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The Effects of Hypnosis on Flow States and Three-Point Shooting Performance in Bastketball Players

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This study examined the effects of hypnosis on flow states and three-point shooting performance in 5 collegiate basketball players. The investigation utilized an ideographic single-subject multiple baselines across subjects design combined with a procedure that monitors the internal experience of the participants (Wollman, 1986). The method of intervention utilized in this study involved relaxation, imagery, hypnotic induction, hypnotic regression, and trigger control procedures. The results indicated that all five participants increased both their mean basketball three-point shooting performance and their mean flow scores from baseline to intervention. There were no overlapping data points between the baseline and intervention for either performance or flow state. Additionally, each participant indicated that they had felt the intervention was useful in keeping them confident, relaxed, and calm. These results support the hypothesis that a hypnosis intervention can improve three-point shooting performance in basketball players and increase feelings and cognitions that are associated with flow.

High levels of athletic performance are frequently attributed to the experience of a mental state described by Csikszentmihalyi (1975) as flow. Evidence supporting this attribution comes mainly from phenomenological reports of athletes in qualitative studies (e.g., Jackson, 1992). Although quantitative research investigations of mental states are rare, measures of mental states in elite performers have been obtained using electrocortical techniques that track changes in nervous system activity in real time during performance. Interestingly, electrocortical data obtained from riflery (Hatfield, Landers, & Ray, 1984), archery shooting (Salazar, Landers, Petruzzello, Han, Crews, & Kubitz, 1990; Wang & Landers, 1986), golf putting (Crews & Landers, 1993), weight lifting (Gannon, Landers, Kubitz, Salazar, & Petruzzello, 1992) and karate (Collins, Powell, & Davies, 1990)

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show similar results, that is, an asymmetrical distribution of cognitive function in the cerebral hemispheres during performance. Specifically, the general findings of this research agree a shift from left-hemisphere to right-hemisphere processing during performance.

While the validity of this work has been questioned on methodological grounds (see Lawton, Hung, Saarela, & Hatfield, 1998), the results are compatible with the description of peak performance states presented by Gallwey (1974) and Unestahl, (1986). Specifically, both Gallwey (1974) and Unesthal (1986) defined a peak performance as a hemisphere shift, that is, an activation of the right hemisphere and a corresponding deactivation of the left hemisphere of the brain. Gallwey (1974) and Unestahl (1986) have also argued that because high levels of performance are generally identified with right hemisphere dominance, then a shift in consciousness from the left hemisphere (dominant mode) to the right hemisphere (alternative mode) will give better access to functions which are important for good athletic performance.

Theoretical explanations of hypnotic phenomena suggest hypnosis may facilitate the hemispheric shift process. For example, Crawford and Gruzelier's (1992) neuropsychophysiological model proposed that during hypnosis, individuals enter an altered state of awareness during which they undergo a shift in cognitive and physiological activity from an analytical, sequential type of processing to a more holistic and imaginal mode. Such a shift underpins a reduction in generalized reality testing (Shor, 1959) and an increase in dissociative experiences during hypnosis. The notion that hypnosis facilitates a shift from an analytical to a holistic style of thinking was based on a number of early psycho-physiological studies showing electroencephalogram (EEG) activity shifts from the left to the right hemisphere during hypnosis (e.g., Graham & Pernicano, 1979; Gur & Gur, 1974; Morgan, Macdonald, & Hilgard, 1974).

Since this time, a number of more methodologically sound studies have been carried out, with results largely supporting the laterality hypothesis. A study by Gruzelier, Hancock, and Maggs (1991), for example, showed that during hypnosis, participants with high and low susceptibility to hypnotic procedures (high and low susceptibles) could be reliably distinguished on the basis of generalized delta, theta and alpha activity predominantly in the right hemisphere. In another study using a signal-detection paradigm, McCormack and Gruzelier (1993) found that high but not low susceptible participants showed a significant left-field (i.e., right hemisphere) visual processing improvement during hypnosis. Also cited in support of the holistic-shift hypothesis, a study by Crawford and Allen (1983) found that high susceptible participants improvement on a visual memory discrimination task was accompanied by reports of a shift from a detail-oriented to a holistic processing strategy. More recent studies by Gruzelier et al. (1991) and Gruzelier and Warren (1993) have provided further support by showing that high susceptibles display a decrease in verbal memory performance, a task shown to preferentially involve the left hemisphere, during hypnosis.

On the basis of this body of research, it is plausible to suggest that hypnosis may assist purposeful hemispheric shifts that are conducive to performance. That is, hypnotic training may increase personal control over flow, which may in turn enhance performance. Pates, Maynard, and Westbury (in press) provided some evidence to support this interpretation when they utilized an idiographic single-subject replication-reversal (ABA) design to analyze the effects of a hypnosis

intervention on set and jump shooting performance in basketball players. Their results indicated that hypnosis was a highly effective tool for improving basketball shooting accuracy and that cognitions normally associated with peak performance states (Privette, 1983) and successful athletic performance may be accessed during performance using hypnotic techniques.

