The Effects of a Rational Emotive Behavior Therapy (REBT) Intervention on Performance in Elite Paralympic Athletes.

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Abstract (250 Words)

The effects of REBT are receiving increased attention within the sport psychology literature, yet the precise link with athletic performance remains unclear. The primary purposes of this study was to investigate the effects of REBT on physiological, psychological, and competition simulation scores indicative of athletic performance, and to examine the acute and maintenance effects of REBT using a SCD with elite Paralympic athletes. Using a single-case research design, eight athletes recruited from the same Paralympic sport ($M = 40.12, SD = 12.99$) received five, one-to-one REBT sessions. Measures of Irrational Beliefs (IBs) were collected on a weekly basis, whereas the remaining psychological and physiological measures were collected at a pre-, immediately post- and 9-month post-intervention. Data indicates REBT brought about reductions in IBs that were coupled with reductions in Systolic Blood Pressure (SBP) indicative of an adaptive physiological response, improved athletic performance during competition simulations, and reductions in avoidance goals. Furthermore, social validation data indicated greater self-awareness, emotional control and competition concentration as a result of the REBT intervention. Results are discussed with reference to anxiety, limitations and intervention reflections. This paper contributes to the extant literature supporting the promising effects of REBT as an intervention to facilitate psychological health and enhance performance with elite athletes.

Key words: Irrational beliefs, Single-case design, Physiology, Paralympic, Elite Sport
**Introduction**

Rational Emotive Behavior Therapy (REBT; Ellis, 1957) is a psychotherapeutic intervention concerned with promoting psychological health, based upon the premise that ‘*People are disturbed not by things but by the view they take of them*’ (Epictetus, 55-135 A.D.). REBT theory posits that Irrational Beliefs (IBs) about adversity (e.g., failure, rejection and ill-treatment) lead to unhealthy emotions (e.g., anxiety, depression, guilt) and dysfunctional behaviors; whereas, Rational Beliefs (RBs) about adversity lead to healthy emotions (e.g., concern, sadness, remorse) and functional behaviors. Thus, two individuals can respond, think, feel and behave differently based on what they tell themselves about the same situation (Maclaren et al., 2016). Specifically, both IBs and RBs consists of four core beliefs comprising of one primary and three secondary beliefs (DiGiuseppe et al., 2013). The primary core IB is a rigid and extreme demand followed by three secondary beliefs of awfulizing, discomfort intolerance and self/other/life-depreciation. IBs are characterized as dogmatic, rigid, inconsistent with social reality, and hinder long-term goal attainment. In contrast, the primary core RB is a flexible and a non-extreme preference followed by three secondary beliefs of anti-awfulizing, discomfort tolerance, and self/other/life acceptance (DiGiuseppe et al., 2013). RBs are characterized as flexible, functional, consistent with social reality and help long-term goal attainment (Dryden & Branch, 2008). REBT theory has been likened to Lazarus’ (1991) cognitive appraisal theory (e.g., Turner et al., 2014). Thus, beliefs largely influence a primary appraisal of the situation, and are central in determining either a healthy or unhealthy response to adversity (Hyland & Boduszek, 2012). Investigations into the influence of beliefs on emotion provide strong and robust support for a binary view of emotional distress (Hyland & Boduszek, 2012); negative emotions are characterized by functionality (i.e., helpful vs. unhelpful) rather than intensity, highlighting the crucial role of negative emotions on human experience (Maclaren et al., 2016).
Research consistently demonstrates the detrimental effects of IBs on psychological health in clinical and non-clinical populations (e.g., Engels et al., 1993; Gonzalez et al., 2004; Vîslă et al., 2016). Accordingly, the application of REBT in this research has seen practitioners use a situational ABC (DE) model (Ellis & Dryden, 1997), where in the face of failure, rejection, or poor treatment (A) participants are encouraged to understand that it is their beliefs (B) about the situation (A) rather than the situation per se that determines the functionality and adaptive consequences (C). Practitioners work collaboratively with clients to vigorously dispute and replace IBs with RBs (see Turner & Barker, 2014). Although not traditionally associated with athletic performance, REBT does provide a model of optimal human functioning that is relevant to athletes (David et al., 2010). Subsequently, there is an emerging line of contemporary research systematically investigating the effects of REBT on athletic performance.

