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Emotions and Golf Performance

An IZOF-Based Applied Sport Psychology Case Study

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A multiple case study investigation is reported in which emotions and performance were assessed within the probabilistic individual zone of optimal functioning (IZOF) model (Kamata, Tenenbaum, & Hanin, 2002) to develop idiosyncratic emotion-performance profiles. These profiles were incorporated into a psychological skills training (PST) intervention, with a focus on three emotional dimensions, that is, arousal, pleasantness, and functionality, and several psychological strategies employed during practice and competition. Two female varsity golfers at a major Division I university in the Southeast participated in the case study during the Spring 2002 season. The PST intervention resulted in enhanced emotional self-regulation skills and improved golf performance. Directions for future research into the IZOF model and implications for practical application of the model are discussed.

Keywords: *emotions; performance; sport psychology; individual zone of optimal functioning (IZOF)*

Commenting on the 2001 U.S. Open Golf Championship, professional golfer Tiger Woods declared that the tournament would be decided by which golfers were “controlling [their] emotions” (Ballard, 2001, p. 26). What is the functional relationship between affect and performance? The common theoretical approaches used to link emotion and athletic performance (e.g., Hardy & Fazey’s catastrophe model, 1987; Hull’s drive theory, 1943; Martens, Burton, Vealey, Bump, & Smith’s multidimensional anxiety theory, 1990; Yerkes & Dodson’s inverted-U theory, 1908) have been negatively

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biased, focusing on anxiety-performance relationships (Hanin, 2000). Hanin (2000) claimed that balance is clearly lacking in the study of emotions and athletic performance, and posited that recent developments in the individual zone of optimal functioning (IZOF) model will remedy this problem.

To clarify the relationship between emotions and sport performance, two questions were examined in this study: (a) Is there a relationship between three dimensions of emotion (i.e., arousal level, pleasantness, and functionality) and objective and perceived performance levels? and (b) How do emotions and performance change following a psychological skills training (PST) intervention?

The revised IZOF model (Kamata, Tenenbaum, & Hanin, 2002) was used to address these questions. Utilizing a multiple case study format, individual IZOFs were identified and refined for 2 participants. These profiles, as well as an assessment of psychological strategies employed during practice and competition, were used to develop a brief PST intervention. It was expected that (a) Kamata et al.'s (2002) conceptualization of the IZOF would be supported, that is, probabilistic curves would distinguish emotions associated with different levels of performance, (b) the PST intervention would result in participants' attainment of optimal emotional states via psychological and emotional self-regulation strategies, and (c) attainment of optimal emotional states would lead to improved golf performance.

METHOD

PARTICIPANTS

Volunteer participants ($N = 2$) were selected from the women's varsity golf team at a major Division I university in the Southeastern United States at the beginning of the Spring 2002 season. The participants were 20 years of age. The cases, designated Players A and B, were selected from the pool of eight golfers eligible to compete in tournaments (i.e., a criterion sample of "traveling players").

The primary investigator (PI) was also considered to be a participant in this study. As a participant-observer, the PI took an active role in the players' actions during the case study. Beginning several months prior to the onset of the study, the PI served as a sport psychological consultant, counselor, and volunteer assistant coach for the collegiate golf team of which the case study participants were members. This unique circumstance provided the PI with access to the participants and allowed trust and rapport to develop.

INSTRUMENTATION

Three instruments were employed in this study. These included a modified version of the Affect Grid (Russell, Weiss, & Mendelsohn, 1989), the Test of Performance Strategies (TOPS) (Thomas, Murphy, & Hardy, 1999), and a modified version of the Positive-Negative Affect Scale (PNA) (Hanin, 2000).

Modified Affect Grid Scorecard (Russell et al., 1989). The affect grid is a quick means of assessing affect along the orthogonal dimensions of pleasure-displeasure and arousal-sleepiness. It was designed to be "short and easy to fill out and . . . could be used rapidly and repeatedly" (p. 493). As noted by Raedeke and Stein (1994), researchers have advocated using short measures because such measures are relatively unobtrusive and can be administered prior to athletes' performances.

The affect grid consists of a 9-by-9 grid of squares. Following a stimulus question (e.g., "please rate your mood as it is right now"), the individual places a single mark somewhere in the grid. The pleasure score, which ranges from 1 to 9, is the number of the column checked, counting from the left. The arousal score, which also ranges from 1 to 9, is the number of the row checked, counting from the bottom (see Russell et al., 1989, for a review of instructions).

