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Archery: Emotion Intensity Regulation to Stay in the Zone during Olympic Competition

Jolly Roy[1] & Edin Suwarganda[2]

[1] Sport Psychology Center, National Institute of Sports Malaysia, KualaLumpur, Malaysia

[2] Sports Biomechanic Center, National Institute of Sports Malaysia, KualaLumpur, Malaysia

Correspondence: Jolly Roy, Sport Psychology Center, National Institute of Sports Malaysia, Kuala Lumpur, Malaysia. Tel: 60-38-991-4955. E-mail: jolly@isn.gov.my

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Abstract

Understanding emotional influence that affect sport performance in archery helps to design the appropriate intervention in athlete's preparation. The present study examined the effect of emotion intensity from four Olympic level recurve archers on error scores and performance outcomes; compared individual emotion intensities of three competing archers during Olympic competition with previously established individual optimal zone; and examined the influence of being "in or out of individual zone" relating the archer's achievement with the individual target set by the coach and performance outcome during Olympic competition. The results revealed that unpleasant dysfunctional emotion (N-) had the most influence on performance score. The in-out of zone results derived from the archers data lend support to emotion-performance relationship.

Keywords: archery, Olympic competition, performance outcome, emotion regulation

1. Introduction

In this study, we offer an overview of how emotion intensity can influence performance in a precision task. To succeed in a high level competition, one has to establish and maintain individual optimal emotional state. Athlete's psychobiosocial states can be organized into emotion categories and explained through Individual Zone of Optimal Functioning (IZOF) concept (Hanin, 1997). Accordingly, the emotional states can be categorized through the hedonic tone and its functional and dysfunctional effects: (a) Pleasant and functional/helpful (P+), (b) unpleasant and functional/helpful (N+), (c) pleasant and dysfunctional/harmful (P-), (d) unpleasant and dysfunctional/harmful (N-) (see Hanin, 2000). IZOF concept, proposed by Hanin (1997) assumes that each individual has a specific intensity range for a given emotional state. In line with IZOF concept, various studies have demonstrated the "in-out of zone" notion within competition and across sports (Hanin & Syrjä, 1996; Robazza, Bortoli, & Hanin, 2006). The notion of individually optimal emotion intensity and the in-out of zone principle are proposed in IZOF to identify intensity effects upon performance. According to IZOF model, an athlete is likely to give best performance when emotion intensities are close to recalled emotion intensities related to functional zone of the previous successful performance. Conversely, poor performance outcomes are observed when emotion intensities are near to the emotion intensities close to dysfunctional zone of the previous unsuccessful performance. The main goal of the investigation was to identify which emotion category (P+, N+, P-, N-) affected the performance score in archery. A second objective was to examine the "in-out of zone" effects on performance score during Olympic competitions.

Emotions during competition can have facilitating or debilitating effects on performance. Hanin (2000) suggests identifying the proximity of athlete's current emotional state and intensity to the previously established individual optimal and dysfunctional zones. To determine individual zone for each athlete, analysis of past performance history and emotional experience related to successful and unsuccessful performance, were considered. Using mean and standard deviation, the IZOF is determined by adding or subtract in half standard deviation to or from the mean intensity to arrive at the individual zone. The discrepancy if small, indicates high probability of successful performance. The IZOF model makes predictions on the relationships between emotion and performance where inter individual variability in the emotion intensity has direct relationship with the athlete's performance (Kouli, Bebetsos, Kamperis, & Papaioannou, 2010).

The exposure to high level competition e.g., Olympics causes major stressor and evokes diverse emotions (see Hanin, 2000 for review). These stressful conditions, necessitates the athletes to engage in coping with different emotional state. Lazarus and Folkman (1984) indicated how stress process involved an individual's cognitive appraisals leading to emotional states and actions. Hanin (2000) indicated that an individual's idiosyncratic perceptions about the meaning and intensity of emotions exert functional and dysfunctional effects during a task execution. Emotional, motivational and attentional control are all essential for effective coping and appropriate decision making which is regulated by an individual's cognitive system (Tenenbaum, Basevitch, Gershgoren, & Filho, 2013). Errors committed interferes significantly with an athlete's appraisals, and emotions during any competitions, particularly Olympics, where personal stakes are high. This triggers loss of focus, or irrelevant focus, uncertainty and self-doubt leading to low efficacy and frustration.