To illustrate, a study by Larner et al. (2007) reported that six 90-minute group REBT workshops significantly reduced IBs and moderated facilitative shifts in ten-pin bowlers’ participants’ directional interpretation of anxiety in comparison to control and traditional anxiety management groups. Using multiple REBT workshops Turner, Slater and Barker (2013) also reported long-term reductions in the content IBs of “need for achievement” and “demand for fairness” in elite soccer academy players, as well as reporting subjective psychological and performance benefits. In sport, REBT is proposed to be most effective delivered on a one-to-one basis (Turner & Barker, 2014); Turner and Barker (2013) reported reductions in IBs and cognitive anxiety after three one-to-one REBT consultancy sessions in elite youth academy cricket players. A case study by Marlow (2009) reported enhanced RBs, enhanced emotions and performance in ten-pin bowlers. Furthermore, IBs have been associated with emotional and physical exhaustion, and burnout in elite youth athletes (e.g., Hill et al., 2008).
Collectively these findings evidence the positive effects of REBT on athletic performance. However, valid conclusions regarding the efficacy of REBT are difficult to ascertain due to various shortcomings within previous research. In particular, there is a scarcity of objective measures (e.g., Turner & Barker, 2013; Turner et al., 2013), and precise intervention effects are difficult to ascertain because REBT has been used alongside other psychological interventions (i.e., multi-modal interventions; e.g., Elko & Ostrow, 1991).

Therefore, the primary purpose of this paper is to investigate the effects of five one-to-one REBT sessions on objective measures including physiological markers, competitive simulation performance scores, and achievement goals indicative of enhanced performance. The use of physiological markers is supported by Harris et al. (2006) who found that an IB manipulation during a real life stressful scenario resulted in greater increases in Systolic Blood Pressure (SBP) whereas an RB manipulation resulted in decreases in SBP. Although scant this study may indicate irrational statements are associated with biological indicators of health, whereas IBs are associated with unhealthy biological indicators of health (i.e., disease related physiological responses; David & Cramer, 2010). To this end, this study contributes to previous research, utilizing physiological markers (i.e., SBP) to examine the effects of REBT on an athlete’s physiological state.

Previous researchers have proposed IBs may harbor motivational qualities (Turner & Barker, 2014). Athlete’s achievement behaviors are proposed to represent their motivation for participating in sport (Jones et al., 2009). In line with achievement goal theory, previous research has reported approach goals are associated with positive achievement-related processes and outcomes, whereas avoidance goals have been associated with negative achievement-related processes, self-handicapping, and state anxiety (e.g., Nien & Duda,
2008). Thus, investigating the effects of REBT on approach and avoidance goals provides a promising avenue of research to further elucidate the nuances between IBs versus RBs and between helpful versus unhelpful consequences. Finally, the current study examines the facilitative effects of REBT by collecting objective markers of performance (e.g., competitive simulation scores).

A secondary purpose of the present study is to provide an idiosyncratic and comprehensive investigation into the effects of REBT on the performance of elite Paralympic archers using single-case design (SCD; Barker, Mellalieu, McCarthy, Jones, & Moran, 2013) within ecologically valid settings. In addition, this study adds to the limited research documenting the effects of psychological interventions with elite athletes who have a disability (Shearer et al., 2009). Previous research suggests athletes with a disability share numerous similarities with able-bodied athletes, nevertheless there are many physical and psychological challenges specific to their condition (e.g., lack of autonomy, potential injury, medical care and negative social reactions from the community; Jaarsma et al., 2014). Finally, considering the centrality of IBs to psychological disturbance (David et al., 2010) this study aims to explore the maintenance effects of REBT at nine months, to allow for stronger conclusions regarding the long-term effectiveness of REBT.

