# A SURVEY INTO THE USE OF COGNITIVE AND BEHAVIORAL PRIMING TECHNIQUES IMPLEMENTED BY ATHLETES TO IMPROVE ATHLETIC PERFORMANCE

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## Abstract

This study aimed to examine the frequency and modes of psychological priming techniques and strategies being implemented by athletes of a variety of performance levels. A 15-question, anonymous questionnaire was developed and shared via social media sites. The survey implemented a quantitative method approach to collect background information (e.g., demographics, competition, and training history), the prevalence of priming, and the methods used. Ninety subjects met the inclusion criteria (71 men, 18 women, 1 subject did not identify their sex), with a median age of 28 ± 7.47 (24-33) years and training age of 11 ± 7.57 (8-18) years. Self-selected participation level accounted for 11 professional, 17 semi-professional, and 54 amateur level athletes. Priming strategies were implemented by 79% of subjects without the use of a coach, 10% used strategies with their coach, and 11% did not prime. For athletes, music was the preferred choice (27%), followed by instructional self-talk (24%), motivational self-talk (23%), applied physical actions (20%), and watching videos clips (6.3%). Coaches preferred motivational statements with 55% implementing this technique, followed by 27% utilizing inspiring team talks, and only 18% playing music. Of those that implemented a priming strategy, 66% found them to be either “very” or “extremely effective”. With 38% of subjects feeling priming accomplished this through increased motivation, 22% felt it reduced their fear and anxiety, 21% thought it improved their intensity, 15% felt it increased strength and power, and 2% felt it improved endurance. The chi-square test also found a significant ($\varphi c = 0.27$; $p = 0.011$) relationship with the use of priming to increase motivation. These results demonstrate priming strategies are being used irrespective of coach intervention, therefore educating coaches and athletes on the implementation of priming techniques has its place when aiming to improve athlete performance.

**Key words:** Priming, techniques, strategy, psychological, improve, performance

## Introduction

The primary role of strength and conditioning (S&C) coaching is to enhance athletic performance and mitigate any potential risk of injury (44). Therefore, professional practice emphasizes exercise prescription, with the intention of creating progressive overload and sport-specific neuromuscular adaptations. However, research would suggest that the role is much more complex, with a wide variety of skill-sets (for example, creating game day itineraries, keeping teams to a schedule, being sideline managers, and handling team discipline (28)) needing to be utilized to maximize athletic performance (28,37). What is possibly given less consideration, is how strength and conditioning coaches can directly affect athlete training effort, behavior, and motivation and thus further adaptions by this means. Psychological priming (also known as “psyching-up”) of an athlete for a given physical task has been defined as “the use of cognitive techniques designed to improve performance before or during competition” (48). Early research from Owen and Lee (32) suggested successful athletes who utilize cognitive strategies differently to less successful athletes, produced greater athletic performances, due to increased self-confidence and self-efficacy, which in turn, helps regulate arousal for the physical task in question. For example, Gould et al., (11) interviewed the United States of America 1988 Olympic weightlifting team, and reported their best performances occurred after undertaking mental preparation techniques of visualization, positive self-talk, and focusing on tactical strategies.

In preparation for physical activity, athletes will typically undertake a “warm-up” to physically and mentally ready themselves to perform (16). The mental preparation will typically involve the implementation of cognitive and behavioral techniques. Behavioral techniques are those not based on a conscious mental strategy, such as listening to music, which potentially can alter emotions and moods, heighten arousal, reduce inhibition, and induce higher states of functioning (17). Cognitive techniques involve various structured psychological frameworks, these include imagery, self-talk, goal setting, arousal, and attentional control (35,43,46). It has been postulated that these techniques can increase focus of attention, self-efficacy, motivation, confidence, mental activation and physiological arousal (2,46). For example, goal-setting facilitates self-regulation, with the goal defining what constitutes an acceptable level of performance (22). Therefore, effort and specificity are central to this framework being successful (3).