One of the fundamental features of the approach of Pates et al. (in press), which clearly differentiates this work from previous research, was the use of trigger control techniques. Triggers are words, sounds, images, or a natural part of a routine that one can do or think about in order to induce a response usually obtained during the induction phase of the hypnotic procedure. Unestahl (1983, 1986) has implied that sport psychologists may use two types of triggers for applied work. The first are natural triggers which are usually part of a normal routine (e.g.,. holding the basketball) while the second are artificial triggers, which do not form part of a normal routine (e.g., a piece of music).

A second important feature of the approach used by Pates et al. (in press) was hypnotic regression. This technique invites the athlete to relive an earlier life experience of their optimal performance with no conscious awareness of any future realities beyond the time frame being experienced. It utilizes a complete dissociation from any other reference to the present and as a result of the change in perception, the rekindling of the participants' experiences tend to be more kinesthetic and emotive (Hammond, 1990). During the regression phase of their intervention, Pates and his associates (in press) found they were able to condition positive emotions associated with basketball players' ideal performance state to a trigger that would allow access to an optimal performance experience during a future event.

The current study attempted to extend the work of Pates et al. (in press) by evaluating the effectiveness of a hypnosis intervention in facilitating flow states and performance accuracy in basketball three-point shooting. It was expected that during hypnosis, the player's best performance could be conditioned to a natural trigger. It was then hypothesized that after conditioning, players using the natural trigger would experience more intense states of flow and achieve improved accuracy in the performance of a three-point shooting task.

In this study, a natural trigger was used instead of an artificial trigger because the researchers wanted to demonstrate the effects of a trigger that requires no conscious control. A single-subject multiple baselines across subjects design was deemed the most appropriate method to study the effects of the intervention because it allowed the analysis of an intervention that cannot be withdrawn or turned off (Hrycaiko & Martin, 1996). Based on the recommendations of Wollman (1986) and other researchers who have utilized single-subject designs (e.g.,. Lerner, Ostrow, Yura, & Etzel, 1996; Swain & Jones, 1995), the present study also applied a procedure that monitored both flow states and the internal experience of each player.

Method

Participants

The participants were 5 members of a male University basketball squad located in the north of England. All participants were aged between 19 and 23 years with a mean age of 20.2 years (SD = 1.6). The participants were regular starting five

players with at least 7 years of competitive basketball experience. None of the players had previous experience with hypnosis training methods. Prior to the study, the participants were informed of the nature and extent of the investigation, and all agreed to participate.

Experimental Design

A single-subject multiple baselines across individuals design was implemented to examine the effects of a hypnosis intervention on flow states and three-point shooting performance. This type of design allows participants to serve as their own source of control for the experiment (Barlow & Hersen, 1984; Hrycaiko & Martin, 1996). This format was also most appropriate because it facilitates the analysis of the effects of an intervention that could not by nature be withdrawn from the participants due to the use of natural trigger control techniques (Barlow & Hersen, 1984). The design required the observation of baseline performance and a treatment phase for each of the participants with the length of baseline increased for each succeeding player used in the analysis. The intervention was introduced when a stable baseline or a trend in the opposite direction of the change anticipated became apparent for each of the participants. A sequential application of the treatment (hypnosis intervention) was applied until all participants received the intervention.

Dependent Variables

Three-Point Shooting. Three-point shooting was selected as a criterion task because participants were familiar with the technique, and it reflected an important component of their performance. The task required the participants to run from the left to the right hand side of the court, stopping to shoot outside of the basketball three-point arc approximately level with the free throw shooting line until a total of 10 three-point shots were performed. The experimenter recorded each three-point attempt using the following scoring system: 1 for the ball hitting the backboard then hitting the rim and coming out, or the ball hitting the backboard and coming out, or a complete miss (air-ball); 2 for the ball hitting the rim and coming out; 3 for the ball hitting the backboard and then going in; 4 for the ball hitting the rim and then going in; and 5 for a clean basket (swish). Performance was measured by summing the scores for 10 attempts.

The reliability of the performance observations was assessed by comparing the judgments of two independent observers, simultaneously measuring the target behavior. The reliability assessment took place prior to the study and resulted in a correlation of 1.00 for the scores of the two independent observers.

Flow Analysis. In addition to the performance data, information on the frequency and intensity of flow experience was assessed using the Flow State Scale questionnaire developed by Jackson and Marsh (1996). This 36-item instrument provides a quantitative measure of the nine dimensions of flow outlined by Csikszentmihalyi (1990). The dimensions measured by this instrument are challenge-skill balance, action-awareness merging, clear goals, unambiguous feedback, concentration on task at hand, sense of control, loss of self-consciousness, transformation of time, and autotelic experience. The internal consistency estimate for the nine FSS scales were alpha M = .83. For the purpose of this investigation, a single global FSS score was collected from the 5 participants after each of the 11 trials. A global measure of flow was preferred in this investigation because of

Jackson's (1999) contention that single factor approaches tend to reveal incomplete information about the total flow experience. Alphas for the nine FSS scales range from .72 to .91 (Jackson, Kimiecik, Ford, & Marsh, 1998).