In sum, through REBT the reduction of IBs and promotion of RBs should be helpful for athletic performance, although the precise effects of IBs remain unclear (Turner et al., 2014). Therefore, the present study aims to provide a novel contribution to the existing literature by (a) investigating the effects of REBT on physiological, psychological, and competition simulation scores indicative of athletic performance and (b) examining the acute and maintenance effects of REBT using a SCD with Paralympic athletes.
Method

Participants

Eight elite athletes were purposively recruited from the same Paralympic sport, aged between 18 and 57 (\(M = 40.12, \ SD = 12.99\)) years with experience on the Paralympic program ranging between 1 month to 17 years (\(M = 6.56, \ SD = 7.08\)). Participants 1, 3, 4, 5, 6 were male and participants 2, 7 and 8 were female. Although the research team were aware certain participants had prescription medication to treat physical and psychological ailments, it was not deemed appropriate to collect medical data prior to the screening process. Nevertheless, this medication did not change over the course of the study. Pre-screening procedures confirmed all participants had no previous experience or understanding of REBT. Considering the postulation that all humans harbor a biological predisposition towards IBs (Ellis, 1976) all archers were included in the study (David & DiGiuseppe, 2010). Consent was provided by all participants and ethics approval gained through the university’s Research Ethics Committee.

Design

The study used a single-case, staggered multiple-baseline across participants design offering an experimental and ideographic platform to observe intervention effects in ecologically valid settings (Barker et al., 2013). Meaningful changes in participants’ state IBs were compared against stable and representative baseline data collected prior to the beginning of the intervention phase (Hrycaiko & Martin, 1996). The sequential delivery of one-to-one REBT sessions using a multiple baseline design allowed the effects of the intervention to be demonstrated by comparing changes in IBs from the onset of the intervention to those before the onset, whilst controlling for extraneous variables (Barker et al., 2011).
variables (i.e., psychological, physiological and performance scores) were collected from all participants at a pre-intervention, post-intervention and 9-month follow-up time point.

**Measures**

**Irrational Beliefs**

The Shortened General Attitudes and Beliefs Scale (SGABS; Lindner et al., 1999) was used as a measure of state and trait IBs. In line with previous research all four items from the RB subscale were removed due to its failure to provide a reliable and sensitive measure of RBs, reducing the SGABS from 26 to 22 items (e.g., Turner & Barker, 2013). The SGABS has good test-retest \( r = .91 \); Lindner et al., 1999), construct, criterion, discriminant, convergent and concurrent reliability (MacInnes, 2003). Participants’ IBs were collected using Qualtrics Survey Software consistently on the same day of the week on weekly basis during the pre-intervention and post-intervention phases. Participants reported **the extent they agreed with six statements about self-downing, other-downing, need for achievement, need for approval, need for comfort and demand for fairness** on a 5-point Likert-scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The extent they agreed with six statements about self-downing, other-downing, need for achievement, need for approval, need for comfort and demand for fairness. Participants’ trait IBs were also collected at 9-month follow-up.

Cronbach’s alpha coefficients of both trait and state SGABS scores for total and subscale scores indicated internal reliability scores ranging from \( \alpha = .71 \) to \( \alpha = 99 \).

**Emotions**

Participants’ trait anxiety (Ax) were measured using 10 items with the best psychometric properties from the trait Ax subscale of the State Trait Personality Inventory (STPI; Spielberger & Reheiser, 2009; Spielberger et al., 1983). The trait STAI (Form Y) has been shown to report high test-retest reliability \( r = .76 - .86 \), Cronbach’s alpha coefficient \( \alpha = .8 \).
90), content, construct and concurrent validity (Spielberger & Reheiser, 2009). Participants recorded their answers on a 4-point Likert-scale ranging from 1 (not at all) to 4 (very much so).

Achievement Goals
The Achievement Goal Questionnaire (AGQ; Conroy, Elliott, & Hofer, 2003) was used to assess the participants Mastery Approach (MAp) Mastery Avoidance (MAv), Performance Approach (PAp) and Performance Avoidance (PAv) Goals in relation to the upcoming competitive simulation. In line with previous research the ACG originally consisting of 12 items were reduced to four items (e.g., Turner et al., 2013). Finally, scores from both MAp and PAp, and MAv and PAv items were collapsed to provide a total score for approach and avoidance orientations respectively. Participants reported their answers on a 7-point Likert-scale ranging from 1 (not at all true) to 7 (very true).