Williams and Krane (50) commented that athletic performance levels can be improved when cognitive behavioral strategies are implemented. Lebon et al., (23) confirmed this when reporting significant strength gains in nine sport students after implementing mental imagery strategies during rest periods between sets in 12 training sessions over six weeks. The subjects visualized their muscles contracting for the sled leg press. The number of repetitions completed at 80% of one repetition maximum (1RM) increased by 17.75 repetitions, representing eight more than the control group (effect size [ES] = 0.7) (23). Sprinting performance over a test distance of 30-m has also been reported to improve when implementing a 30-s imagery technique immediately before (ES = 0.61) and at 1-minute (ES = 0.40) and 2-minute (ES = 0.30) intervals prior to the test, in 16 male regional sprinters (13). Therefore, the implementation of cognitive priming techniques prior to undertaking an athletic performance can potentially achieve increases in performance levels.

Gluch (11) reported how athletes may use music to prime their performances. Similar to cognitive strategies, this behavioral technique can alter emotions and moods, heighten arousal, reduce inhibition, and induce higher states of functioning (17). For example, Karageorghis et al., (19) reported a significant 2% improvement in a 200-m freestyle time trial whilst listening to asynchronous music (the music does not match the pace of the activity) in 20 collegiate swimmers. Research into priming for strength and power using music is in its infancy (19,22,25), however, the emerging research using music to prime strength performance has typically reported positive results (17,18). Improvements in handgrip strength by 0.63 N/kg were noted after listening to pre-task fast-tempo music (at 126 beats per minute [bpm], played at a high intensity of 80 decibels), compared to matched controls (18).

It has been reported that S&C coaches are in an ideal position to implement psychological interventions in training as they are independent from the sports coach but have regular contact with the athlete (1). Therefore, recent research has focused on understanding the knowledge, use, and perceptions of these strategies with S&C coaches (37,38,39). Interviews conducted with 18 coaches identified that they predominately employ priming strategies to enhance confidence and arousal regulation, largely through goal-setting (39). To gain a wider understanding of priming strategies being utilized, Radcliffe et al., (39) investigated the employment of psychological strategies from 112 S&C coaches. Strategies ranged from simple techniques that are easy to measure (e.g., goal-setting) to more complex techniques which require an increased understanding of psychology (e.g., imagery);

however, the former were utilized far more frequently than the latter. Radcliffe et al., (37) reported the reason for this was that coaches felt they had insufficient knowledge and inability to inform their athletes about complex strategies. Coaches also identified that if athletes believe the strategy is customized to them, then they are more likely to respond positively, rather than using a strategy with no personal link to themselves.

Thus, athlete priming represents an additional strategy to maximize training intensity, overload, and ultimately adaptations. However, there is a distinct lack of research investigating the implementation of such techniques (38). Furthermore, previous research has not considered the athlete's perspective of priming, something which seems especially pertinent given the aim is for their performance to improve. Linking this to the current research could demonstrate how prevalent priming is and whether athletes are consciously believing and implementing such strategies for the reported physiological or psychological benefits, or whether they are inadvertently undertaking these measures. Harnessing strategies already implemented by athletes could lead to greater performance improvements rather than using prescriptive priming strategies. S&C coaches and sport scientists in general, should be aware of the various stimuli being used, and note that they can be deliberately planned. In this study, we aim to: (a) identify whether any form of priming was being implemented, (b) what these strategies were, and (c) whether there was any coach involvement. Understanding the evidence may assist in optimising training interventions which aim to enhance athletic performance.

## Methods

### *Experimental Approach to the Problem*

As this research area is relatively new, a pragmatic approach was taken. An expert panel consisting of sports psychologists and strength and conditioning coaches formulated the questions (survey) and initially piloted it on a small group of sports science students. This process and the ensuing feedback, reflection, and subsequent edits, resulted in the design of the short anonymous survey used within this study. The survey contains exploratory quantitative questions addressing whether athletes of varying abilities engaged in the use of priming techniques prior to performance or practice. If they did, which techniques did they use, what were their feelings towards the priming strategy, and where did they learn or adopt it from.