Treatment: The Hypnosis Intervention

The training of the participants in hypnosis took place immediately after the completion of the final trial of baseline testing and was divided into three stages. The first author who had successfully completed extensive training in a variety of hypnosis techniques delivered the intervention. In the first stage of the intervention, participants were encouraged to sit in a comfortable position and then were asked to focus on their breathing. Specifically, they were instructed to breathe deeply and to release air slowly while counting backwards from the number ten. They were then given a 15-min session involving progressive muscular relaxation (PMR). The technique originally pioneered by Jacobson (1938) involved the basketball players tensing and relaxing parts of their body while deeply inhaling. Suggestions asking the participants to contrast the differences between the tense and the relaxed muscles were also given.

The second stage embodied an Ericksonian hypnosis technique known as a staircase induction (Hammond, 1990). The staircase induction consisted of a journey, one step at a time, down a flight of twenty stairs. As the participants took the journey, they were told to see each stair in front of them and feel the stair under their feet. At the bottom of the stairs, they were told they would see a door, and beyond the door they would see a room with a comfortable chair. The participants were then asked to sit down in the chair and focus on a small cinema screen on which appeared a relaxing scene. At this point, the participants were instructed to direct their attention to situations that were associated with relaxation, for example, the images of a warm comfortable beach or the sensation of floating in water. Throughout this stage, suggestions were given to reinforce both the experience of the PMR and the deep breathing technique.

In the third stage, suggestions were given to help the participants regress and remember a polysensory experience of their best competitive performance. Specifically, they were asked to include visual, auditory, tactile, olfactory, gustatory, and memory of their best performance from an internal perspective. When a memory was accessed, a trigger was then introduced so an association was developed between the trigger and the variables responsible for the optimal performance. The trigger used was the basketball. The participants were then told to see themselves rising from the chair and proceed out of the door and up the staircase. As they ascended the staircase, they were instructed to come out of trance and feel refreshed and alert. After waking from trance, they were asked to access the ideal performance state using the trigger. Training was considered complete when the participants reported that emotions normally associated with their optimal performance could be experienced when they remembered the trigger (basketball).

Intervention Procedure

The hypnotic intervention was administered to the players in a small, quiet, and comfortable room on the college campus and lasted approximately one hour. The training was composed of four stages: Stage 1-relaxation, Stage 2-hypnotic induction, Stage 3-hypnotic regression, and Stage 4-trigger control. After the training,

participants were asked to commit themselves to practice the techniques by playing a 40-min audio tape recording of the live session everyday over a seven day interval between the baseline and intervention phase of the study. In total, the players were given one live session and seven audio tape sessions before the intervention phase. To ensure participants had listened to the audio tape recording, the players were contacted daily and asked to listen to the audio tape in a quiet room in the presence of an experimenter. The quality of the participants' experience was assessed by examining the thoughts, feelings, and cognitions immediately after each session.

Following this training, the players began the intervention phase of the design. The players were instructed to imagine the trigger (basketball) each time they attempted a shot. After each performance trial, flow and the internal experience of each player was assessed using the FSS and Practical Assessment Questionnaire. It should be noted that during this stage, players were not under hypnosis; instead, they were merely using the trigger conditioned to the way they felt during their ideal performance.

Procedural Reliability Assessment

To ensure that participants received the same information throughout the study, a number of strategies were employed. For instance, some of the sessions including a familiarization session prior to the first data collection were conducted in a group. The sessions were delivered in a standardized protocol: (a) perform progressive muscle relaxation, (b) perform mental imagery relaxation, (c) perform staircase hypnosis induction, (d) perform hypnotic regression technique, (e) condition trigger to a flow experience, (f) have participants access their ideal performance state utilizing the trigger, (g) have participants complete the FSS questionnaire, (h) to reinforce training give participants an audio tape recording of the hypnosis session, (i) contact participants daily to check that they have played the audio tape recording of the training, (j) check that the audio tapes have been retrieved before the beginning of the second baseline, (k) ask if there are any questions, (l) copy questions down and answer them, and (m) check understanding with participants. Verification that all aspects of the standardized protocol were consistently applied was obtained from an observer.

The internal experience of each player was monitored by asking each participant to complete a questionnaire after each testing trial. This information permitted on-going assessment of the quality of the participant's feelings, thoughts and cognitions across the baseline and treatment sessions. The data were analyzed by comparing the comments obtained in the baseline sessions to the comments obtained during the intervention phase of the experiment.

Practical Assessment Questionnaire

In order to provide information about the effectiveness of the intervention, each of the participants completed a practical assessment questionnaire adapted from Kazdin (1992) and Kendall, Hrycaiko, Martin, and Kendall (1990). The participants were asked the following questions: How did you feel during the performance? What were you thinking during the performance? Were there any outside thoughts distracting you? Did you experience any problems? Were you satisfied with the results following the intervention? Were the procedures acceptable to you? What

was the effect of the intervention? What were your general beliefs about your performance? How much effort did you put into today's performance?