Based on a weeklong pilot study, it was determined that these emotion components needed to be assessed in a more efficient, less intrusive manner. Thus, the arousal and pleasantness dimensions of the affect grid were captured by assigning each to a line on the participants' scorecards, along with emotional functionality, objective score, and perceived performance categories. The rows on the participants' scorecards were labeled as follows: score, arousal, pleasantness, helpfulness (i.e., functionality), and rating (i.e., perceived performance rating). The participants rated each category (other than objective score) on a continuum from 1 to 9. This scoring method is conceptually equivalent to the affect grid rating system.

The arousal dimension ranged from a score of 1 (*very low arousal*, i.e., "feeling sleepy") to 9 (*very high arousal*, or "frantic excitement"). The pleasantness dimension ranged from a score of 1 (*very unpleasant, negative emotions*) to 9 (*very pleasant, positive emotions*). The emotional functionality continuum ranged from 1 (*very unhelpful*) to 9 (*very helpful*). The perceived measure of performance ranged from 1 (*very poor*) to 9 (*excellent*). The midpoint of each scale (5) represented a neutral state (e.g., average arousal, pleasantness, functionality, or performance).

Examined in four studies, Russell et al. (1989) reported adequate reliability, convergent validity, and discriminant validity for the affect grid. In a review of several studies, the authors found the affect grid to be highly comparable with Mehrabian and Russell's measures of pleasure and arousal, which have reported coefficient alphas of .91 and .81, respectively (as cited in Raedeke & Stein, 1994). In addition, Russell et al. reported sufficient convergent validity (correlations of .95 and .96, respectively) between the pleasure and arousal scores of the affect grid and Mehrabian and Russell's measures of pleasure and arousal. Discriminant validity was also determined to be high, with correlations between the pleasure and arousal scores of the affect grid and Mehrabian and Russell's measures of arousal and pleasure, respectively, approaching zero.

TOPS (Thomas et al., 1999). This questionnaire consists of 113 items designed to assess the psychological strategies of self-talk, emotional control, imagery, relaxation, activation, resistance to disruption, negative thinking, attentional control, and automaticity during practice and competition. Automaticity in this context refers to an expert stage of development in which performance is smooth and conscious cognitive control is minimal. Automaticity is especially important in self-paced, closed skills such as a golf swing. The TOPS also measures goal setting; however, as the participants had previously engaged in goal setting with the primary investigator, this skill domain was not expected to change as a result of the intervention.

Using a Likert-type scale format, the TOPS items range in value from 1 (*never*) to 5 (*always*), with a midpoint of 3 (*sometimes*). For example, the first item reads, “I set realistic but challenging goals for practice,” to which a respondent might answer “never,” “rarely,” “sometimes,” “often,” or “always.” Thirty-three of the 113 items are reverse scored. The items are summed into nine competition and eight practice domains (i.e., strategies). Domain totals are available only in raw score format as standardized scores based on normative responses have not yet been established. However, as the domains comprise different numbers of items, raw score total ranges are not equivalent. To compare strategies, scores were determined as the percentage of available total raw score for each domain. Because of the Likert-type scale format, in which item responses ranged from 1 to 5, dividing the total score of a domain by the number of items comprising that domain resulted in means ranging between 1 and 5. Domain scores were then expressed as a percentage value of 5. For example, if the self-talk competition strategy domain score was 11, and this domain comprised four items, the mean score would be 2.75, and the percentage score would be 55% ($[2.75/5] \times 100 = 55\%$). Strengths and weaknesses in psychological strategies were then determined relative to each other, in a collaborative process between the PI and the athlete.

Thomas et al. reported that exploratory factor analysis yielded very clear factor structures for both the competition and practice items. Alpha coefficients for the eight practice factors are as follows: goal setting (.78), emotional control (.72), automaticity (.67), relaxation (.78), self-talk (.81), imagery (.72), activation (.66), and attentional control (.73). Alpha coefficients for eight of the nine competition factors are as follows: self-talk (.80), emotional control (.79), automaticity (.74), goal setting (.78), imagery (.79), activation (.76), relaxation (.80), and negative thinking (.74). Thomas et al. have not provided an alpha coefficient for the ninth competition factor (resistance to disruption). The authors stated that the substitution of attentional control by negative thinking in the set of competition strategies is not unreasonable given that negative thinking may well be the metacognitive manifestation of a lack of attentional control. With the possible exception of the practice strategy factors of automaticity (α = .67) and activation (α = .66), these domains each possess adequate internal consistency.

According to Thomas et al. (1999), the development of the TOPS was based on the psychological processes thought to underlie successful athletic performance as delineated by contemporary theory. Validation was conducted on a large population of male and female athletes (N = 472, mean age 19.25 ± 6.87 years) drawn from three different locations.