### *Subjects*

A convenience sample method was implemented with a total of 90 subjects from 93 fully completing the questionnaire, with three being removed due to partial completion and subsequently not reporting enough information. Inclusion criteria required all subjects to be a minimum age of 18 and have a minimum training age of five years with a coach in their respective sport. Seventy-one were male, 18 were female, and one subject did not identify their sex. There was a median age of 28 $\pm$ 7.47 (24-33) years and a median training age in their sport of 11 $\pm$ 7.57 (8-18). Subject's ability levels ranged from those that did not compete in sport (*n* = 7, 7.9%), to amateur (*n* = 54, 60.7%), semi-professional (*n* = 17, 19.1%), and professional (*n* = 11, 12.4%). Sporting backgrounds were from CrossFit, weightlifting, bodybuilding, powerlifting, rugby, athletics, running, golf, hurling, Jiu jitsu, volleyball, trampolining, gymnastics, cycling, climbing, hockey, judo, rowing, Gaelic football, and swimming. Subjects were informed that data would be collected anonymously and that by proceeding they were providing their consent for their participation in the research. Ethical approval was granted by the [deleted for peer review] research and ethics committee.

### *Procedures*

This survey was administered via the online survey platform Qualtrics. This online method was chosen due to the platform's ease of access, user friendly interface and offered a wider reach to athletes, which could potentially increase response rates. Subjects were requested to complete the questionnaire regarding selected priming techniques, along with open-ended questions allowing space to expand on any strategies that were implemented.

Multiple answers could be given for select questions should the subject have chosen to do so. The survey was standardized with all questions presented in the same order. The utilization of a quantitative approach was suggested for improving the efficacy of future priming intervention programs. Data was analyzed using Microsoft excel and IBM SPSS Statistics software (version 25.0; SPSS, Inc).

*Questionnaire*

The online survey contained 9-15 questions for subjects to respond to, consisting of multiple choice and open-ended formats to allow for greater depth of answer. Specific protocols were undertaken to assure questions did not consist any bias. This involved pilot testing on a comparable athletic sample ($n$ = 30), after a panel of experts agreed on the questioning. Part one collected subject's demographic information, which are reported in Table 1 (questions one through five). Part two investigated athlete's use of priming strategies (questions six through nine), their perceptions of its effectiveness (questions ten and eleven, which are reported in Table 2), their development and support of using priming strategies (question twelve through fourteen), and the timing of priming use (question fifteen). Multiple answers could be given for the type of priming strategies implemented. The majority of questions implemented binary answer questions, with select questions using a Likert-scale (25) where answers were based on existing research investigating priming strategies (47,40,23).

** Insert Table 1 about here **

** Insert Table 2 about here **

** Insert Questionnaire about here **

*Statistical Analyses*

Quantitative statistical analyses was conducted on survey responses. Subjects that partially completed the demographic questions but did not complete the priming questions were removed from the data sample. All data was initially analyzed in Microsoft excel. Summarizing of the research was performed by calculating the percentage of support for each answer given. Further statistical analysis was later undertaken using IBM SPSS Statistics software (version 25.0; SPSS, Inc), with chi-square tests being performed to

determine levels of significance athletes felt toward the use of priming interventions, with significance being determined at $p < 0.05$ (29).