Following the completion of the study, the participants were given a social validation questionnaire. The questionnaire was designed to provide information concerning the importance of the study and the effectiveness of the intervention. Specifically, the participants were asked the following questions: (a) Did you perceive the three-point shooting task to be important? (b) Were the procedures of the study acceptable? (c) Are you satisfied with the results? (see Hrycaiko & Martin, 1996).

Treatment of Data

The performance scores obtained from the participants were plotted according to the accuracy of their attempts. Via visual inspection of the data, the researchers used the following criteria to establish the occurrence of an experimental effect: (a) when baseline performance was stable or in the direction opposite to that predicted for the effects of the treatment, (b) the greater the number of times that an effect was replicated both within and across participants, (c) the fewer the number of overlapping data points between baseline and treatment phases, (d) the sooner the effect occurs following the introduction of the treatment, and (e) the larger the size of the effect in comparison to baseline (Hrycaiko & Martin, 1996). An effect was considered to have occurred when at least one of the criteria has been reached (Barlow & Hersen, 1984).

Results

Three-Point Shooting Performance Data

The three-point shooting performance data for each participant is presented in Figure 1. For each of the five participants, the hypnosis intervention led to an increase in performance accuracy, with Participant 2 displaying the largest improvement. This finding suggests that the hypnosis intervention consistently improved three-point shooting performance.

Specifically, Participant 1 improved from a mean of 30 during the first baseline to a mean of 36 during the intervention phase, the smallest improvement in performance accuracy. The effect of the intervention was immediate with no overlapping data points between the baseline phase and the intervention phase.

Upon receiving the intervention, Participants 2, 3, 4, and 5 also experienced an immediate performance effect with no overlapping data points between the baseline and the intervention phase. Specifically, Participant 2 increased from a mean of 29 during the baseline to a mean of 39 during the intervention phase, Participant 3 from 31 to 39, Participant 4 from 27 to 35, and Participant 5 from 28 to 36.

The results of the flow data for each participant are presented in Figure 2. For all five participants, the hypnosis intervention led to an increase in flow scores. This finding suggests that the hypnosis intervention increased the intensity of each participant's experience of flow. Specifically, Participant 1 improved from a mean flow score of 130 during the baseline to a mean of 144 during the intervention. The effect of the intervention was immediate with no overlapping data points between the baseline phase and the intervention phase.

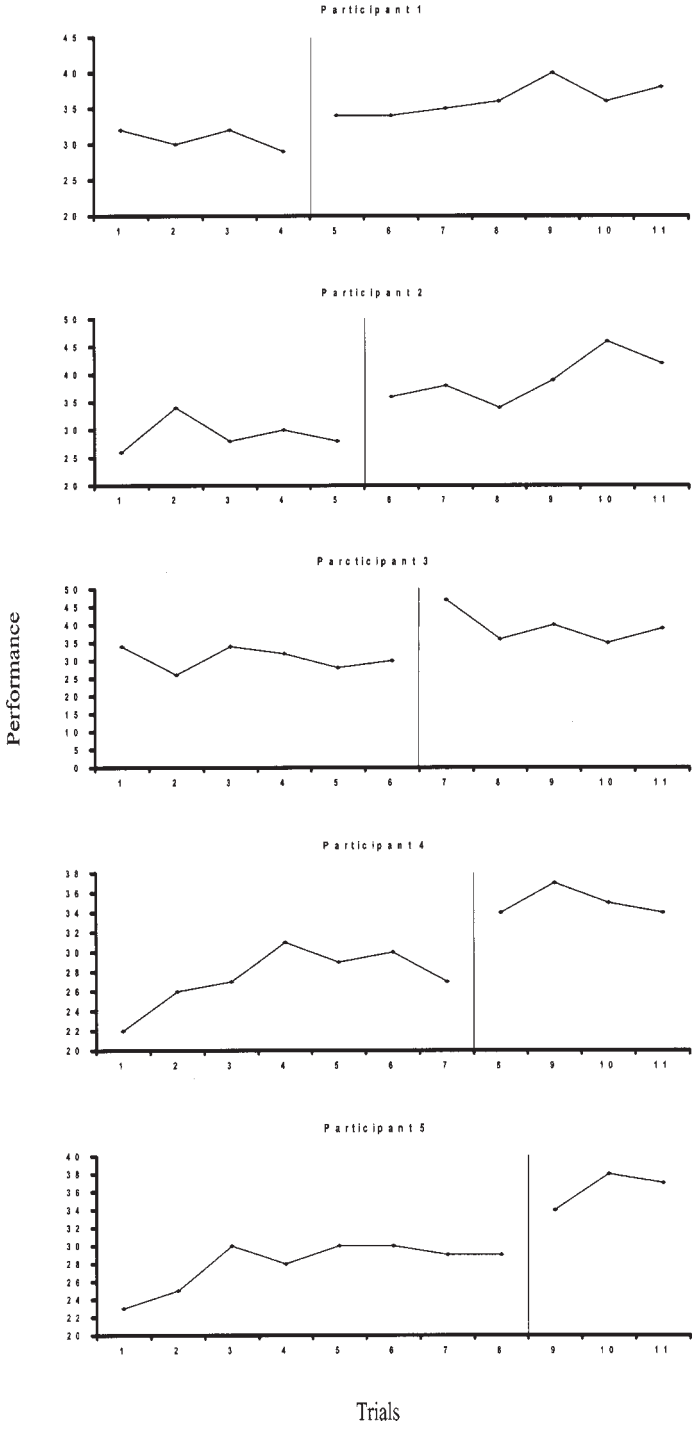

Figure 1 — Performance accuracy for each participant on each trial.