PNA (Hanin, 2000). The PNA allowed the primary investigator to establish individualized vocabularies for each player, increasing the accuracy and effectiveness of the treatment application. It consists of a list of 40 positive and 37 negative emotions, compiled through selection and revision of items from 10 global PNA scales. Participants selected the positive and negative items that best described their emotions related to past successful and poor performances. This process resulted in an alphabetized list of 28 affective words, with two spaces for other emotional words to be added. Following a practice or competition, the participants circled only those emotional words that they felt were relevant to that particular round.

A modification to Hanin's (2000) PNA list was the inclusion of a column adjacent to the emotional word list that allowed the participants to note whether an emotion was helpful or harmful for their performance. This facilitated the assessment of emotional functionality during practice and competition. Intensity levels for each emotion ranged from 0 (*nothing at all*) to 10 (*very, very much*). Hanin and Syrja (1996) have demonstrated adequate reliability for the PNA (alpha ranging from .76 to .90), with the highest internal consistency (α = .90) observed in positive and negative optimal items.

PROCEDURES

As defined by Yin (1994), a case study is the study of events with their real-life contexts. Because of the need to model IZOF profiles with systematic observations of performers in real-life situations

(Hanin, 2000), a problem-focused case study design was employed. In an ideographic manner, individual zones of optimal, moderate, and poor functioning were determined with repeated assessments across numerous time points.

This study had essentially two phases, pre- and postintervention. Both phases took place during the Spring 2002 golf season, which consisted of four intercollegiate tournaments. Preintervention data were collected from the beginning of Spring practice through the end of the second tournament. These data were used to develop IZOF profiles and psychological-strategies profiles for both case study participants. These profiles, as well as interviews with the participants, were used to develop the PST intervention, which was initiated following the second tournament and continued for the remainder of the Spring season (i.e., through the fourth intercollegiate tournament). At the end of the season, psychological-strategies profiles were again established for the purpose of a manipulation check. IZOF data were not collected for the second half of the Spring season, as the participants felt that the IZOF data collection procedures were too distracting during practice and competition.

Case study data were collected during pretournament practices, typically consisting of two to three rounds of golf, and during intercollegiate golf tournaments, which comprised 54 holes (three rounds) of golf, played over 3 days. The procedure for one round of golf was as follows: Each participant played hole number 1 and noted the score on this hole in relation to par. Each then assigned a value, ranging from 1 to 9, for pleasantness, arousal level, functionality of emotions, and perceived rating of performance on the hole just completed, before moving on to the next hole. This pattern was repeated for all 18 holes. Immediately after the round ended, each participant completed the PNA for that round. This procedure was followed for each practice round and each intercollegiate tournament of the Spring 2002 season. The TOPS questionnaire was completed following the final round of the second and fourth intercollegiate tournaments. The participants were instructed to consider the psychological strategies employed during the previous phase of the study when completing the TOPS questionnaire.

At the midpoint of the season, following the second tournament, each player's unique IZOF, individual zone of moderate functioning (IZMod), individual zone of dysfunction (IZDy), and psychological-strategies profile were determined on the basis of the multiple data points collected during the first phase of the study. The performance zones, psychological-strategies profiles, and qualitative data collected from the PNA and interviews were used to design an intervention for each participant. Although structured similarly for both participants, the intervention was tailored to each individual's unique combination and intensity of emotional dimensions. The treatment was initiated following the second tournament and continued for the remainder of the season.

At the end of the season, following the fourth tournament, each player's psychological-strategies profile was again determined on the basis of the participants' responses to the TOPS questionnaire. This was used as a manipulation check to determine the efficacy of the intervention conducted during the second phase of the study. Objective performance statistics and perceived performance ratings were also compared between the first and second phases of the study to ascertain any changes in golf performance following the initiation of the intervention.

PST INTERVENTION

The intervention program targeted a combination of psychological skills that directly and indirectly affected emotional self-regulation. The PST intervention was designed to address the participants' skills in the areas of attentional control, imagery, relaxation and activation, self-talk, automaticity, resistance to disruption, and emotional control.

The intervention was applied in two ways. One-hour psychoeducational and experiential group sessions were provided once per week during the second phase of the study, targeting the psychological skills assessed by the TOPS. In addition, individual PST sessions were conducted with each player, on the basis of the empirical and qualitative data collected during the first phase of the study.

Following the end of the season, participants were given an opportunity to discuss the project, the results of the study, and were given as much information as possible to continue enhancing their skills in regulating emotions for optimal performance. After the study's completion, the golfers and coach each received an abstract summarizing the results of the study.

DATA ANALYSIS PROCEDURES

Kamata et al.'s (2002) probabilistic method was used to determine the emotion-related performance zones for each golfer for the three emotional dimensions, that is, arousal, pleasantness, and functionality. Each of the emotional dimension zones were regressed onto their perceived ratings of performance and objective performance scores using a series of ordinal regression curves.