## Results

Due to the nature of certain questions asked, multiple answers may have been given for some questions. Of the 90 subjects, *n* = 71 (78.7%) used psychological priming, whereas *n* = 10 (11.2%) did not, with *n* = 9 (10.1%) using them with their coach. The most popular priming strategy used (see table 2) was music (*n* = 34, 26.6%), followed by instructional self-talk (*n* = 31, 24.2%), motivational self-talk (*n* = 29, 22.7%), physical actions such as stamping feet or hitting their chest (*n* = 25, 19.5%), watching video clips (*n* = 8, 6.3%), and other (*n* = 1, 0.8%). From the 9 subjects that used strategies through their coach, motivational statements were the most frequently used (*n* = 6, 54.5%), followed by motivating team talks (*n* = 3, 27.3%), and listened to the coach's choice of music (*n* = 2, 18.2%). Of the subjects that used music themselves, the genres listened to were: rap (*n* = 9, 18.8%), hip hop (*n* = 8, 16.7%), rock (*n* = 4, 10.4%), metal (*n* = 4, 10.4%), rhyme and blues (*n* = 4, 8.3%), dance (*n* = 3, 6.3%), general high-tempo (*n* = 3, 6.3%), instrumental (*n* = 3, 6.3%), house (*n* = 2, 4.2%), music related to motivational films (*n* = 2, 4.2%), pop (*n* = 2, 4.2%), electronic (*n* = 1, 2.1%), and techno (*n* = 1, 2.1%). The video clips that were viewed were of "other people successfully lifting" (*n* = 5, 71.4%), "themselves successfully lifting" (*n* = 1, 14.3%), and other or non-specified motivational videos (*n* = 1, 14.2%).

** Insert Table 3 about here **

The subjects' perception of the effectiveness of the implemented priming technique was very positive, with "very effective" (*n* = 33, 50.8%) making up the majority of the answers given. "Moderately effective" (*n* = 16, 24.6%), followed by "extremely effective" (*n* = 10, 15.4%), "slightly effective" (*n* = 5, 7.7%), and "not effective at all" (*n* = 1, 1.5%). Subjects felt priming was worthwhile as it increased their motivation (*n* = 48, 38.1%), reduced fear and anxiety (*n* = 28, 22.2%), increased competition/session intensity (*n* = 26, 20.6%), increased strength and power (*n* = 19, 15.1%), increased endurance (*n* = 3, 2.4%), and other category (*n* = 2, 1.6%), consisting of, increased focus, help with strategy, prepare them for high rating of perceived efforts, part of a routine/superstition and increased confidence. Levels of significance through a chi-square test found that increasing motivation was the only statistically significant result ($\varphi c = 0.27$; $p = 0.011$).

The origin of why priming techniques were being implemented predominately occurred through experience and education (*n* = 39, 50.0%), followed by a somewhat intuitive

implementation by the athlete (*n* = 20, 25.6%), the coach telling them to (*n* = 13, 16.7%), and learned behavior from a peer (*n* = 6, 7.7%). These techniques were mainly employed when training had commenced (*n* = 44, 37.0%), before competition (*n* = 35, 29.4%), during competition (*n* = 24, 20.2%), and only on maximal effort days (*n* = 14, 11.8%).

Across all performance levels, the use of priming techniques was high with all semi-professional athletes implementing a technique (*n* = 22, 100%), followed by amateur athletes (*n* = 54, 85.1%), and professionals (*n* = 12, 83.3%) (see table 4). The motivation to train was either to improve performance (*n* = 45, 53.6%), to stay fit and healthy (*n* = 33, 39.3%), or another reason (*n* = 6, 7.1%). The most popular sports undertaken by the subjects was CrossFit, weightlifting, bodybuilding, and powerlifting (*n* = 24, 30.4%), followed by football (*n* = 16, 20.3%), rugby (*n* = 6, 7.6%), athletics (*n* = 5, 6.3%), running and golf (*n* = 4, 5.1%), hurling (*n* = 3, 3.8%), Jiu-jitsu and no sport (*n* = 2, 2.5%). The following sports listed have just one subject (1.3%) participating in them: volleyball, trampolining, cycling, climbing, hockey, judo, rowing, Gaelic football, swimming, skiing, cricket, tennis, and a retired Gaelic football player.

** Insert Table 4 about here **

## Discussion

This study sought to further understand whether athletes have been implementing cognitive or behavioral priming strategies to improve physical performance. It was identified that there was a need to obtain an assessment directly from athletes, as the majority of research to date investigated strength and conditioning coaches (37,38,39). A large proportion of athletes (78.7%), across all ability levels in this study reported using psychological priming strategies to enhance their performance. Strategies using various stimuli were implemented prior to and during training or competition. A significant relationship ($\varphi c = 0.72$; $p = 0.011$) was observed when priming was implemented for improving motivation.

