Assessing the Effectiveness of Self-Talk Interventions on Endurance Performance

RYAN A. HAMILTON, DAVID SCOTT, AND MICHAEL P. MACDOUGALL

University of New Brunswick, Canada

Self-talk in sport has been widely researched with somewhat conflicting results (Van Raalte et al., 1995; Perkos et al., 2002). The purpose of this study was to assess the effectiveness of three different self-talk interventions on endurance performance. Participants were nine cyclists who performed a 20-minute cycling ergometer workout two times per week for five weeks. At each workout participants were requested to cycle as far as possible. A multiple-baseline design was utilized, which after varying baseline lengths allowed for the implementation of one out of three self-talk interventions: self-regulated positive self-talk, assisted positive self-talk, and assisted negative self-talk. Results revealed a performance increase in all groups with the greatest increase being found in the assisted positive self-talk condition.

Previous research has demonstrated that specific performance strategies influence the intensity and duration of someone’s performance (Scott, Scott, Bedic, & Dowd, 1999; Tammen, 1996). One of the most commonly used strategies is that of self-talk (Gould, Finch, & Jackson, 1993; Madigan, Frey, & Matlock, 1992). Indeed, it has been suggested that self-talk interventions and procedures are some of the most widely applied and effective strategies used by athletes (Park, 2000; Weinberg, Grove, & Jackson, 1992). Self-talk strategies have been examined in a wide variety of sports and tasks including basketball (Perkos, Theodorakis, & Chroni, 2002), cricket (Holt, 2003; Slogrove, Potgieter, & Foxcroft, 2003), golf (Harvey, Van Raalte, & Brewer, 2002), ice hockey (Rogerson & Hrycaiko, 2002), soccer (Papaoannou, Ballon, Theodorakis, & Auwelle, 2004), swimming (Wang, Huddleston, & Peng, 2003), tennis (Mamassis & Doganis, 2004), and water polo (Hatzigeorgiadis, Theodorakis, & Zourbanos, 2004). The popularity of self-talk would seem to support the belief that it is indeed related to sport performance.

Ladin and Hebert (1999) suggested that athletes use self-talk in both practice and competition as the result of, or to bring about, a specific outcome. Anderson (1997) suggested that self-talk refers to what athletes say to themselves in an attempt to think both more appropriately about their performance and to direct their actions in such a way to reach a desired outcome. According to Zinsser, Bunker, and Williams (1998) self-talk influences performance in a number of ways including the acquisition of skills, the development of self-confidence, and the self-regulation of habits. The content of individual self-talk tends to be either positive, negative, or neutral, although the specific type used may be task-specific (Hatzigeorgiadis et al., 2004, Moran, 1996).
Much of the research on self-talk has focused on the comparison of positive and negative self-talk groups. The former has been described as the one that helps athletes stay focused, not dwell on past errors, and remain in the present (Perkos et al., 2002). It has been suggested by Hardy, Jones, and Gould (1996) that positive self-talk may enhance performance through increases in confidence and anxiety control and Landin (1994) proposed that the effectiveness of positive self-talk was related to attentional processes. A series of studies have reported that positive self-talk is associated with enhanced performance in a number of sports, including figure skating (Ming & Martin, 1996), golf (Kirschenbaum, Owens, & O’Connor, 1998; Thomas & Fogarty, 1997), soccer (Papaioannou et al., 2004), and tennis (Defrancesco & Burke, 1997; Mamassis & Doganis, 2004; McPherson, 2000). Dagrou, Gauvin, and Halliwel (1992) reported that positive self-talk was associated with superior performance, as did Schill, Monroe, Evans, and Ramanaiah (1978). Van Raalte, Brewer, Lewis, Linder, Wildman, and Kozimor (1995) reported that positive self-talk participants performed significantly better than negative self-talk participants on a dart-throwing task; Johnston-O’Connor and Kirschenbaum (1986) reported the same on a golfing task, and Kirschenbaum, Ordman, Tomarken, and Holtzbauer (1982) reported the same on a bowling task. The belief that positive, rather than negative, self-talk enhances performances has led to the implementation of a number of positive self-talking techniques, namely, thought stopping, cognitive restructuring, and countering (Van Raalte, Brewer, Rivera, & Petitpas, 1994).