Arousal level, emotional pleasantness, and emotional functionality data were recoded into three performance levels: poor (PP), moderate (MP), and optimal (OP). Using the original 9-point Likert-type scale, all input coded 1, 2, or 3 was recoded as poor. Input originally coded as 4, 5, or 6 was recoded as moderate, and input originally coded 7, 8, or 9 was recoded as optimal. All moderate performance levels were further recoded into two separate categories, moderate performance above the optimal zone (MoA) and moderate performance below the optimal zone (MoB) for each emotion dimension (arousal, pleasantness, and functionality). Mean arousal, pleasantness, and emotional functionality intensity levels were calculated for optimal performance for both participants. All performances in the moderate zone with emotional intensity levels above the participants' respective optimal performance mean were classified as "moderate performance above" (MoA), whereas moderate performances with intensity levels below each participant's mean optimal performance level were classified as "moderate performance below" (MoB).

A similar procedure was used to categorize objective and perceived performance levels into the same four categories (PP, MoB, MoA, and OP) for each participant. The participants' self-ratings of performance (1-9) were used to categorize perceived performance levels, whereas the frequency distribution of scores on each hole (i.e., number of birdies, pars and bogeys, double-bogies or worse) was used to determine objective performance levels. Birdies and pars were recoded as optimal performance, bogeys were recoded as moderate performance, and double bogeys or worse scores were recoded as poor performance.

RESULTS

Figure 1 indicates that Player A's objective performance IZOFs for arousal, pleasantness, and functionality ranged in intensity from 2.74 to 9.00, 4.11 to 9.00, and 5.16 to 9.00, respectively. Player A's objective performance IZDys for arousal, pleasantness, and functionality were rather narrow, ranging in intensity from 1.00 to 1.14, 1.00 to 1.44, and 1.00 to 2.01, respectively. In contrast, Figure 1 indicates that Player B had an objective performance IZOF for arousal ranging in intensity from a lower threshold of 1.28 to an upper threshold of 2.58. Player B's objective performance IZOFs for pleasantness and functionality were rather wide, both ranging in intensity from 1.53 to 9.00, as she did not report any scores in the MoA range. IZDys for objective scores could not be identified for Player B.

Figure 2 demonstrates the performance zones for perceived performance ratings. Player A's IZOFs for arousal, pleasantness, and functionality ranged in intensity from 4.19 to 9.00, 5.40 to 9.00, and 5.97 to 9.00, respectively. Player A's perceived performance IZDys for arousal, pleasantness, and functionality ranged in intensity from 1.00 to 4.19, 1.00 to 5.40, and 1.00 to 3.87, respectively. Player B did not have identifiable IZOFs for perceived performance. Although pleasantness and functionality IZOF curves do appear for Player B (Figure 2), they do not rise above the probability of performing at the MoB and MoA levels. Player B's perceived performance IZDys for arousal, pleasantness, and functionality range in intensity from 1.00 to 5.45, 1.00 to 4.27, and 1.00 to 4.11, respectively.

Player A's arousal, pleasantness, and functionality IZOFs and IZDys were of similar intensity ranges for both objective and perceived performance. This was not the case for Player B. As can be seen in Figure 1, Player B's objective arousal IZOF is at the lower end of the