Radcliffe et al., (39) reported the top two attributes that athletes felt were needed for successful performances was increased motivation and confidence. This study identified a large proportion of subjects felt their priming method improved performance significantly ($\varphi c = 0.72$; $p = 0.011$) via increased motivation (38.1%), followed by reduced fear and anxiety (22.2%), competition/session intensity (20.6%), and perceived increase in strength and power (15.1%), which are also in line with previous research (39). Interestingly, these traits have all been shown to be associated with anabolic hormonal changes (20,41,49). Cook et al., (5) examined associations between salivary free testosterone and training motivation in elite male rugby union players, they found that changes in pre-workout free endogenous testosterone concentrations correlated strongly ($r = 0.81$) to voluntary workloads. Cook and Beavan (4) also reported salivary testosterone concentration levels were strongly correlated with bench press ($r = 0.83$) and squat ($r = 0.67$) performances at a self-selected workload, as well as maximal medicine ball throws for distance ($r = 0.70$). Therefore, a potential association may occur between elevated testosterone concentration levels and an athlete's psychological and behavioral state; which subsequently may lead to improved physical performance. The results from this survey were in line with Cook et al., (5) who suggested that improved motivation and confidence levels may potentially lead to improved physical performance.

In the present study, music was the most popular mode for priming (26.6%), followed by instructional self-talk (24.2%), motivational self-talk (22.7%), physical actions (19.5%; such as stamping feet, clenching fists or jaw, slapping head or back), and watching video clips (10.8%). Karageorghis and Priest (17) reported the effect of music magnifies an athlete's psychological state and physical performance levels. Listening to music prior to undertaking

a 50-m freestyle race, showed significant improvements in both swimming race performance (0.82-s difference; $p < 0.01$) and hand grip strength (2.2 kg difference; $p < 0.05$) (34). Eliakim et al., (8) also reported similar results after 12 male and 12 female volleyball players undertook a 30-s Wingate test and significantly ($p < 0.05$) increased peak anaerobic power from 10.7 to 11.1 Watts/kg after arousing music was played during a 10-minute warm-up. In addition, the use of music has been shown to significantly improve anaerobic endurance when holding a 1.1 kg dumbbell extended in front of the body until muscular failure in 58 physically active subjects (11% improvement; ES = 0.4) (7). Miller et al., (30) also reported that music can significantly increase low-to-moderate-intensity endurance oxygen uptake (1.18 ml/kg/min difference), minute ventilation (3.91 l/min difference), enjoyment (3.35 points higher out of a score of 10), and reduced subjects' rating of perceived effort (0.65 difference) in 20 university students when running at 78% heart rate maximum, for 20-minutes on a treadmill. More recently, Moss et al., (31) reported small to large ES (0.2-1.2) improvements in muscular strength in 16 university students when listening to self-selected music, whilst undertaking the back squat and bench press at 60 and 70% 1RM to repetition failure. The increases in muscular endurance may be due to an ergogenic effect of delaying fatigue or increasing work capacity through the impedance of physiological feedback signals associated with physical exertion (17). However, this effect appears to have little impact upon high-intensity running (27). It has been reported this is due to lower information processing abilities to external stimuli at high intensities (41,46); thus, it seems music may have a more prominent effect on high-intensity efforts compared to low-intensity exercise bouts. Interestingly, the ideal music tempo appears to be 120 bpm as this is the cutoff point from varying music aesthetics, neurophysiology, and human locomotion (15,26,43). It is a tempo that reflects natural rhythmicity (26) and could potentially be the point whereby the intensity begins to switch to a higher level.