On the other hand, negative self-talk has been considered as being inappropriate, anxiety-producing, and counterproductive (Hatzigeorgiadis et al., 2004). As previously pointed out, a number of researchers have reported that positive self-talk participants performed significantly better than negative self-talk participants on a variety of sporting tasks (Johnston-O’Connor & Kirschenbaum, 1986; Kirschenbaum et al., 1982; Van Raalte et al., 1995). Indeed, Van Raalte et al. (1994) suggested that experimental research evidence examining the effects of self-talk on performance indicated that negative self-talk was associated with worse performance. However, a number of other researchers have come to a different conclusion and some have suggested that research results are equivocal with positive and negative self-talk being associated with both good and poor performance (Hatzigeorgiadis et al., 2004; Perkos et al., 2002). It was reported by Van Raalte, Cornelius, Brewer, and Hatten (2000) in a study involving junior tennis players, results indicated negative self-talk was not associated with losing. Furthermore, Rotella, Gansneder, Ojala, and Billing (1980) found that elite skiers did not differ from less successful ones with regard to the type of self-talk used and Highlen and Bennett (1983) reported that elite qualifying divers used less positive self-talk than elite, non-qualifying divers.

So why the ambivalence with regard to the effect of positive and negative self-talk on performance? There are a number of possible explanations. First, it has been suggested by Van Raalte et al. (2000) that negative self-talk may only be harmful to the performance of certain athletes since self-talk is a uniquely personal experience that influences individuals in a particular way. Second, self-talk may serve as a motivational tool. Goodhart (1986) has suggested that individuals who employ negative self-talk may actually be encouraging themselves to avoid a negative outcome and so try harder than those individuals who employ positive self-talk. This contention is supported by Van Raalte et al. (1995) who proposed that expectations with regard to future performance may be fuelled through negative self-talk and by Horn, Lox, and Labrador (2006) who suggested that individuals who receive criticism, which includes negative self-talk, perceive themselves as more competent than individuals who receive neutral responses to failure. A third possible explanation is that the retrospective self-reports of athletes are unreliable and may also be subject to recall bias (Van Raalte et al., 1994). Fourth, it may be that individuals are simply unable to accurately recall their own unique past self-talk. Fifth, it has been suggested that different types of self-talk may
be influential across different sports (Hatzigeorgiadis, Theodorakis, & Zourbanos, 2004). For example, the effect of negative or challenging self-talk on technique sports or sports with a high cognitive component may be drastically different from sports comprising of a more physical nature. It may well be the case that sports that are heavily oriented toward precise technique or in-depth decision making may not benefit from more challenging self-talk. There is evidence which lends some support to this contention (Hatzigeorgiadis et al., 2004) but more research is required in this area.

Finally, it may be suggested that the uncertainty generated by conflicting results is in some part a result of the design methodology that has been implemented. Indeed, concerns have been raised with regard to the most appropriate type of research design for applied sport psychology (Bryan, 1987; Greenspan & Feltz, 1989; Seiler, 1992). A number of researchers (Hrycaiko & Martin, 1996; Wanlin, Hrycaiko, Martin & Mahon, 1997) have suggested that single-subject designs have a number of features that make them appropriate for evaluating the effectiveness of interventions in the sport environment. Single-subject designs allow for ongoing monitoring of athletic performance, a feature of interest to both athlete and coach. In addition, not only do single-subject designs permit the scientific and practical evaluation of the intervention, the design also promotes the study of individual responses to psychological skills training (Scott, Scott, & Goldwater, 1997, Shambrook & Bull, 1996). This would seem to be of particular importance in cases where individual athletes differ in their responses to varying types of self-talk.