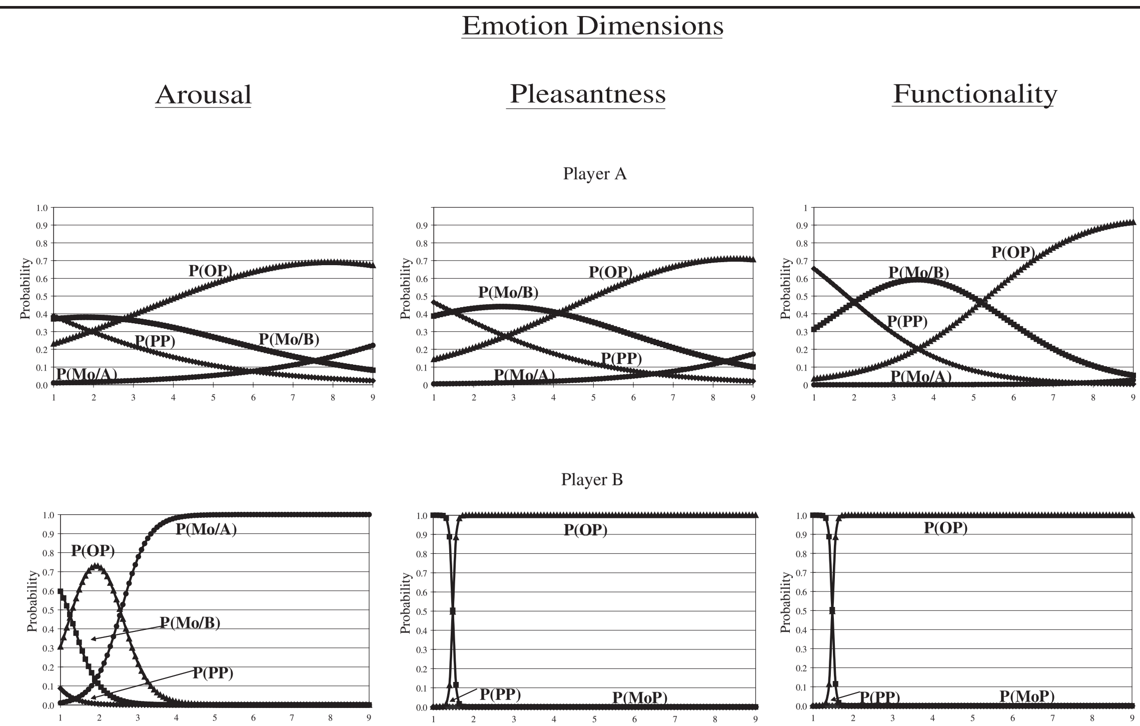

Figure 1. Graphical representation of objective performance probability curves for poor performance, P(PP); moderate performance below IZOF, P(MoB); optimal performance, P(OP); and moderate performance above IZOF, P(MoA), for each emotional dimension for Players A and B.

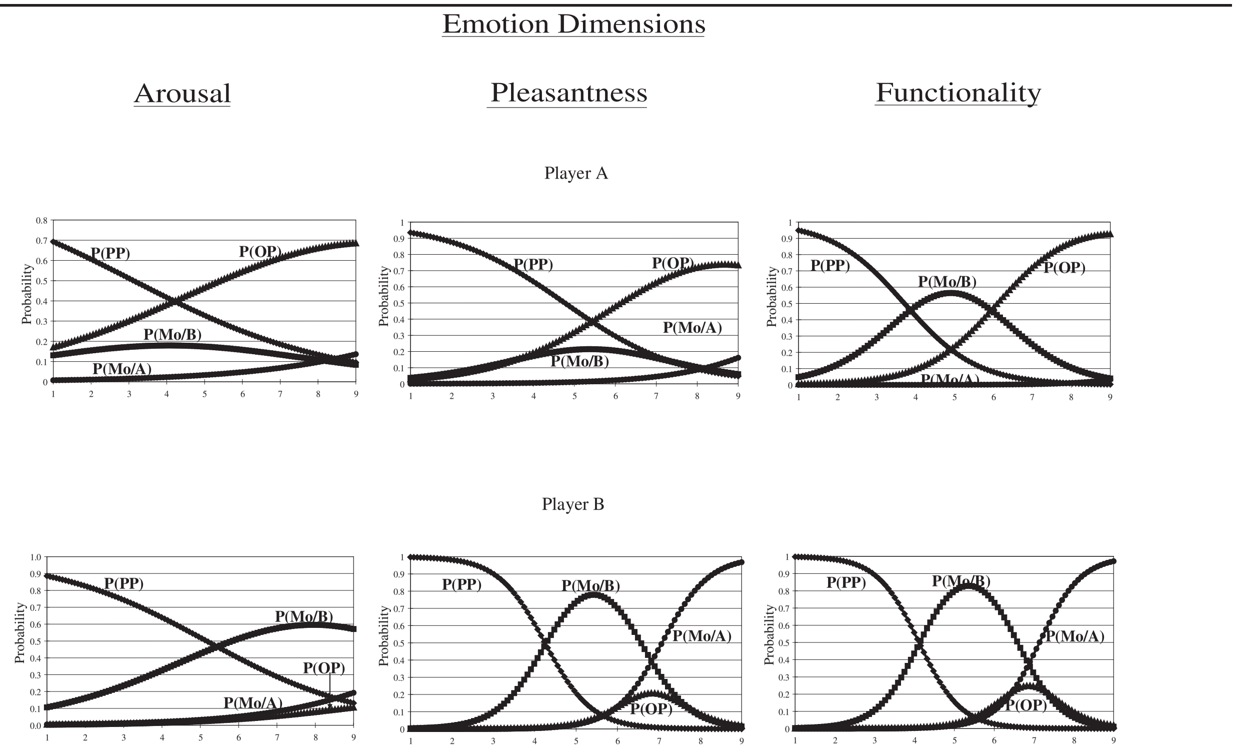

Figure 2. Graphical representation of perceived performance probability curves for poor performance, P(PP); moderate performance below IZOF, P(MoB); optimal performance, P(OP); and moderate performance above IZOF, P(MoA) for each emotional dimension for Players A and B.

scale, whereas pleasantness and functionality IZOFs are rather wide and have a relatively low threshold. However, in relation to perceived performance ratings, Figure 2 reveals that Player B performed better (at least moderately) when emotional arousal, pleasantness, and functionality were at a relatively high level. This inconsistency may be due to the way in which Player B subjectively rated performance. Overall, these results provided support for the hypothesis that the probabilistic method would determine unique performance zones for each golfer. These performance zones were used to tailor the PST intervention for each player. By showing them the conditions under which they had the highest probability of achieving optimal performance, the players could regulate their thoughts and feelings accordingly to recreate optimal internal performance states.