Interestingly, imagery was not reported to be used by any of the subjects in the present study. Research has shown that increased electromyographic activity, strength, technique development, program adherence, and stress regulation are all achieved via the use of imagery (39). Imagery is a complex strategy to implement due to greater emphasis on psychological elements (37); therefore, the lack of implementation could be due to athletes not being exposed to such a technique or given specific guidance or coaching at how to undertake the strategy. The self-talk technique was also employed by only half of the present sample, despite existing research supporting its use due to increased arousal, confidence, belief, muscular strength, and power (46). These findings potentially indicate that it could be

an under-utilized priming strategy. However, self-talk has been shown not to elicit as favorable results for improving muscle endurance markers compared to preparatory arousal, goal setting, and free-choice psych-up (46). Also, when compared to motivational self-talk, instructional and cognitive restructuring self-talk (to modify or replace negative thoughts) did not produce positive results (46).

The timing of implementing a priming strategy was preferred to be undertaken during training (37.0%), followed by before competition (29.4%), during competition (20.2%), and on maximal effort days (11.8%). Research into the efficacy of implementing priming strategies at varying times appears to be sparse. However, Crust (6) reported that listening to music for the entirety of holding a 2.2 kg dumbbell horizontally in front of the body was more efficacious by 7.5 seconds than only listening prior to the task in 27 male undergraduate students. Elliott et al., (9) also implemented motivational music during a 20-minute cycle at 60-80% of maximum heart rate in 18 students and found distance covered increased by 0.99 km compared to no music played. Priming strategies implemented pre-task appear to be more common. For example, a self-selected psychological “psych-up” significantly improved peak torque by 61 Nm (11.8%) during a 5-repetition chest press in 20 adults when performed 1-minute prior to the test (49). Hammoudi-Nassib et al., (12) also reported improvements of 5.7% in 30-m sprint performance when a “psych-up” with imagery 30-s prior to undertaking the task in 16 student male sprinters. Positive results associated with using imagery pre-task for high-intensity exercise could be due to the anxiety reducing benefits that run alongside the increase in self-confidence and motivation (33), which may not occur with music. Interestingly, Peynirocioglu et al., (36) found basketball free-throw shots significantly improved ($p$ <0.01) by 14 completed baskets after 120 students performed a self-selected imagery strategy prior to performing the task. This may indicate that psychological priming could also improve skill-based performance markers when implemented prior to a given task. However, with research on the implementation of non-music strategies during competition being sparse, based on the current literature, the efficacy of the timing of priming strategies and whether the techniques elicit positive results with high-intensity tasks is mixed and requires further research.

An additional aim of this study was to understand whether athletes recognize that their coaches are incorporating priming strategies, as this may be the most viable way to support the implementation of such techniques. The results indicate that only 10.1% of coaches utilized priming strategies to support their athletes’ performance. Of these athletes, 9.0%

were professional, 27.3% semi-professional and 63.7% were amateur, with amateur athletes better supported by their coaches. However, coaches of professional athletes may not have been using conscious priming techniques, rather passive subtle techniques such as images on walls whereby the athletes were only sub-consciously aware of them. Nonetheless, Radcliffe et al., (37) reported that coaches felt they did not have the requisite skill levels to integrate appropriate psychological strategies but were aware of their importance and significance. This would align with the results from this study whereby only 44.4% (n = 4) from the semi-professional and professional athletes implemented the use of a coaching priming strategy. Radcliffe et al., (39) reported a much higher use of psychological strategies from coaches. The disparity in findings could be interpreted in a couple of ways: coaches use them but with select few athletes, or athletes may not acknowledge or realize the use of certain strategies.

It has been previously identified by coaches that one of the barriers to implementing priming strategies is the perceived negative attitude athletes have towards learning and using these techniques (37). This study reported priming strategies were utilized by 88.8% of subjects. However, this result could be due to differing perceptions of priming. For example, coaches may not consider physical actions or watching videos as priming, whereas athletes may. Aligning definitions between coaches and athletes would eliminate any confusion and potentially increase strategies being implemented and should be a source for future research, particularly as these findings would suggest athletes' perceptions towards priming strategies are potentially not as skeptical as coaches may believe. Results here also support the lack of coach involvement towards priming with few coaches encouraging their athletes with these methods; however, athletes were intuitively undertaking priming strategies regardless as they had a positive perception toward them. If coaches had greater knowledge and confidence in priming strategies, they may be able to consider using them for the purpose of performance enhancement. The findings from this paper would indicate that at an organizational level, perhaps psychological strategies could be given greater consideration with the education of coaches.