Therefore, the purpose of this study was to examine the effect of positive and negative self-talk on performance on a cycling ergometer task. More specifically, the study examined the influence of self-regulated positive self-talk, assisted positive self-talk, and assisted negative self-talk on performance. In the self-regulated self-talk condition, participants were introduced to positive self-talk and encouraged to use it, whereas in the assisted positive and assisted negative self-talk conditions participants were audibly provided with self-talk. Applying an assisted self-talk intervention was important as it provided a variety of prompts for using self-talk throughout the trial, enabling a fairly rigorous intervention. The assisted self-talk conditions were not unlike a self-talk coach cueing the participant as to which thoughts may be most appropriate at different points of the trial; a strategy yet to be tested in the self-talk literature. This approach was taken to further insure the interventions were being applied as designed. In the latter two conditions, recall problems were controlled, to some extent, whilst the examination of individual responses to specific self-talk was still possible.

METHOD

Participants

Nine university students (three women and six men, mean age = 20.88, standard deviation = 2.89) volunteered to participate in and complete the study. Three additional participants volunteered but withdrew before completion. All participants were familiar with cycling on a stationary bike, although none of the participants reported cycling at a competitive level. All participants were physically active at least three times per week, had participated in high school sport only, and only two were familiar with the concept of self-talk at the commencement of the study.

Experimental Design

This design followed a single-subject multiple-baseline design protocol set out by Scott et al. (1999). The multiple-baseline design demonstrates that following a period of performance stability, enhanced performance only occurs when the intervention is introduced (Scott et al.,
1999). This is conducted in a sequential pattern so as to eliminate the influence of extraneous variables.

Kazdin (1982) suggested that when baseline performance is stable, intervention is applied to the first participant. Stability is reached when the data indicate a level of performance with limited variability (i.e., the participant is no longer improving at the task). Data continue to be gathered for the other participants, who are still on baseline. If the intervention is effective, one would expect changes only in the targeted performer. Performances of those participants who are still on baseline should remain constant. If the performance during the intervention phase changes, and those still at baseline remain constant, this suggests that the intervention was responsible for the change. The intervention is then introduced to a second participant. Data continue to be gathered for the third participant, who remains on baseline. Should the second participant's performance also change in the same direction as the first, one can be confident that the intervention was responsible for the performer's change. The intervention is finally introduced to the third participant, where one would expect a performance change similar to that demonstrated by the first two participants. Thus, to dispel the notion that an extraneous variable was responsible for the performance change, introduction of the intervention is staggered across all participants. The pattern of results should illustrate that whenever the intervention is applied, performance is altered. The repeated demonstration that performance changes in response to the intervention usually discredits the influence of extraneous variables.

In this present study, a single-subject multiple-baseline design across nine university students with limited cycling experience was employed. Initially four participants were recruited per condition. However, before completion of the study one participant from each group had withdrawn. Having three participants per condition was sufficient for this design and is not uncommon in the literature (Greg, Hrycaiko, Mactavish, & Martin, 2004; Scott et al., 1999). Following a stable baseline period participants were randomly assigned to one of three conditions: self-regulated positive self-talk, assisted positive self-talk, and assisted negative self-talk. The assisted conditions were used as a means of assessing the content of the self-talk. In the self-regulated condition which is common in self-talk research, it can be difficult to conduct a meaningful manipulation check. However, this was much more accessible in the assisted conditions where participants were asked to re-state the self-talk content that had been available to them.

The condition of baseline stability was met when participants were showing little or no variability in their performance from trial to trial. Although each participant completed a varying number of baseline and intervention sessions, the total number of sessions for each participant was 10. This permitted some participants to be on intervention while others remained on baseline.

Dependent Variable

The dependent variable was the total amount of work completed over the 20-minute session by each participant. Total work (kpm/20 minutes) was the product of rpm's and resistance. The combination of rpm's and resistance is used in the standard procedure of Wingate testing, which is used to calculate participant power (Reiser, Broker, & Peterson, 2000). The summed observations of power throughout the trial produced the dependent variable of Total Work.
Observer Training, Interobserver Reliability, and Manipulation Checks

Prior to the study, the researchers developed a protocol to follow when collecting data. This involved ensuring that the cycling ergometer was properly calibrated prior to each session, in addition to the systematic recording of performance throughout the trial. The observers did not encourage or in anyway interfere with each participant’s performance and provided the same instructions and comments to all participants for all sessions.