Performance
Participants took part in competitive shooting simulations mimicking the format of a major championship. Participants’ performance scores were calculated as mean of the three arrow mean-scores over the course of the competition simulation.

Physiological Markers
The Finometer PRO (Finapres Medical Systems, Netherlands) was used to collect resting physiological measures prior to the upcoming competitive simulations. Previous research has validated the Finometer PRO as an apparatus to measure cardiovascular indices (e.g., Kaltoft et al., 2010; Schutte et al., 2004). Preceding the data collection process participants were notified of the upcoming simulation, then Heart Rate (HR), Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) were monitored over a five-minute period; mean scores were calculated.
**Social Validation**

Integral to SCDs (Barker et al., 2013) social validation data was collected at the end of the post-intervention time point through semi-structured interviews to ascertain the participants’ perceptions and feelings about the intervention and its procedures. Interviews were also conducted and triangulated with the head coach and sport psychologist (Page & Thelwell, 2013).

**Data Collection**

To ensure participants were accustomed and desensitized to the research protocol (e.g., white coat syndrome; Parati et al., 2003) participants were first provided with a 30-minute introduction session to the research project, and then completed a trial run of the research protocol (i.e., self-report, physiological and performance measures). At the onset, changes in participants’ IBs were monitored using the state SGABS inventory. The SGABS was then completed on a weekly basis from at least five weeks prior to beginning the REBT intervention, to five weeks after completing the intervention. Using a multiple-baseline across participants approach the REBT intervention was delivered after participants 1 and 2 reported 5 weeks of stable baseline measures. Participants 3 and 4 then began the REBT intervention on week 7. Following this participants 5, 6 and 7 commenced the intervention on week 8, and participant 8 on week 9. Depending on the training schedule and availability each participant received the intervention lasting for approximately 30 minutes each, on a weekly or fortnightly basis. Pre-intervention measures were collected in week 5 prior to the onset of the REBT intervention and post-intervention measures were collected the week following all participants had completed the intervention program (week 18). To explore the maintenance effects of the REBT intervention identical measures were again collected at 9-months follow-up. Measures taken at pre-, post-intervention and 9-month follow-up time points were collected over the duration of a day. Each participant was allocated a time slot to complete a
series of self-report measures (i.e., trait IBs, trait anxiety). Following this resting HR, SBP, and DBP measures were collected. Upon completion participants were then asked to report their achievement orientation prior to taking part in the competitive simulation.

**Intervention**

Participants received an REBT intervention program consisting of five one-to-one sessions each lasting for 30 minutes, as well as four inter-session homework tasks (Turner & Barker, 2014). To ensure procedural reliability a session-by-session REBT booklet (available from the first author) ensured each participant was guided by the ABCDE framework (see Figure 1.). The intervention was separated into education, disputation and reinforcement phases (see Turner & Barker, 2014). Due to availability participant 6 was only able to complete three of the five intended sessions, due to their availability.

**Data Analysis**

At the 9-month follow-up time point no data was collected for participant 7 and no performance scores were collected for participant 5 and 8.

**Visual Analysis**

A combination of visual and graphical analysis was used to investigate intervention effects on participants’ IBs. Where appropriate (i.e., data is not serially dependent) visual and statistical analysis techniques are favored when analyzing single case data (Ottenbacher, 1986). Intervention effects were inferred when two of the following criteria were met (Barlow & Hersen, 1984): a) the last few data points of the baseline were stable, or in the opposite direction to the predicted effects of the intervention; b) there were a minimal number of overlapping data points between baseline and treatment phases, c) there was an immediate effect following the intervention and d) there was a larger effect size in comparison to the
baseline (Hrycaiko & Martin, 1996). Participants’ IBs were visually inspected using graphical and descriptive statistics.