In Archery, even the smallest error can result in elimination. Target error, consistency error, and total score were considered as performance measures in this study. More specifically, we were interested to examine how emotion intensities affected the total score during competitions. The target error, also known as the "constant error", indicates how many points the archer deviates from a previously set target score per end. The target score was based on competitive data of international standard. Consistency error (or variable error) is a measure of variance from the average score per end (Schmidt & Lee, 2005). The last of the performance measures is total score as in the sum of scores per arrow shot. Archery is a precision event and archers must perform every single action with great care and repeat the task with absolute precision to accumulate the best score. Success in archery, then, is related to the degree of consistency of each archer. In addition to the physical component and posture, most people also attribute the success of an archer to good psychological preparations. This implies that an archer must be calm and steady with la lot of emotional control to manage one's arousal level. Therefore the research aim was to examine the effect of emotion intensity on error scores and performance outcomes. Second aim was to plot individual emotion intensities during Olympic competition against the previously established individual optimal zone. Finally the study examined the influence of "in-out of zone" relating the archer's achievement with the individual target set by the coach (performance outcome during Olympic competition)

2. Method

2.1 Participants

The participants were Olympic level male archers (n = 4, mean age = 23 years, SD = 2.3) recurve team. All participants practiced regularly two sessions daily. In a single day they shot 250-300 arrows. All players were engaged in regular conditioning program for maintaining physical fitness. All participants were free of injury during the experiment. For simulated training days data from all the 4 archers were collected. For assessment of in out of zone during Olympic competition, only 3 archers' data who participated in Olympics were considered in the study.

2.2 Measures

The participants were provided a list of emotions (Hanin, 2000), and each athlete is required to select pleasant and unpleasant emotions typically associated with their best performance. The same procedure was repeated for emotion related to poor performance. A modified Borg's intensity scale (Hanin, 2000) with verbal anchor 0 = nothing at all (low intensity), 0.5 very very little, 1 = very little, 2 = little, 3 = moderately, 5 = much, 7 = very much, 10 very very much, and 11 = maximum possible (high intensity) was then used to secure the emotion intensities. Satisfactory reliability of the individualized scale has been reported on Olympic level soccer players(Hanin & Syrjä, 1996).

In archery tournaments, the total score of the ranking round determines the match ups for the ensuing individual elimination rounds. The simulated competition in this study consisted only of the ranking round in accordance with official World Archery Federation format. That was, each archer shot a total of 144 arrows spread over 36 arrows and 4 different distances of 30, 50, 70 and 90 meters. The arrows were shot in a sequence of 6 arrows (or 3 arrows when at 30m) constituting an "end". After each end the scores of individual arrows was retrieved on a score sheet. An arrow in the most central circle of the target earned a score of 10 points and arrows in each larger concentric circle were worth 1 point lesser i.e., 9, 8 and so on. Thus the maximum accumulated score per end was 60 (or 30) points and the total maximum score was 1440 points. Having benchmarked the top 20 scores in world tournaments during 2009 and 2011, it was calculated that a minimum score of 1320 points was needed to be ranked with the international top. Consequently, the following target scores per distance per end were set as 58 points (90m), 55 points (70m, 50m), and 58 points (30m). Herewith, the target error was calculated from the difference between the actual score and the target score per end. The final target error calculation was the average of all target errors per end. The consistency error was calculated as the square root of the sum of

differences squared between actual score per end and the averaged score of all 6 (or 12) ends divided by the number of ends. The final consistency error was calculated as the average consistency error of all 4 distances.

2.3 Procedure

After getting the necessary approvals from the research and ethics committee of the institution, the participants were explained about the purpose of the study and their consent was given.

Archers provided the recalled emotion content and intensities during previously best/worst performance on a normal day during the preparation for competitions. An idiographic approach was adopted as it was considered a sensitive measure of individual emotional experience toward competition (Robazza & Bortoli, 2000) besides facilitating within-subject responses.