PSYCHOLOGICAL SKILLS ASSESSMENT AND INTERVENTION—MANIPULATION CHECK

Player A's Phase 1 TOPS profile for competition strategies showed relative strengths in goal setting, imagery, and relaxation. Areas for improvement included self-talk, emotional control, automaticity, activation, reduction in negative thinking, and resistance to disruption. Player A's Phase 1 TOPS profile for practice strategies showed relative strengths in automaticity, imagery, attentional control, and relaxation. Areas for improvement included self-talk, emotional control, and activation (see Table 1).

The elevation in relaxation and relative weakness in controlling activation corresponded to Player A's IZOF profiles (high arousal intensity) and personal statements concerning the use of relaxation skills. Accordingly, the PST intervention for Player A was designed to focus on appropriate activation strategies (e.g., "psyching up" for competition) as well as relaxation strategies to channel this positive energy (e.g., diaphragmatic breathing, progressive relaxation; Jacobsen, 1929). Emotional control was targeted directly by increasing Player A's awareness of emotions and the way they interact with performance so that they could be monitored and controlled. Emotional regulation was also targeted indirectly by examining Player A's self-talk and negative thinking strategies. The effects of self-talk and negative thinking on emotion and confidence were described (Hardy,

TABLE 1
Pre- and Postintervention Psychological Strategies and Percentage Change in Scores for Player A

	Score Phase 1 (%)	*Score Phase 2 (%)*	*Percentage Change (%)*
Competition strategies			
Self-talk	70.00	75.00	7.14
Emotional control	45.71	51.43	12.50
Automaticity	65.45	61.82	–5.56
Goal setting	100.00	90.00	–10.00
Imagery	95.00	75.00	–21.05
Activation	72.00	80.00	11.11
Negative thinking	75.00	75.00	0.00
Relaxation	84.00	82.00	–2.38
Resistance to disruption	72.73	78.18	7.50
Practice strategies			
Self-talk	55.00	70.00	27.27
Emotional control	46.67	56.67	21.43
Automaticity	62.22	77.78	25.00
Goal setting	55.00	65.00	18.18
Imagery	60.00	50.00	–16.67
Activation	44.00	54.00	22.73
Attentional control	60.00	60.00	0.00
Relaxation	60.00	67.50	12.50

Jones, & Gould, 1999), and suggestions were made for improving self-talk and reducing negative thinking.

Player B's Phase 1 TOPS profile for competition strategies showed relative strengths in self-talk, goal setting, reduction in negative thinking, and relaxation. Areas for improvement included emotional control, automaticity, and imagery. Player B's Phase 1 TOPS profile for practice strategies showed relative strengths in self-talk, emotional control, goal setting, activation, and attentional control. Areas for improvement included automaticity, imagery, and relaxation (see Table 2).

The PST intervention for Player B was designed to enhance emotional control, particularly in arousal regulation, the key performance variable identified by her IZOF profile. As with Player A, this was accomplished by increasing Player B's awareness of emotions so that they could be monitored and controlled. Emphasis was also placed on relaxation and appropriate activation strategies to regulate emotional

TABLE 2
Pre- and Postintervention Psychological Strategies and Percentage Change in Scores for Player B

	Score Phase 1 (%)	*Score Phase 2 (%)*	*Percentage Change (%)*
Competition strategies			
Self-talk	75.00	80.00	6.67
Emotional control	62.86	74.29	18.18
Automaticity	60.00	74.55	24.24
Goal setting	70.00	75.00	7.14
Imagery	65.00	80.00	23.08
Activation	72.00	86.00	19.44
Negative thinking	75.00	80.00	6.67
Relaxation	76.00	80.00	5.26
Resistance to disruption	69.09	78.18	13.16
Practice strategies			
Self-talk	80.00	80.00	0.00
Emotional control	76.67	66.67	–13.04
Automaticity	66.67	53.33	–20.00
Goal setting	75.00	70.00	–6.67
Imagery	65.00	70.00	7.69
Activation	72.00	72.00	0.00
Attentional control	70.00	70.00	0.00
Relaxation	65.00	70.00	7.69

arousal. Player B had no problem in becoming psychologically activated, during either practice or competition. The key was to achieve emotional excitation (i.e., enthusiasm for competition) without becoming so physiologically aroused that performance decrements would occur. Player B was taught to interpret symptoms of autonomic arousal in a positive manner (see Apter's reversal theory, 1982), while simultaneously using relaxation training to remain calm and focused on the process of playing golf.