Statistical Analysis

Statistical analysis was used to compliment visual inspection of the data. Descriptive statistics, percentage change scores, immediate change scores and Non-Overlapping Data-points (NDP) were calculated between pre-intervention and post-intervention phases (see Table 1). The percentage of non-overlapping data points was calculated from the treatment data that overlapped with the most extreme baseline data point (Morgan & Morgan, 2009). Furthermore, to determine the magnitude of the intervention effect Cohen’s $d$ was calculated between pre-intervention and post-intervention phases (Cohen, 1992). Single case data was interpreted in reference to small effect size <0.87; medium effect size .87- 2.67; and large effect size >2.67 (Parker & Vannest, 2009). In line with guidelines provided by Ottenbacher (1986), to ensure the data met parametric assumptions, participants’ state IBs were assessed for serial dependency via autocorrelation analysis. Scores were assessed over pre-intervention (onset of baseline to start of intervention) and post-intervention (intervention onset –five weeks post intervention conclusion) phases. Pre-intervention and post-intervention scores for participant 1 and 2 were analyzed together as there was fewer than 6 baseline data points (Ottenbacher, 1986). Auto correlation analysis revealed significant autocorrelation in Participant 2’s SGABS scores ($r =0.86$), whilst all other data revealed non-significant autocorrelation. Using a first difference data transformation (see Ottenbacher, 1986) state IBs data for participant 2 produced non-auto correlated data, subsequently, permitting analysis whilst retaining original scores for visual analysis (see Figure 1). Changes in participants’ state IBs between pre- intervention and post-intervention phases were analyzed using an independent samples $t$-test, statistical significance was set at $p <.05$. To further ascertain associations between IBs and participants’ physiological responses two non-parametric
correlations (Spearman’s rho) were used (1. pre-intervention and post-intervention; 2. pre-intervention and 9-month follow-up time point).

Procedural Reliability

To ensure each participant was treated equally post-intervention irrational belief scores were not viewed until all participants had completed the REBT intervention. Further, to ensure the intervention was delivered consistently a session-by-session manual was used to guide the REBT intervention (Barker et al., 2013). Finally, reviews of previous sessions and the completion of homework were checked to confirm participants successfully received and completed the intervention.

Results

The results of this study are presented in two sections. First, we detail and summarize the effects of the intervention on the participants across all outcome variables. Second, using social validation data we draw together report the participants, head coach and sport psychologists’ perceptions and thoughts about the intervention.

Irrational Beliefs

Six participants (P 2, 3, 4, 5, 7, 8) reported substantial mean reductions in IBs between pre-intervention and post-intervention phases, constituting one small, three medium and two large effect sizes (see Table 1). Notably, the REBT intervention brought about maintained reductions in IBs for these six participants between the pre-intervention phase and at a 9-month follow-up time point, whilst three out of five participants (P 3, 4, 8) reported reductions between the post-intervention phase and 9-month follow-up. Participant 1 recorded a significant increase in IBs after the onset of the REBT intervention, which plateaued for the remainder of post-intervention phase (see Figure 1). Participant 6 who received only three of
the five intended REBT sessions reported no significant changes in IBs between pre- and post-intervention phases. No participants reported an immediate change in IBs at the onset of the intervention, indicating a delayed intervention effect (Figure 1). Broadly, the data suggests that the REBT intervention brought about both short and long-term reductions in IBs. However, data for participant 5 and 7 exhibited both a downward trend in state IBs and strong floor effects prior to the onset of the intervention and therefore should be interpreted with caution.

**Trait Anxiety**

Three of the five participants (P 2,4,5) who reported reductions in IBs also reported reductions in trait anxiety between pre-intervention and 9 month-follow-up (see Table 2). Participant 1 who reported significant increases in IBs recorded increases in trait anxiety scores between both pre- and post-intervention, and at a 9-month follow-up time point. Considering this, only one of the six participants (P 2) who reported significant reductions in IBs reported substantial reductions in trait anxiety between pre- and post-intervention, therefore concrete conclusions about the effects of REBT on participants’ trait anxiety are difficult to draw (see Table 2).