The archers were explained how emotional states combined with bodily responses exerted a combined influence on performance when facing competition. Psychological profiling of idiosyncratic emotions was conducted by providing the athletes with a list of 64 emotions (Hanin, 2000). The archers were required to select up to a maximum of 5 emotions considering their two-three previously successful performance. The same procedure was repeated for emotions related to poor performance to obtain a baseline profile. The archers were then required to rate the intensity derived from modified Borg category ratio-10 scale for each selected emotion descriptors from the emotion list. To refine the baseline profile, the archers reexamined the emotion content and intensity two days later. Further, the athletes' emotion intensity was obtained during London Olympics to examine the in-out zone concept. The emotion intensities were plotted against the previously established zone and juxtaposed with the score and ranking.

Emotion intensities of 4 Olympic level archers were considered for a full FITA round (90m, 70m, 50m, 30m) during the simulated competition. Based on the deviation from the target, mean score errors were calculated. Correlation and regression analysis was calculated for each emotion category in relation to the total score, target error and consistency error. Score data was taken from simulated competition for a total of 144 arrows per athlete 36 arrows x 4 distances. Data was collected on 3 non consecutive simulation days (Two in April and the third in June). Initially data from the first 2 simulated competitions were considered. To reaffirm the output, data from the third simulated competition were added in further analysis. In the third simulated competition, only 10 out of 12 data sets were used because a single day data was incomplete from two of the athletes.

3. Results

We examined the association between emotion intensity, target error, consistency error and performance score. The results from the first two simulated competition yielded a significant negative correlation ($df = 5$, $p < .01$) between dysfunctional negative emotion category (N-) and total score ($r = -0.94$) and target error ($r = -0.93$). We further added the data from a third simulated competition which also provided a significant negative correlation ($df = 8$, $p < .05$) between unpleasant and dysfunctional emotion category (N-) and total score ($r = -0.69$) and target error ($r = -0.69$). Since unpleasant dysfunctional emotion category (N-) surfaced as the emotion category that impacted the performance score in both the above cases, we examined the pattern of individual data from 4 archers on performance score and unpleasant dysfunctional emotion category (N-). The results also showed a negative correlation.

Non significant results were obtained from the data from the two simulated competition and three simulated competitions respectively for all other emotion category viz: unpleasant and functionally optimal emotion (N+) and score ($r = -0.40$; $r = -0.22$); pleasant and functionally optimal emotion (P+) and score ($r = 0.53$; $r = 0.33$); pleasant and dysfunctional emotion (P-) and score ($r = - 0.41$; $r = -0.40$); unpleasant and functional emotion (N+) and target error ($r = -0.39$; $r = -0.22$); pleasant and functionally optimal emotion (P+) and target error ($r = 0.52$; $r = 0.33$); pleasant and dysfunctional positive emotion (P-) and target error ($r = - 0.61$; $r = -0.41$); unpleasant and dysfunctional emotion (N-) and consistency error ($r = -0.10$; $r = -0.18$); unpleasant and functional emotion (N+) and consistency error ($r = -0.26$; $r = -0.18$); peasant and functionally optimal emotion (P+) and consistency error($r = 0.28$; $r = 0.07$); pleasant and dysfunctional emotion (P-) and consistency error ($r = - 0.61$; $r = -0.56$). Given the small sample size and to prevent loss of statistical power, the level of significance was adopted at 0.01 for the data from the first two simulated competition. A standard multiple regression analysis was used to determine the best predictor variables. The best single predictor for performance score was the unpleasant dysfunctional emotion (N-) which accounted for 48% of the variance $Y = 1334.38-14.58$ (N-).

Individual emotion intensities from three Olympic participants (during London Olympic competition) were compared with previously established optimal zone. The results revealed that only Athlete 2 was within the zone in pleasant functional emotion category (P+) reflecting effective utilization of available resources and unpleasant

dysfunctional emotion category (N-), suggesting that the athletes was attempting to self regulate to control the disorganizing effects upon performance. Unpleasant functional emotion of Athlete 2 was out of the optimal zone on first 2 days of the competition, however, by the third day, the athlete managed to regulate himself to be in the zone to effectively utilize available resources. Athlete 1 remained out of their individual optimal zone on most occasions. Barring helpful functional emotion (P+), Athlete 3 also was out of the optimal zone.