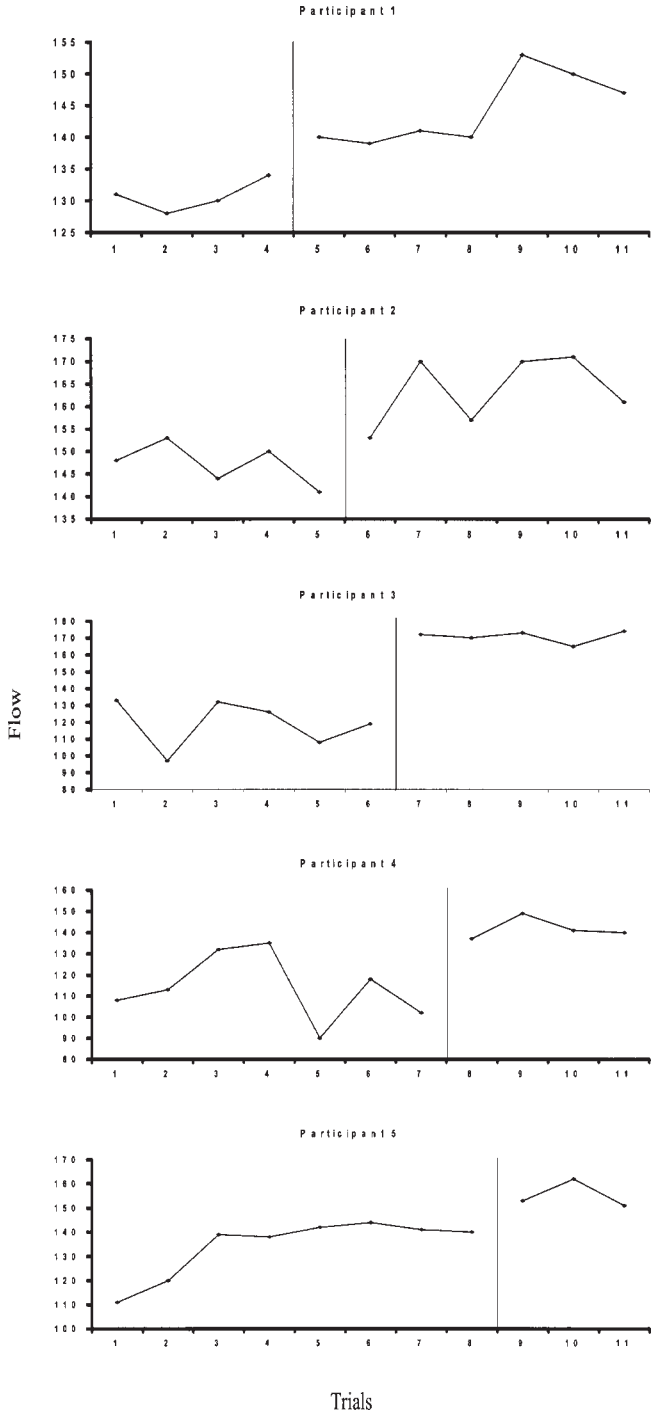

Figure 2 — Flow scores for each participant on each trial.

Participants 2, 3, 4, and 5 also experienced immediate intervention effects with no overlapping data points. Specifically, Participant 2 increased from a mean of 147 during the baseline to a mean of 164 during the intervention phase, Participant 3 from 119 to 171, Participant 4 from 114 to142, and Participant 5 from 134 to 155.

Practical Assessment Data

Upon completing the study, each of the participants was asked to respond to a social validation questionnaire. All participants indicated that during the intervention phase, they had felt more relaxed, calm, composed, in control, and confident when compared to the baseline phase. For example, participant 1 indicated that during the intervention phase, he had felt more relaxed and confident and his shooting was more controlled and had a rhythm: "Shooting was easy . . . I could not miss . . . I could will the ball to go where I wanted it to go, this made me feel confident and great. I had my rhythm and it was really fun." Moreover, he reported that he had no thoughts about his technique and had high levels of concentration, "I thought of nothing . . . I had complete concentration."

Additionally, Participant 2 also indicated he had experienced reduced concerns about performing: "My shot was automatic. . . . I forgot about technique and just relied upon my increased confidence." Similar verbal reports were provided by Participant 3: "My mind went blank and everything became automatic. . . . I just knew the shots were going to go in." It should be noted that all participants reported that they sustained substantial effort throughout the trials and had believed that the intervention had made them more consistent three-point shooters.