The PST intervention for Player B, as with Player A, targeted self-talk and negative thinking. These psychological strategies were again addressed within the IZOF framework, as skills that could facilitate optimal performance through their interaction with emotional arousal. Player B was taught to recognize negative thinking and use internal verbal persuasion (Gould, Hodge, Peterson, & Giannini, 1989; Weinberg, Grove, & Jackson, 1992) combined with a thought-stopping technique to regulate thought content (Beck & Weishaar, 1995). When Player B became aware of self-defeating negative thoughts, she was taught to replace them with positive ones (Zinsser, Bunker, & Williams, 1998). Intervening in the cognitive-affective cycle thus contributed to a reduction in feelings of frustration and dysfunctional emotional arousal.

To test the hypothesis that a structured PST intervention would result in optimal emotional states via psychological and emotional self-regulation strategies, psychological-strategies profiles of the first and second phases of the study were contrasted. These profiles indicated the efficacy of the PST intervention.

Tables 1 and 2 depict the pre- and postintervention psychological strategies for Players A and B, as well as the percentage change in scores between Phase 1 and Phase 2. Player A showed progress in several psychological-strategies categories. During competition throughout Phase 2, Player A used more self-talk, emotional control, activation, and resistance to disruption by 7.14%, 12.50%, 11.11%, and 7.50%, respectively. During practice throughout Phase 2, Player A's psychological strategies improved in every category except imagery and attentional control. Improvements were seen in self-talk (27.27%), emotional control (21.43%), automaticity (25.00%), goal setting (18.18%), activation (22.73%), and relaxation (12.50%). Although it was a focus of the intervention, relaxation decreased slightly during competition (–2.38%). Negative thinking did not change as a result of the intervention. Although Player A did improve positive self-talk, occasional negative internal statements were also reported, such as "there I go again" following poor shots or holes in critical situations during tournaments.

Player B also showed progress in several psychological strategies categories. During competition throughout Phase 2, Player B used more self-regulatory strategies, including self-talk (6.67%), emotional control (18.18%), automaticity (24.24%), goal setting (7.14%), activation (19.44%), reduction in negative thinking (6.67%), relaxation (5.26%), and resistance to disruption (13.16%). Player B's imagery strategies substantially improved by 23.08% during competition and 7.69% during practice (see Table 2). These findings are congruent with the literature on imagery and sport performance (e.g., Murphy, 1990, 1994; Murphy & Jowdy, 1992).

The hypothesis that optimal emotional states would lead to improved golf performance was tested by contrasting objective performance statistics between Phase 1 and Phase 2. Table 3 presents objective performance statistics for each player, as well as the percentage change in scores between Phases 1 and 2. Both Players A and B exhibited substantial progress, most notably in tournament scores. Player A's three-round tournament average improved from 243.5 to 232.5 (–4.52%), whereas Player B's three-round tournament average improved from 244 to 231 (–5.33%). In contrast, the other three players that comprised the traveling squad for each tournament (designated Players C, D, and E) did not have as dramatic a decrease in average score between Phase 1 and Phase 2. The combined average three-round tournament score for Players C, D, and E, who did not participate in the PST intervention, changed from 232 to 226 (–2.59%). Player A's birdie percentage increased by 100%, whereas the number of holes below par increased by 98.92%. Average pars increased from 9.17 to 10.17 (10.85%), whereas bogeys and double bogeys decreased by 11.08 and 49.81%, respectively. Player A also reached many more greens in regulation during Phase 2 (21.18%).

Player B's birdie percentage improved dramatically (175%), as did the number of holes below par (175.68%). Average pars increased from 8 to 10.5 (31.25%), whereas average bogeys and double bogeys decreased by 40.42 and 37.45%. Moreover, while Player B hit slightly fewer fairways (1.09%) during Phase 2, the percentage of greens reached in regulation improved dramatically (90.88%). Player B stated that the improvement in greens reached in regulation was due primarily to a change in strategy over the second phase, in that she aimed toward the middle of each green more often in the final two tournaments. Player B felt that this more conservative strategy was more rewarding than aiming at each pin regardless of its position on the green, an aggressive strategy that occasionally resulted in shorter putts for birdie, but overall resulted in fewer greens reached in regulation during Phase 1. Although the strategy used during Phase 2 was more conservative, it actually resulted in a higher birdie percentage, as Player B had more putts for birdie as a result of a higher percentage of greens reached in regulation.