Consistent with IZOF predictions, the observations of emotion intensities near to the recalled best performance was observed in Athlete 2. The data revealed the intra individual dynamics and inter individual differences in the intensities of emotion during Olympic competitions (Figure 1, 2 & 3). More specifically, an individual's functional responses of emotion intensity related to performance are evident. Hanin (2000, p. 82) proposes that if greater discrepancy occurs between actual emotional state and optimal zones, there is a high probability of less than successful performance. Our results suggests that even if the actual emotional state does not show wide discrepancy from the optimal zone, the results are not good enough even to achieve the target set by the coach in high level competition such as Olympics. Internationally a score of above 1300 is necessary to be ranked in the top.

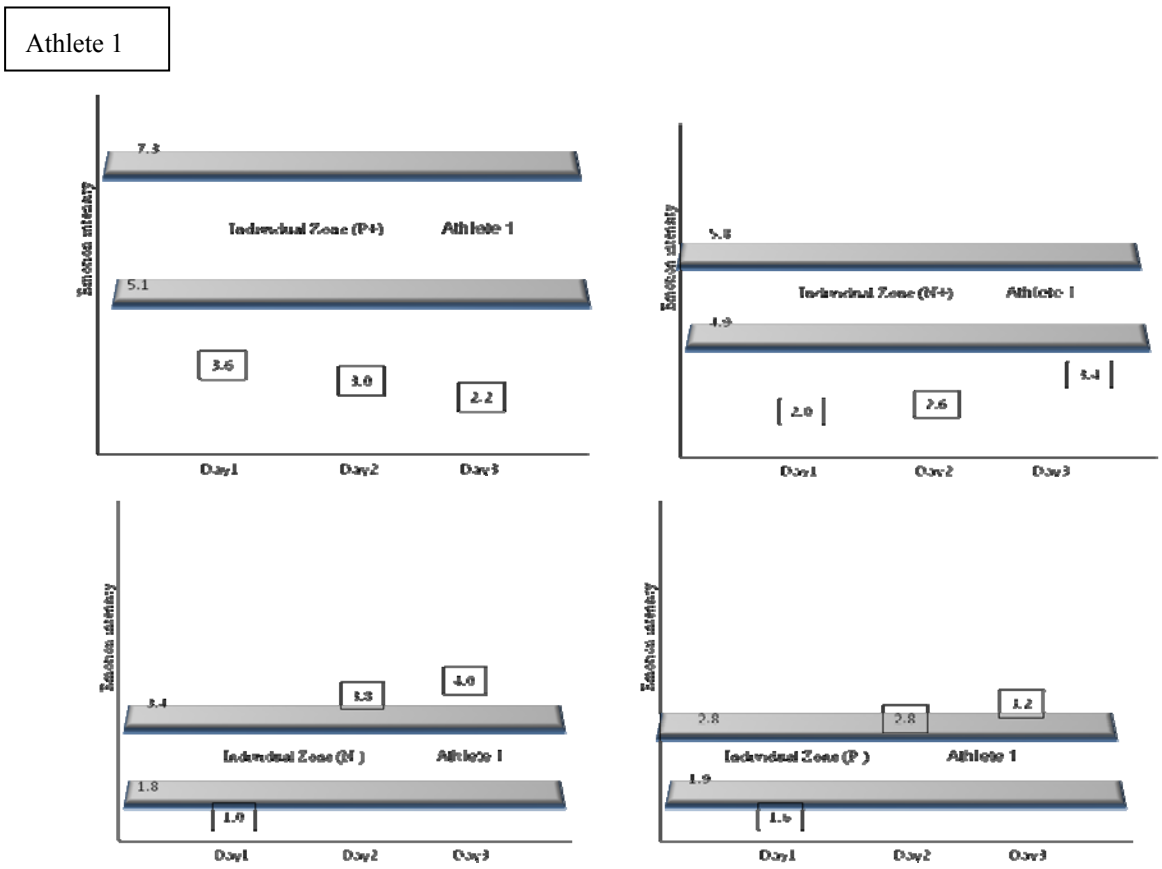

Figure1. Optimal emotion zone and individual emotion intensities during Olympic competition (athlete 1)