All participants were instructed to internalize and use their particular interventions throughout each trial. In the assisted conditions researchers checked with the participants with regard to the content of their self-talk and whether it matched the assisted self-talk that they had just heard. In other words: Did they use as self-talk the statements that the researchers had provided them in the assisted conditions? This was done at the completion of each session. Participants in the self-regulated group were asked at the end of their sessions to give examples of the self-talk statements that they had used. The manipulation check revealed that all participants could recall the self-talk that they used during the trial and reported that they used these statements the majority of the time. Had participants failed in either regard, their trial data would have been eliminated from the analysis.

Procedure

Baseline Phase

Each participant completed a 20-minute cycling ergometer workout twice a week with workouts being spaced at least one day apart. All workouts were completed on a Monark cycling ergometer in a research laboratory. Participants were given ten minutes to warm up and stretch prior to the workout; the warm-up routine was documented and participants warmed up the same way for each session. They were instructed that the goal of each session was to complete as much work (output) as possible in the 20-minute timeframe. During the 20-minute test, participants were able to view an output reading of their rotations per-minute as well as the ergometer resistance. They were able to alter both rotations per-minute and resistance throughout the trial to optimize their control over their level of work. In addition, the researchers informed the participants every two minutes about the amount of time remaining in the session. Following the ergometer workout, total work was calculated and recorded.

Intervention Phase

During intervention, participants were assigned to one of three conditions: positive self-talk, assisted positive self-talk, or assisted negative self-talk. Each condition consisted of the following:

1. Self-regulated positive self-talk group: Participants in this group were given an introduction to positive self-talk. They were instructed in how to use positive statements to increase confidence, prolong persistence, and increase effort. Participants in this group were given a sheet with examples of statements, which they could use or modify, prior to the beginning of each intervention session. Examples of positive statements were: “My legs are strong and powerful” and “I can maintain this pace.”

2. Assisted positive self-talk group: Participants were given the same introduction as those participants in the self-regulated positive self-talk group. However, participants in this group were then advised that they would be listening to an audiotape as they cycled. The tape contained positive statements which participants were encouraged to internalize and elaborate. The script for the tape was identical to the list given to participants in the self-regulated positive self-talk group.
3. Assisted negative self-talk group: Participants were given an introduction to self-talk. However, they were then advised that they would be listening to an audiotape as they cycled. The tape contained negative comments and participants were advised that they would be listening to this tape for the remainder of the intervention sessions. The script for this tape consisted of a variety of negative statements that the participants were asked to internalize. Examples of negative statements were: “My legs are weak and lethargic” and “I can’t maintain this pace.”

The intervention workout procedure was identical to that of the baseline condition. All procedures were carried out in an identical fashion and total work was calculated and recorded.

RESULTS

Means and standard deviations for the mean work completed in the 20-minute workout by each participant from baseline to intervention are shown in Table 1. A summary of the mean change, percentage increase, change in variability and percentage of overlapping points is provided in Table 2. The items in Table 2 are outlined as follows:

Mean Change

The difference between the mean baseline value and the mean intervention value (kp/m).

Percentage Increase

Mean intervention change expressed as a percentage of baseline.

Change in Variability

The change in standard deviation from baseline to intervention.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Means and Standard Deviations for Mean Work per minute (kp/m) in Three Self-Talk Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition/Participant</td>
<td>Baseline</td>
</tr>
<tr>
<td></td>
<td>M</td>
</tr>
<tr>
<td>Positive (Self-Regulated)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>905.4</td>
</tr>
<tr>
<td>2</td>
<td>809.3</td>
</tr>
<tr>
<td>3</td>
<td>917.3</td>
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<tr>
<td>Positive (Assisted)</td>
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<tr>
<td>4</td>
<td>568.7</td>
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<tr>
<td>5</td>
<td>814.8</td>
</tr>
<tr>
<td>6</td>
<td>1212.8</td>
</tr>
<tr>
<td>Negative (Assisted)</td>
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<td>7</td>
<td>780.4</td>
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<tr>
<td>8</td>
<td>994.7</td>
</tr>
<tr>
<td>9</td>
<td>822.7</td>
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</table>
Table 2
Mean Shift, Percentage Increase, Change in Variability, and Percentage of Overlapping Points from Baseline to Intervention Conditions