TABLE 3
Objective Statistics and Percentage Change in Scores for Players A and B, With Comparison to Players C, D, and E

	Phase 1 (Average)	*Phase 2 (Average)*	*Percentage Change*
Player A			
3-round score	243.5	232.5	–4.52%
Avg. # birdies	2.5	5	100.00%
Subpar holes %	4.65%	9.25%	98.92%
Avg. pars	9.17	10.165	10.85%
Avg. bogeys	6	5.335	–11.08%
Avg. double bogeys	1.335	0.67	–49.81%
% Fairways hit	56.45%	76.20%	34.99%
Avg. putts	33	32.165	–2.53%
% Greens in regulation	48.15%	58.35%	21.18%
Player B			
3-round score	244	231	–5.33%
Avg. # birdies	2	5.5	175.00%
Subpar holes %	3.70%	10.20%	175.68%
Avg. pars	8	10.5	31.25%
Avg. bogeys	7.83	4.665	–40.42%
Avg. double bogeys	1.335	0.835	–37.45%
% Fairways hit	78.20%	77.35%	–1.09%
Avg. putts	30	31.665	5.55%
% Greens in regulation	29.60%	56.50%	90.88%
Players C, D, E			
3-round score	232	226	–2.59%

These improvements, as well as statements by Players A and B attesting to the efficacy of the intervention (e.g., "I'm much more able to relax during competition," and "I'm doing better at taking it one shot at a time, not getting ahead of myself"), strongly support the hypothesis that optimal emotional states would increase the probability of improved golf performance.

DISCUSSION

The height of Player A's objective and perceived performance curves (Figures 1 and 2) depicts the probability of optimal performance for each IZOF. For both arousal and pleasantness, the probability of optimal performance was around 70% when in the appropriate intensity range, which increased to 90% when emotions were interpreted as functional. This suggests that it is probable that Player A will perform well in the future when physiological arousal is elevated and accompanied by pleasant feelings. Furthermore, there is a strong probability of optimal performance when Player A experiences emotions as helpful. The height of these curves also indicates that there is some probability, albeit smaller, that Player A can perform successfully even when emotional arousal, pleasantness, and functionality are not at optimal intensities.

Player B's objective performance zones were not as uniform as Player A's. Player B's objective performance IZOF for arousal was relatively narrow (1.28-2.58), which shows optimal performance at a lower level of physiological arousal than for Player A. However, Player B's objective performance IZOF curves for emotional pleasantness and functionality were extremely wide (1.53-9.00). This indicates that Player B had the highest probability of performing optimally only when relatively underaroused, yet could perform rather well when experiencing all but the most unpleasant and dysfunctional of emotions.

The height of Player B's objective performance IZOF curve for arousal shows that the probability of optimal performance was about 70% when in the appropriate arousal intensity range. However, the probability of a moderate performance was much higher (100%) when emotional arousal rose above an intensity of 2.58. The implication is that Player B's performance may drop to suboptimal levels when she becomes aroused beyond a relatively low level.

The height of Player B's objective IZOFs for pleasantness and functionality must be interpreted somewhat differently. As Player B did not report any objective scores in the MoA range, three ordinal regression curves were used to graph performance zones (optimal, moderate, and poor) rather than the typical four. As depicted, these curves suggest that Player B has a nearly 100% chance of performing optimally when emotional pleasantness and functionality are above an intensity level of 1.53. The key emotional variable for Player B was therefore arousal, and was targeted accordingly in the PST intervention.

Several lines of inquiry extend from this field investigation. Certainly, more support is needed for Kamata et al.'s (2002) probabilistic conception of the IZOF model. Kamata et al. (2002) suggested that further investigations of the relationships between zones would extend the probabilistic IZOF model. For example, if a performer has a narrow IZOF in one intensity dimension, it may be that having a wide IZOF in another such dimension may serve a compensatory role, resulting in high probability of overall performance. These authors noted that this type of outcome could not be determined unless the relationships between all the emotional intensity dimensions are taken into account. Therefore, a multivariate approach should be applied to estimate a single probability as the total emotional effect, additive or interactive, for IZOF and IZDy by employing a linear combination of the measures of emotional intensity.

Athletes may not always report an optimal performance zone. If an athlete is not able to establish an IZOF, it is up to the practitioner to assist the athlete in creating one. Athletes may also be taught to play well despite having dysfunctional emotions. As the probabilistic IZOF model suggests, it is possible, though less probable, for an athlete to perform well even when outside of the IZOF. It is therefore important for practitioners to teach their clients problem-focused coping skills, as well as emotion-based techniques (Folkman & Lazarus, 1980). In this manner, the athlete can focus on the physical aspects of sport until his or her emotions can be adjusted. It is likely that the combination of emotion-focused and problem-focused coping skills training will allow athletes to more readily achieve optimal performance states.

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