Athlete 2

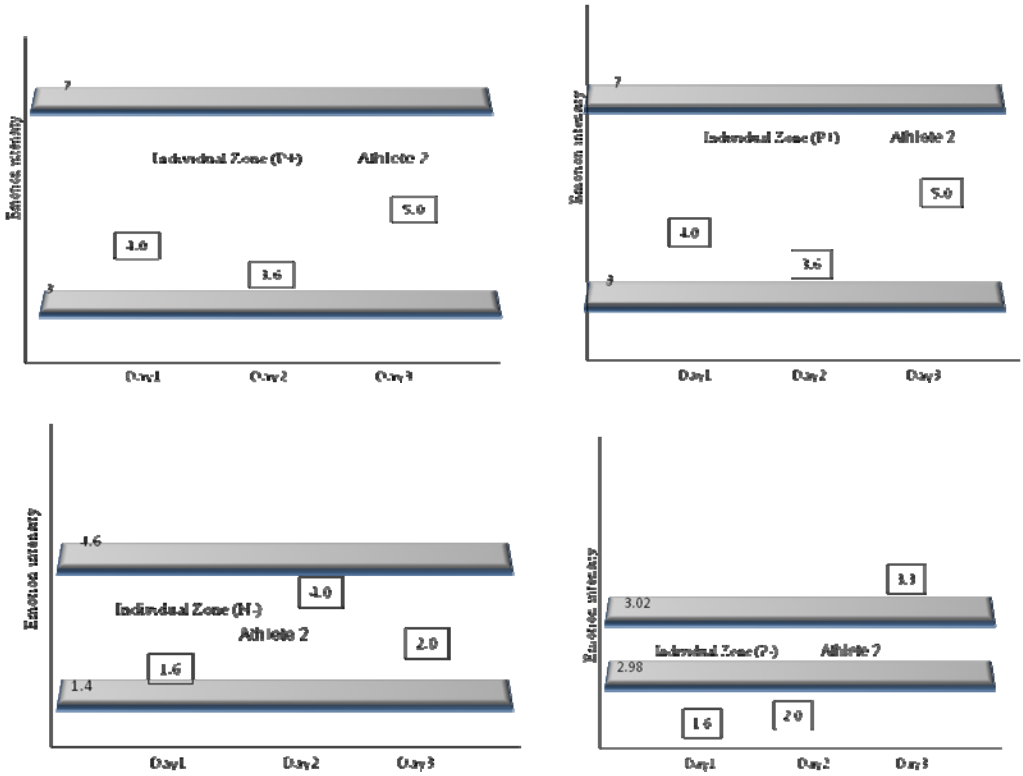

Figure 2. Optimal emotion zone and individual emotion intensities during Olympic competition (athlete 2)