A limitation of this study is the small sample size of professional athletes (n=11) surveyed, along with the relatively small subject number from the various sports with many sports represented only having one subject. Additionally, greater description should have been given to questions asked, along with a greater number of questions to gain more depth, for example, this investigation failed to ask how long prior to training did priming occur and how

priming knowledge was obtained. Therefore, further research is required to determine the efficacy of the physiological effects of the preferred priming strategies and their subsequent affect upon athletic performance through a wide range of sports and athletic ability.

## Practical Applications

This study shows that a significant proportion of athletes from all performance levels questioned, felt their priming technique improved performance, particularly the use of the behavioral stimulus of listening to music and physical actions, along with cognitive motivational self-talk. This provides potential direction in targeting techniques for specific strategies to be developed. As cognitive and behavioral psychological priming strategies were similarly undertaken, S&C coaches should therefore be equipped to develop both for their athletes. To facilitate this sporting organizations should allow such opportunities for S&C coaches to access educational workshops or mentorships with sports psychologists, to develop their knowledge and confidence to implement psychological strategies to improve preparation to training and competition.

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**Appendix**

**Table 1.** Demographic, competitive and motivation information of survey.

| | | |
|---|---|---|
| Age (Median) | 28 | (Range: 19 - 63) |
| Training Age (Median) | 11 | (Range: 1 - 35) |
| Resistance Training Frequency (Median) | 4 | (Range: 0 - 11) |
| Sports Training Frequency (Median) | 2 | (Range 0 - 10) |
| | | |
| Training Level *n* (%) | | |
| Amateur | 54 | (60.7%) |
| Semi-Professional | 17 | (19.1%) |
| Professional | 11 | (12.4%) |
| Does Not Compete | 7 | (7.9%) |
| | | |
| Motivation to Train *n* (%) | | |
| Improve Competition Performance | 45 | (53.6%) |
| Stay Fit & Healthy | 33 | (39.3%) |
| Other | 6 | (7.1%) |

*n* = Number of subjects

**Table 2.** Summary of athlete's perceptions of priming.

| | Count (*n*) | Percentage (%) | Significance ($p$ <0.05) |
|---|---|---|---|
| How effective are priming and psyching-up strategies in improving your performance? (n = 74) | | | |
| Not effective at all | 1 | 1.5% | $p$ = 0.188 |
| Slightly effective | 5 | 7.7% | $p$ = 0.414 |
| Moderately effective | 16 | 24.6% | $p$ = 0.515 |
| Very effective | 33 | 50.8% | $p$ = 0.987 |
| Extremely effective | 10 | 15.4% | $p$ = 0.614 |
| In what way do you think priming helps your performance? (*n* = 74) | | | |
| Increases motivation | 48 | 38.1% | $p$ = 0.011 |
| Reduces fear and anxiety | 28 | 22.2% | $p$ = 0.214 |
| Increases competition or session intensity | 26 | 20.6% | $p$ = 0.68 |
| Increases strength and power | 19 | 15.1% | $p$ = 0.367 |
| Increase Endurance | 3 | 2.4% | $p$ = 0.68 |
| Other | 2 | 1.6% | |