Discussion

The purpose of this study was to examine the effects of hypnosis on three-point shooting performance and flow in basketball players. The results of this study indicate that a hypnosis intervention consisting of relaxation, imagery, hypnotic induction, hypnotic regression, and trigger control techniques were effective at enhancing basketball three-point shooting performance. This finding supports previous research that found hypnosis to be a highly effective tool for improving athletic performance (Baer, 1980; Pates et al., in press; Schreiber, 1991; Unestahl, 1975, 1986).

The results also support the contention that flow, which is usually associated with successful athletic performance, may be accessed using hypnotic regression and trigger control techniques. The results are clearly relevant to sport psychology practitioners because they suggest hypnotic training may increase personal control over flow and performance.

Perhaps the most important feature of hypnotic training is that once conditioning has taken place, processes important for optimal performance no longer need to be consciously controlled. This may lead to more attentional resources being available to the athlete, which may improve performance and allow flow to occur more often. Support for this conjecture comes from Masters (1992), who explicitly indicated that conscious control of a motor task disrupts automatic task processing and impairs performance. Clearly, the unconscious feature of hypnotic interventions is of value from an applied perspective as it provides the sport

psychologist with a tool that does not constitute a conscious left hemisphere distraction for the performer.

Unfortunately, the mechanism by which hypnotic interventions increase performance, and the experience of flow is not known. However, it is possible that hypnosis facilitates a shift from an analytical to a holistic style of thinking, which gives access to processes that are important for athletic performance (Crawford & Gruzelier, 1992). Alternatively, the effect hypnotic interventions have on flow and performance may be best explained by Norman and Shallice's (1986) cognitive model of behavioral control, which appears in the literature on cognitive psychology and neuropsychology.

The Norman and Shallice (1986) model proposes that the cognitive system is comprised of a large, distributed set of specialized processing systems under the guidance of a two-tiered cognitive control system. In routine situations, behaviors may be controlled exclusively by the operation of low-level cognitive control structures or schemata. These structures or schemata are triggered by cues in the internal and external environment in accordance with a contention scheduling mechanism, which operates automatically without consuming attentional resources. This low level of control is considered to be an automatic process, requiring neither attention, awareness, nor volition for its operation.

According to Woody and Bowers (1994), hypnosis represents one situation where the supervisory system of control is inhibited, leading to the hypnotized individual's overreliance on situational cues for determining subsequent behavior. The resulting behaviors may then be perceived as occurring automatically and involuntary, because they have not been performed under conscious control (Woody & Bowers, 1994). This view has recently become particularly influential within contemporary hypnosis research underpinning the dissociated control theory view of Bowers (1992).

Interestingly, Hargadon, Bowers, and Woody (1995) have suggested that the ability to become intensely absorbed in a given experience is another situation by which dissociated control might be induced. This suggests that any absorbing activity such as participating in sport may inhibit the supervisory system of control, leading to the athlete's reliance on situation cues for determining behavior. Under these nonanalytical conditions, an athlete's perception of behavior may be altered resulting in behavior that is best described as flow.

Flow states and hypnotic states may be perceived as similar because the cognitive mechanisms that bring about their existence are the same. Evidence for this view is provided by Unestahl (1983). Specifically, interviews conducted by Unestahl (1983) with elite athletes after experiencing a peak performance indicated that flow states and hypnotic states share many of the same qualities. Additionally, support for the association between hypnotic states and flow states has come from other sources. For example, Grove and Lewis (1996) found participants high in hypnotic susceptibility reported higher levels of flow during exercise than participants low in hypnotic susceptibility.

The dissociative control theory of hypnosis is still very much in the early stages of its development, and researchers must be relatively cautious when attempting to draw any firm conclusions regarding its use as an explanation of flow as experienced by many athletes. However, it represents a plausible cognitive theory explaining the hypnosis/flow/performance relationship. Furthermore, while retaining its cognitive basis, it acknowledges that environmental factors play an important role in the flow experience. Thus dissociative control theory accommodates

Csikszentmihalyi's (1975) model of the flow experience, which described flow as the balance between skill (action capabilities) and challenge (action opportunities). Moreover, it is based on a model of behavioral control developed within cognitive psychology and, on this basis, offers testable predictions with which to assess its validity.

An important aspect of this study was that the single-subject multiple baselines across subjects design enabled the experimenters to be more confident and that the change in flow and performance scores were produced by the intervention and not some other uncontrollable variable. Additionally, the qualitative data revealed that during the intervention phase, the players were relaxed, confident, and calm. Two of the participants also reported having more control and reduced concerns about performing. These findings are entirely consistent with the research of Crawford, Clarke, and Kitner-Triolo (1996); Damaser, Shor, and Orne (1963); Kihlstrom (1985); Kirsch (1994); and Wadden and Anderton (1982), who have clearly demonstrated the positive effects of hypnosis on emotions, thoughts, and perceptions. A further worthwhile consideration revealed by the social validation questionnaire within this study indicated that the participants would continue their use of the hypnosis intervention.