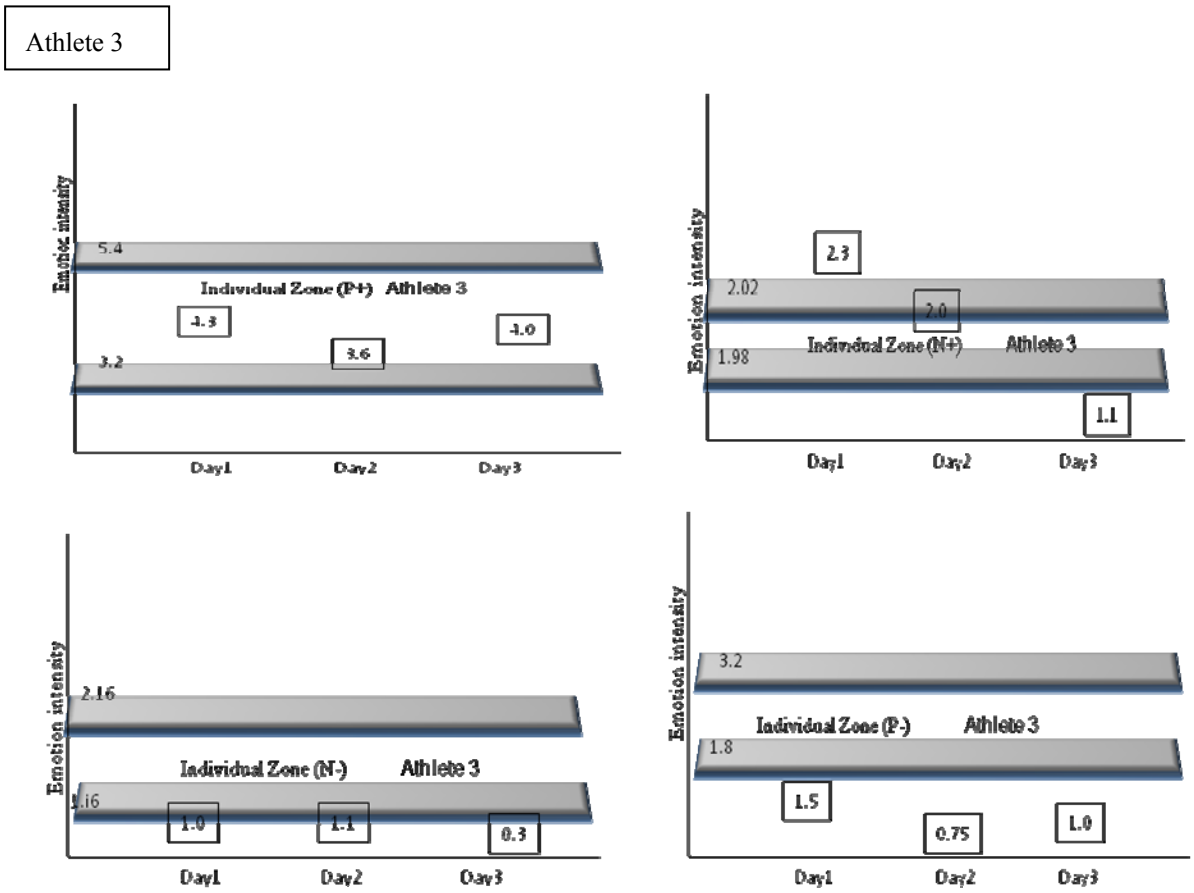

Figure 3. Optimal emotion zone and individual emotion intensities during Olympic competition (athlete 3)

4. Discussion

Emotion dynamics and outcome measure have been used by researcher seeking to understand the complex nature of emotion interaction and its input in competitive sport. Emotion performance relationships are reciprocal. Emotion affects performance and performance process and outcome produce a shift in emotion context and intensity affecting performance. One of the basic assumption of IZOF model is that emotion can produce optimal and dysfunctional effects (or) both on performance process (Hanin, 2000). Therefore prediction of performance is based on assessment of interaction effect of these emotions (Hanin, 2000). The present study sought to understand the impact of key emotion category on performance score in Archery. Functionally, emotion intensity is related to the perceived effort and energizing and de-energizing effort of performance process (Hanin, 2000).

IZOF model conceptualize the intensity dimension at individual athlete's in-out zone notion. Facilitating emotions would be beneficial to the archer to mobilize and organize functions. Debilitating emotions, on the other hand would result in a reversal of energy generation function (Hanin, 1997, p. 56). This implies that the athlete do not invest enough effort and does not recruit or utilize available resources. One of the concerns to seek which emotion category can impact the most in high level competition was because of the personal stake the Olympic level competition have on performance outcome (Lazarus, 2000). Emotions serve adaptation struggles to survive and sustain in competition, but they can at times produce counterproductive effects (Lazarus, 2000). Our study show that unpleasant dysfunctional emotion (N-) impacted the most on performance score of the archers. This finding is important in applied field to assist athletes to be able to recruit available individual resources to switch back and forth voluntarily.