<table>
<thead>
<tr>
<th>Condition/Participant points</th>
<th>Mean change (kp/m)</th>
<th>Percentage increase</th>
<th>Change in variability</th>
<th>Percentage of overlapping</th>
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<tr>
<td>Positive (Self-regulated)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>206.8</td>
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<td>−123.86</td>
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<td>2</td>
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<td>3</td>
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<tr>
<td>Positive (Assisted)</td>
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<td></td>
</tr>
<tr>
<td>4</td>
<td>224.8</td>
<td>39.5</td>
<td>59.53</td>
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<tr>
<td>5</td>
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<td>0</td>
</tr>
<tr>
<td>6</td>
<td>371.2</td>
<td>30.6</td>
<td>−163.70</td>
<td>0</td>
</tr>
<tr>
<td>Negative (Assisted)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>61.5</td>
<td>7.9</td>
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<tr>
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<td>277.3</td>
<td>33.7</td>
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</tbody>
</table>

Percentage of Overlapping Points

The percentage of overlapping points represents the percentage of intervention points equal to or less than the highest baseline data point.

All individual performances from baseline to intervention are presented in Figures 1, 2, and 3. Results indicated that all intervention conditions produced a positive impact on performance for the cycling task. The three participants who received the assisted positive self-talk intervention demonstrated the greatest change with a mean improvement of 281KP/M (32%). The mean improvement for the self-regulated positive self-talk group and assisted negative self-talk groups were 205 KP/M (23.4%) and 94.4 KP/M (11%), respectively.

Participant 1 (Self-Regulated Positive)

This participant showed a clear performance improvement from baseline to intervention (see Figure 1). In addition to an increase in work-per-minute this participant also displayed less variability in performance during the intervention. All performances in intervention were at a level greater than any in baseline and there was a clear change in level from baseline to intervention.

Participant 2 (Self-Regulated Positive)

This participant demonstrated a clear mean performance improvement from baseline to intervention (see Figure 1). All performances in intervention were at a level greater than any recorded during baseline. Little change in variability was demonstrated in the intervention phase.

Participant 3 (Self-Regulated Positive)

This participant displayed a marked performance improvement from baseline to intervention (see Figure 1). There was a marked change in level from baseline to intervention and all intervention performances were at a level greater than those recorded during baseline.
Participant 4 (Assisted Positive)

This participant demonstrated a marked performance increase from the baseline to intervention condition (see Figure 2). There was a clear change in level immediately following the administration of the intervention. Despite the increased variability in the intervention phase, all points were above the highest data point achieved in baseline.
Participant 5 (Assisted Positive)

This participant demonstrated a clear performance increase from the baseline to intervention condition (see Figure 2). In addition to increased performance, this participant also demonstrated less variability in performance during the intervention phase. All performances during intervention were at a level greater than those during baseline, and there was a clear change in level from baseline to intervention.
Figure 3. Work per minute (kp/m) for participants 7, 8, and 9 (assisted negative self-talk).

**Participant 6 (Assisted Positive)**

This participant demonstrated a marked performance increase from the baseline to intervention condition (see Figure 2). In addition to increased performance, this participant also demonstrated much less variability in performance during the intervention phase. This participant also displayed less variability in performance during intervention.
Participant 7 (Assisted Negative)

This participant showed a small mean performance increase from baseline to intervention (see Figure 3). The intervention did not produce an immediate performance increase and 40 percent of intervention data points overlapped with baseline data.

Participant 8 (Assisted Negative)

This participant demonstrated a small mean decrease from baseline to intervention (see Figure 3). The introduction of the intervention did not result in an immediate impact on performance either in a positive or negative direction. Furthermore, 100 percent of the intervention data points overlapped with baseline data. This participant also displayed an increase in variability during the intervention phase.

Participant 9 (Assisted Negative)

A clear mean shift was demonstrated by this participant from baseline to intervention (see Figure 3). However there was not a clear change in level from baseline to intervention and 50 percent of the intervention data points overlapped with baseline data. This participant showed a large decrease in variability in the intervention phase.