There remains a possibility, of course, that the improvements in both performance and flow scores are an artifact of participant and experimenter bias. Indeed, neither the participants or experimenter were blind to the outcome, and so experimenter expectations or the demand characteristics of the experiment would affect the results. There also remains an issue of a possible Hawthorne effect, the change in performance that occurs merely as a function of being in an investigation (Drew, 1976). Scrutiny of performers in a single-subject experimental design might heighten this effect. Drew (1976) observed, however, the effect tends to decline as the participants become acclimatized so the extended length of the single-subject study could aid in controlling this effect. A further weakness of this study is that the experiment may not generalize to game situations. Indeed, during competitions, it is rare to attempt three-point shots without the pressure of an opponent. Performing the task under experimental rather than competitive conditions further weakens the ecological validity of our findings.

In summary, the present findings suggest that the intervention consisting of relaxation, imagery, hypnotic induction, hypnotic regression, and triggers enhance flow and three-point shooting performance. Also the evidence suggested that hypnosis affects emotions, thoughts, and perceptions. Further study is required, however, if hypnotic interventions are to be accepted by the sports science community. Specifically, more ecologically valid and group-based research methods would contribute to the knowledge base.

Finally, the authors do not wish to promote the misuse or unethical use of hypnosis interventions. We therefore recommend that sport psychologists who wish to use these techniques acquire specialized training and education from mentors with appropriate clinical qualifications and experience.

References

Baer, L. (1980). Effect of time slowing suggestion on performance accuracy on a perceptual motor task. *Perceptual and Motor Skills*, **51**, 167-176.

Barlow, D.H., & Hersen, M. (1984). *Single case experimental designs: Strategies for studying behavior change* (2nd ed.). New York: Pergamon.

Bowers, K.S. (1992). Imagination and dissociation in hypnotic responding. *International Journal of Clinical and Experimental Hypnosis*, **40**, 253-275.

Collins, D., Powell, G., & Davies, I. (1990). An electroencephalographic study of hemispheric processing patterns during karate performance. *Journal of Sport and Exercise Psychology*, **12**, 223-234.

Crawford, H.J., & Allen, S.N. (1983). Enhanced visual memory during hypnosis as mediated by hypnotic responsiveness and cognitive strategies. *Journal of Experimental Psychology*, **112**, 662-685.

Crawford, H.J., Clarke, S.W., & Kitner-Triolo, M. (1996). Self-generated happy and sad emotions in low and highly hypnotisable persons during waking and hypnosis: Laterality and regional EEG activity differences. *International Journal of Psychophysiology*, **24**, 239-266.

Crawford, H.J., & Gruzelier, J.H. (1992). A midstream view of the neuropsychophysiology of hypnosis: Recent research and future directions. In E. Fromm & M. R. Nash (Eds.), *Contemporary hypnosis research* (pp. 227-266). London: Guilford.

Crews, D.J., & Landers, D.M. (1993). Electroencephalographic study of attention patterns prior to the golf putt. *Medicine and Science in Sport and Exercise*, **25**, 116-126.

Csikszentmihalyi, M. (1975). *Beyond boredom and anxiety*. San Francisco: Jossey-Bass.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper & Row.

Damaser, E.C., Shor, R.E., & Orne, M.T. (1963). Physiological effects during hypnotically requested emotions. *Psychosomatic Medicine*, **25**, 334-343.

Drew, C.J. (1976). *Introduction to designing and conducting research*. St.Louis: C.V. Mosby.

Gallwey, W.T. (1974). The inner game of tennis, New York: Random House.

Gannon, T., Landers, D.M., Kubitz, K., Salazar, W., & Petruzzello, S. (1992). An analysis of temporal electroencephalographic patterning prior to the initiation of the arm curl. *Journal of Sport Psychology*, **14**, 87-100.

Graham, K.R., & Pernicano, K. (1979). Laterality, hypnosis and the autokinetic effect. *American Journal of Clinical Hypnosis*, **22**, 79-84.

Grove, J.H., & Lewis, M.A.E., (1996).Hypnotic susceptibility and the attainment of flowlike states during exercise. *Journal of Sport and Exercise Psychology*, **18**, 380-391.

Gruzelier, J.H., Hancock, J. & Maggs, R. (1991). EEG topography during word versus face recognition memory in high and low susceptibles in baseline and hypnosis. *International Journal of Psychophysiology*, **11**, 36.

Gruzelier, J.H., & Warren, K. (1993). Neuropsychological evidence of reductions on left frontal tests with hypnosis. *Psychological Medicine*, **23**, 93-101.

Gur, R.C., & Gur, R.E. (1974). Handedness, sex and eyedness as moderating variables in the relation between hypnotic susceptibility and functional brain asymmetry. *Journal of Abnormal Psychology*, **83**, 635-643.

Hammond, D.C. (1990). *Handbook of hypnotic suggestions and metaphors*. New York: Norton.

Hargadon, R., Bowers, K.S., & Woody, E.Z. (1995). Does counter pain imagery mediate hypnotic analgesia? *Journal of Abnormal Psychology*, **104**, 508-516.

Hatfield, B.D., Landers, D.M., & Ray, W.J. (1984). Cardiovascular-CNS interactions in a highly trained intentional attentive state. *Psychophysiology*, **24**, 542-549.

Hrycaiko, D.W., & Martin, G.L. (1996). Applied research studies with single-subject designs: Why so few? *Journal of Applied Sport Psychology*, **8**, 183-199.