In somewhat related studies involving university physical education and sports students research in emotion intensities has shown that the intensity of positive emotion was higher in cooperative games and lower in individual games (Lavega, Alonso, Etxebeste, Lagardera, & March, 2014). The athletes participating in this study are Olympic level archers and the level of the competition can influence the emotional experience of participants. These athletes would be evaluating the performance score of each arrow according to their

expectations and the consequent emotions and emotion intensity experience will impact their subsequent performance. Considering this, understanding the interaction effects of all emotion modality, particularly the impact of unpleasant dysfunctional emotion (N-) is critical. If indeed N- has greater effect on precision event like archery, then planning intervention for effective emotion regulation would be vital. Thus, becoming aware of one's emotion and influence of emotion intensity would be a key aspect in the athlete's preparation for Olympics. If the emotions are generated from the cognitive appraisals of the athlete, then it would be worth considering cognitive techniques to deal with adversity. For example, if an athlete perceives that the poor performance is the result of controllable factors such as stopping unproductive thoughts or managing stress energy balance, then practitioners should adopt cognitive techniques and try out its effect in simulated competitions.

Although simulated competitions cannot match up to Olympic environment, it is still an exercise worth pursuing. This is especially important keeping in view the personal stake of an Olympic podium finish. Missing one Olympic medal on a hairline difference in score in archery would imply that the athlete has to wait for another four years until the next Olympics, with no guarantee that the athlete would be competing in the finals.

Emotion intensity is the quantitative characteristics of affect (Hanin, 2000). The in-out of the zone concept serves as a guideline in optimizing an individual's performance (Hanin, 2000). Hanin states that in a short duration task, performance success relates to whether pre-competition anxiety is near the individual zone or outside the zone. IZOF concept also focuses on intra individual consistency and inters individual variability in the zone intensity. In this study only the emotion intensity of athlete 2 was within the optimal zone on all the 3 days of the competition except in pleasant dysfunctional category (P-), where it was still closer to the zone. When performance score was considered, only athlete 2 could qualify for the last 32 archers (rank 20), with a total score of 669 points. Athlete 1 was ranked 45 with a score of 658 points and Athlete 3 was ranked 48 with a score of 654 points) and both the archers were eliminated. In archery competition, 64 archers qualify for the elimination round there of 32 archers will advance to the next round (Table 1).

Table 1. Score, rank and performance outcome during London Olympic competition (Ranking round 2x70 m; 2x36 arrows)

	1st half	2nd half	Total score	Rank	Performance
Athlete 2	334	335	669	20	Quarter final
Athlete 1	333	325	658	45	last 64
Athlete 3	327	327	654	48	last 64

Note. 64 archers qualify for the elimination round, there of 32 archers will advance to next round.

Findings of this study lend support to Hanin's IZOF based emotion-performance relationship although it is limited to three Olympic level participants. While IZOF emphasizes on the interactive effects of emotions, the regression equation revealed that the negative dysfunctional emotion (N-) can impact the total performance score costing the athlete a medal. Therefore practitioners are advised to profile individual athlete's optimum zone of functioning to equip the athletes with unique measure to deal with adversity in high level competition. Research from actual Olympic competition, or similar level competition would further reiterate the findings of this study done during London Olympics.

According to IZOF concept, good performance would be expected if current pre-performance emotion scores were closer to the recalled optimal emotion intensity. Conversely, poor performance would be expected if the current emotion score were further away from optimal zone (Robazza & Bortoli, 2000). In this study, optimal zone based on previous successful performance were drawn for the athletes who participated in the Olympic competition. Data from three Olympic day competition were captured for emotion intensity and compared with performance score and level. The results were consistent with IZOF model that in two of the athletes the emotion intensities were frequently out of their respective zone of action. Only one athlete was able to self regulate recruiting personal strategies to achieve the desirable optimal state (see Figure 2). This result suggest that not only individuals' awareness of critical aspects of performance, but a purposeful search of emotional experience and feelings is vital to gaining control of pressure situations. To achieve this, practitioners adopt a mindful based training firmly fixing the goal to be achieved and helping athletes to navigate within the available space amidst adversity. More specifically if athletes can be aware of their psychophysical states (i.e., emotion content,

intensity, and resultant subjective experiences), they would be in a better position to mindfully accept unpleasant inner conditions and switch to newer strategies to self regulate and perform better.

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