DISCUSSION

The findings of this study contribute to the literature in several ways. First, the results of this study lend support to previous self-talk studies that have examined the effectiveness of positive self-talk on performance (Defrancesco & Burke, 1997; Kirschenbaum et al., 1998; Mamassis & Doganis, 2004; McPherson, 2000; Ming & Martin, 1996; Papaioannou et al., 2004; Thomas & Fogarty, 1997). It was found that positive self-talk, whether self-regulated or assisted, does have a beneficial impact on endurance performance. However, the present study examined the effect of an assisted, or controlled, self-talk intervention on performance, an issue that has not been studied yet. The finding that assisted positive self-talk is linked with performance gains is important. This may be particularly apt when a coach or consultant is working with an athlete who has little or no experience with mental skills. By aiding the athlete in the early skill acquisition stage through an assisted positive self-talk intervention, the athlete may be likely to acquire the skill more rapidly, stay motivated longer, develop self-confidence sooner, and bring about performance increases earlier.

A second finding of this study relates to the discovery that two of the three participants who received the assisted negative self-talk intervention improved their performance. This finding is in contrast with previous research, which has suggested that negative self-talk is detrimental to sport success (Harvey et al., 2002; Van Raalte et al., 1994). However, this result does partly support the suggestion that negative self-talk may only be harmful to the performance of specific athletes and that for some individuals self-talk may serve as a motivational tool (Goodhart, 1986; Van Raalte et al., 2000). One can speculate as to why negative self-talk acts as a motivational cue for certain athletes. It may be that for certain individual athletes negative self-talk is interpreted as being challenging in nature rather than negative. In other words, the actual style of the self-talk (negative or positive) is not nearly as important as the interpretation of its content, (i.e., positive, negative, or challenging). For certain athletes negative self-talk is interpreted as a challenge to which they positively respond. For these athletes negative self-talk may be better described as challenging self-talk. The outcome of this response is an improvement in performance. However, the precise cognitive restructuring which brings about
such an interpretation of self-talk and subsequent changes in performance warrants further investigation.

Third, although one cannot discount other explanations, the multiple-baseline design which is staggered over time, makes it less likely that any variable, other than the self-talk intervention, brought about performance improvement. This design allows the researcher to accurately assess how specific types of self-talk influence specific athletes. Previous research (Van Raalte et al., 2000) has suggested that athletes may well differ in their individual responses to self-talk. Not only do the results of this study confirm this, but the study serves to demonstrate that the single-subject methodology is an ideal method in which to study the phenomenon.

Fourth, a single-subject design permits a more complete and detailed analysis with regard to individual performance in each of the self-talk conditions. Since such designs allow for scientific, practical, and in-depth assessment, they are particularly well suited to the applied situation and are valued by coach and athlete alike. The results of this study would suggest that one type of self-talk does not fit all conditions. Not only is it important to match up the category of self-talk with the type of sport, but it is as equally important to match up the category of self-talk with the specific individual.

The results of this study lend support to the notion that both positive and negative self-talk, regardless of how it is delivered (self-regulated or assisted), can lead to enhanced performance. This may lead one to hypothesize that the nature, content, and delivery of self-talk may not be as important as the individual interpretation of that self-talk. This study supports the notion that the influence self-talk has on performance is individual in nature and that its interpretation by the athlete is a crucial factor. Since the nature and extent of performance improvement is specific to each individual athlete, care needs to be taken, particularly when introducing negative self-talk as a performance enhancement tool. The results of this study suggest that for some athletes negative self-talk will aid performance, but for others it will have the opposite effect.

Developing the assisted self-talk interventions without input from the participants involved is a limitation. In developing interventions the athlete, or in this case the participant, using them is a crucial factor. It could be speculated that the results for the assisted self-talk groups would have been more pronounced if the participants applying them had a hand in their development. Furthermore the individual characteristics of each participant were disregarded to a certain degree as standardized protocol, standardized interventions, and experimental controls were emphasized.

Finally, the results of this study also raise some issues with regard to future research. More specifically, research needs to be conducted with regard to the psychological characteristics of those athletes who benefit from specific types of self-talk. Future researchers may also wish to test the overall generalizability of the present findings in a larger, group-design, project.

REFERENCES