**Table 3.** Summary of athletes use and perceptions of priming.

| | Count (*n*) | Percentage (%) | Significance (*p = <0.05*) |
|---|---|---|---|
| Do you use psychological priming strategies? | | | |
| Yes | 71 | 78.7% | |
| No | 10 | 11.2% | |
| Yes, directed by the coach | 9 | 10.1% | |
| Which priming strategy do you personally use? | | | |
| Music | 34 | 26.6% | *p* = 0.791 |
| Instructional self-talk | 31 | 24.2% | *p* = 0.344 |
| Motivational self-talk | 29 | 22.7% | *p* = 0.968 |
| Physical | 25 | 19.5% | *p* = 0.620 |
| Video | 8 | 6.3% | p = 0.088 |
| Other | 1 | 0.8% | |
| Which priming strategy does your coach use to psych you up? *12 Athletes identified their coaches to use priming strategies. 10 answered* | | | |
| Motivational statements | 6 | 54.5% | |
| Team talks: inspiring and motivating | 3 | 27.3% | |
| Music | 2 | 18.2% | |
| When do you use the priming technique? | | | |
| When you train | 44 | 37.0% | *p* = 0.265 |
| Before your competition | 35 | 29.4% | *p* = 0.163 |
| While you compete | 24 | 20.2% | *p* = 0.493 |
| Only on maximum effort days | 14 | 11.8% | *p = 0.971* |
| Other | 2 | 1.7% | |

Only on maximal effort days = training sessions involving resistance exercise of 5RM to 1RM or when maximal intensity is required in an athlete's training.

**Table 4.** Analysis of priming use and perceived effectiveness.

| | Priming count (*n*) | Perceived positive effectiveness of priming (%) |
|---|---|---|
| Performance level | | |
| Amateur | 54 | 85.1% |
| Semi-professional | 22 | 100% |
| Professional | 12 | 83.3% |

**Questionnaire**

1. Gender: (tick box)
    a. Male
    b. Female

2. Age (open box)

3. How many times a week do you undertake resistance training (total)? (open box)

4. How many times a week do you undertake sports training (e.g., coaching sessions, practice games)? (open box)

5. How many years have you trained (total)? (open box)

6. Which of the below best describes your motivation to train: (tick box)
    a. To improve competition performance
    b. To stay fit and healthy
    c. Other: please specify

7. If you compete in a sport or event, which one? (open box)

8. If you compete in a sport or event, at what level: (tick box)
    a. Recreational
    b. Semi-professional
    c. Elite
    d. Other, please state: (open box)

9. Do you (personally or via your coach) use priming (i.e., “psyching up”) strategies? If you tick No, the survey ends here (tick box - multiple)
    a. Yes – I do (not clicking here collapses personal option – Q10)
    b. Yes – my coach does (not clicking here collapses coach option – Q11)
    c. No – please state why not (ticking here ends survey)

10. Do you feel that when you use priming and psyching-up, your performance improves?
    a. Extremely effective

b. Very effective
c. Moderately effective
d. Slightly effective
e. Not effective at all

11. In what ways do you think priming helps your performance
    a. Increases my strength
    b. Increases my power
    c. Increases my endurance
    d. Increases my motivation
    e. Increases my session or competition intensity
    f. Reduces fear and anxiety
    g. Other – please state (open box)

12. Who advised you to engage in effort priming strategies: (tick box - multiple)
    a. A coach
    b. A peer
    c. No one: you learned to do it through your own experience and education
    d. No one: you tend to just do it naturally

13. Which of the following priming strategies ***do you*** personally use: (tick box)
    a. Music - please state which type (open box)
    b. Videos - please state which type (open box)
    c. Self-talk: motivational statement (or a mantra) e.g., “I can do this”
    d. Self-talk: instructional statements e.g., “keep the bar close”
    e. Physical actions: e.g., stamping feet, clenching fists or jaw, slapping head or back
    f. Other, please state (open box)

14. Which of the following priming strategies does your ***coach*** use to psych you up: (tick box)
    a. Music - please state which type (open box)
    b. Videos - please state which type (open box)
    c. Motivational statement e.g., “You can do this”
    d. Team talk: inspiring and motivating talk to psych you up
    e. Other, please state (open box)

15. Final Question. When do you typically prime your effort: (tick box)
    a. When you train
    b. Before you compete
    c. While you compete
    d. Only at max effort days
    e. Other, please state (open box)