Jackson, S.A., (1992). Athletes in flow: A qualitative investigation of flow states in elite figure skater. *Journal of Applied Sport Psychology*, **4**, 161-180.

Jackson, S.A., (1999). Joy, fun, and flow state in sport. In Y. Hanin, *Emotions in sport* (pp. ■). Human Kinetics, Champaign IL.

Jackson, S.A., Kimiecik, J.C., Ford, S & Marsh, H.W. (1998). Psychological correlates of flow in sport. *Journal of Sport and Exercise Psychology*, **4**, 358-378.

Jackson, S.A., & Marsh, H.W. (1996). Development and validation of a scale to measure optimal experience: The Flow State Scale. *Journal of Sport and Exercise Psychology*, **18**, 17-35.

Jacobson, E. (1938). *Progressive relaxation* (2nd ed.). Chicago: University of Chicago Press.

Kazdin, A.E. (1992). *Research design in clinical psychology*. New York: Macmillan.

Kendall, G., Hrycaiko, D., Martin, G.L., & Kendall, T. (1990). The effects of an imagery rehearsal, relaxation, and self-talk package on basketball game performance. *Journal of Sport and Exercise Psychology*, **12**, 157-166.

Kihlstrom, J.F. (1985). Hypnosis. *Annual Review of Psychology*, **36**, 385-418.

Kirsch, I. (1994). Defining hypnosis for the public. *Contemporary Hypnosis*, **11**, 142-143.

Lawton, G.W., Hung, T.M., Saarela, P., & Hatfield, B.D., (1998). Electroencephalography and mental states associated with elite athletes. *Journal of Sport and Exercise Psychology*, **20**, 35-53.

Lerner, B.S., Ostrow, A.C., Yura, M.T., & Etzel, E.F. (1996). The effects of goal-setting and imagery training programs on the free-throw performance of female collegiate basketball players. *The Sport Psychologist*, **10**, 382-397.

Masters, R.S.W. (1992). Knowledge, knerves and know-how: The role of explicit versus implicit knowledge in the breakdown of a complex motor skill under pressure. *British Journal of Psychology*, **83**, 343-358.

McCormack, K., & Gruzelier, J. H. (1993). Cerebral asymmetry and hypnosis: A signal-detection analysis of divided visual field stimulation. *Journal of Abnormal Psychology*, **102**, 352-357.

Morgan, A.H., Macdonald, H., & Hilgard, E.R. (1974). EEG alpha: Lateral asymmetry related to task and hypnotizability. *Psychophysiology*, **11**, 275-282.

Norman, D.A., & Shallice, T. (1986). Attention to action: Willed and automatic control of behaviour. In R.J. Davidson, G.E. Schwartz, & D. Shapiro (Eds.), *Consciousness and self-Rregulation: Advances in research and theory* (pp. 1-18). New York: Plenum.

Pates, J.K., Maynard, I., & Westbury, A. (in press). The effects of hypnosis on basketball performance. *Journal of Applied Sport Psychology.*

Privette, G. (1983). Peak experience, peak performance, flow: A comparative analysis of positive human experience. *Journal of Personality and Social Psychology*, **45**, 1361-1368.

Salazar, W., Landers, D.M., Petruzzello, S.J., Han, M.W., Crews, D.J., & Kubitz, K.A. (1990). Hemispheric asymmetry, cardiac response, and performance in elite archers. *Research Quarterly for Exercise and Sport*, **61**, 351-359.

Schreiber, E.H. (1991). Using hypnosis to improve performance of college basketball players. *Perceptual and Motor Skills*, **72**, 536-538.

Shor, R.E. (1959). Hypnosis and the concept of the generalized reality-orientation. *American Journal of Psychotherapy*, 13, 582-602.

Swain, A.B.J., & Jones, G. (1995) Goal attainment scaling: Effects of goal setting interventions on selected sub-components of basketball performance. *Research Quarterly for Exercise and Sport*, **66**, 51-63.

Unestahl, L.E. (1975). *Hypnosis in the seventies*. Orebro, Sweden: Veje Publications.
Unestahl, L.E., (1983). *Inner mental training*. Orebro, Sweden: Veje Publications.
Unestahl, L.E. (1986). Self-Hypnosis. In J. Williams, *Applied sport sychology: Personal growth to peak performance* (pp. 285-300). ■: Mayfield.
Wadden, T.A., & Anderton, C.H. (1982). The clinical use of hypnosis. *Psychological Bulletin*, **91**, 215-243.
Wang, M.Q., & Landers, D.M. (1986). A psychophysiological investigation of attention during archery performance. *Psychophysiology*, **23**, 449.
Wollman, N. (1986). Research on imagery and motor performance: Three methodological suggestions. *Journal of Sport Psychology*, **8**, 135-138.
Woody, E.Z., & Bowers, K.S. (1994). A frontal assault on dissociated control. In S.J.Lynn & J.W.Rhue (Eds.), *Dissociation: Clinical and theoretical perspectives* (pp. 52-79). New York: Guilford.

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