but most often these had to do with nontarget behavior issues (e.g., learning a new play, injuries); they occurred in a similar manner across all players.

Interobserver Agreement

An independent observer recorded each player’s performance of releases, blocks, and routes to determine the reliability of the observational data. The observer, an experienced football coach, was not directly involved with the study’s implementation or coaching the wide receivers. The reliability observer had been trained prior to the start of the study using direct observation and video recordings. He met or exceeded a criterion of 95% agreement with the primary investigator on three 45-min videotapes.

Interobserver agreement was distributed equally across phases and assessed during 50% of practice sessions and 67% of games using point-by-point agreement. Percentage agreement was calculated by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100%. The mean agreement was 96%. The means and ranges were, for releases, 97% (range, 92% to 100%); for blocks, 95% (range, 93% to 100%); and for routes, 97% (range, 90% to 100%).

Social Validity

Following the conclusion of the study, each of the participants and the head coach were asked to complete an open-ended questionnaire. Feedback was sought from the players to allow researchers (a) to assess the acceptability of the three interventions and their effects, (b) to detect other effects not discernible from the data (including undesired effects), and (c) to adjust the procedures in future studies. The questionnaire was completed anonymously.

RESULTS AND DISCUSSION

Figures 1 through 3 show the percentage of correct performances in practices and games for the three dependent variables for each player. The data are remarkably similar among the players across skills. During baseline, performances ranged between 50% and 80% correct, except for Dave’s release performance for Day 10, which was 90%. Correct performance during games ranged between 60% and 80%. During public posting plus verbal feedback, correct performance ranged between 80% and 100%, and correct performance during games ranged between 90% and 100%. Baseline levels were recovered for all behaviors during practices and games.

Performances were better during goal setting plus verbal feedback than during public posting with verbal feedback for at least one of the dependent measures of each participant, and the
results were similar for the two conditions on the other dependent measures. Baseline levels were recovered for all behaviors during practices; however, the game data remained at least 10% higher than baseline levels. During the combined phase levels, all practice performances were consistently between 90% and 100% correct and all game performances were 100% correct.

It is not possible to draw conclusions about the relative effectiveness of the treatments, in part because all participants had high initial baselines and because the order of treatment introduction was the same across all conditions. There was also some evidence for an improving trend during public posting plus verbal feedback for some of the data paths. The findings do show, however, that each treatment was better than baseline, and this finding supports the use of goal setting and public posting with verbal feedback in sport. The social validation
questionnaires indicated that players and coaches preferred the combined intervention to the other two interventions and to baseline. Players reported that individual goal setting was the least preferred intervention because of the absence of visual feedback. A second contribution of this study to the literature is the demonstration of generalization from practice settings to game settings. The strength of this transfer serves to validate not only the intervention procedures but also the effects of the intervention.

A third contribution of this study is that dependent measures were defined in terms of outcomes rather than topography alone. The topography of the performance was determined either by comparing it to the playbook (e.g., running a pattern in response to a specific offense or defense) or according to the legal rules of play (e.g., tackling). In addition, the

Figure 2. The percentages of blocks, routes, and releases during practice and game sessions for Mike.
successful outcome of the performance was included in the definition. In sporting contexts, both outcomes and topography are important. However, the outcome is also a function of the play selection by the coach or quarterback and performances of the other team. Thus, care must be taken to define the outcome in terms of the initial success.

The specific behavioral processes that operated in this study are unclear. Some authors have suggested that publicly posted feedback may have multiple functions (e.g., discriminative, reinforcing, and punishing) relative to the particular context (Alvero et al., 2001; Duncan & Bruwelheide, 1986; Van Houten, 1980). Given the immediacy of the change between the interventions and baseline, the results are unlikely to be explained in terms of learning. It seems more likely that the results were influenced by motivational factors. In particu-
lar, we hypothesize that these are demonstrations of motivating operations (Laraway, Sny
cerski, Michael, & Poling, 2003). However, more tightly controlled research will be necessary to test this hypothesis.

The problem addressed in this study of assuring consistent high-quality performances over the course of a season is a common challenge to coaches and athletes. Although the gains reported in this and similar studies (e.g., Ward & Carnes, 2002; Ward et al., 1997) are small relative to baseline measures of 70% to 80% correct, the consequences of performing at levels below the treatment criterion of 90% include missing an opportunity to start on the team or to receive scholarships for student athletes.

REFERENCES


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