**Physiological Measures**

Three of the eight (P 2,4,6) participants reported reductions in mean resting SBP scores between pre- and post-intervention time points, whereas all seven participants with relevant data reported a reduction in mean resting SBP between a pre-intervention and 9-month follow-up time point. Five out of six participants (P 2,3,4,5,8) who reported significant reductions in IBs between pre- and post-intervention phases also reported reductions in mean resting SBP between pre-intervention and 9-month follow-up time points (see Table 3).
Spearman rho indicated a non-significant but moderate positive correlation between reductions in IBs and SBP from pre-intervention to 9-month follow-up ($rs(7) = .57, p = .18$); squaring the correlation coefficient revealed 44% of the variance in change SBP scores were accounted for by the change scores in IBs. In contrast, there was a very weak negative correlation in changes in IBs and SBP from pre-intervention to post-intervention ($rs(8) = -.07, p = .86$) time points. Furthermore, data suggests the intervention brought about reductions in resting blood pressure for participants who initially reported high levels and significant reductions in IBs. To illustrate, participants 2 and 4 indicated staggered reductions in SBP and DBP across all three-time points. Data suggests that reductions in IBs may have a lagged effect on the mean resting SBP of the participants approaching a competition simulation.

*Performance Scores*

Five of seven participants (P 2,3,4,6,7) recorded increases in competitive simulation performance from pre- to post-intervention (see Table 2). Four of five participants who reported significant reductions in mean IBs from pre- to post-intervention phases (P 2,3,4,8) also recorded improvements in performance scores from pre- to post-intervention. Four of six participants (P 2,4,5,6) reported performance increases between pre-intervention and 9-month follow-up. Broadly, the data suggests reductions in IBs brought about by the REBT intervention were paralleled with increases in the participants’ performance scores between pre-, post-intervention and 9-month follow-up time points. Considering the variations in the magnitude of change in each participant’s performance scores, such conclusions are drawn tentatively; in addition, participant 1 exhibited strong ceiling effects in performance scores across all time points.

*Achievement Goals*
All six participants who reported significant reductions in mean IBs from pre- to post-intervention (P 2,3,4,5,7,8) also reported small reductions in approach goals. Furthermore, five of these six participants (P 3,4,5,7,8) also reported reductions in avoidance goals from pre- to post-intervention. All participants reported a maintenance (P 3,6) or an increase (P 1,2,4,5,8) in approach goals from post-intervention to 9-month follow-up; whereas, four of seven participants reported a maintenance (P 2) or reductions (P 1,4,5,8) in avoidance goals. These data suggest the REBT intervention may have brought about reductions in approach goals and greater and sustained reductions in avoidance goals.

**Social Validation**

Interviews revealed that the participants, head coach and sport psychologist received the REBT intervention positively, and reported a shift towards a rational philosophy. In response to adversity participants noted improvements in: taking perspective; confidence and autonomy to manage their emotions; self-awareness; and the autonomy to use rational self-talk that subsequently enhanced their self and other perceptions. To illustrate, participant 2 noted “I feel these sessions have been incredibly helpful and I have gained tools that I will use for the rest of my life”. Participants also reported performance improvements as a result of the REBT intervention. These including managing negative thoughts; improved competition concentration; and the ability to respond proportionately to competition stressors. To illustrate, participant 6 stated “it has allowed me to focus on my performance without wasting my mental energy”. All parties reported the REBT intervention developed interpersonal relations within the team through the use of rational language and rational phraseology. For example, participant 8 stated “I don’t put other people in boxes anymore and place a big X next to them”. As a result of the intervention, both the head coach and sport psychologist reported no changes in participants’ motivation. In addition, the
participants were reported to have engaged and been receptive to the intervention, which was facilitated, by the content, style of delivery and establishment of trust with the practitioner.

**Discussion**

The major purpose of the present study was to investigate the effects of REBT on athletic performance. Specifically, this paper contributes to the extant literature and is the first study to investigate the immediate and maintenance effects of REBT using both physiological and performance outcomes. This paper also extends the literature by offering an idiosyncratic examination of the effects of REBT in an elite sample of Paralympic archers within ecologically valid settings.

As previously found (e.g., Larner et al., 2007; Turner & Barker, 2013), IBs reduced with the intervention and demonstrated the facilitative effects of REBT as an intervention to enhance athletic performance with Paralympic athletes. However, in contrast there was little change in trait anxiety as a result of the REBT intervention. To explain, REBT theory supports the conceptualization of emotion as a binary construct (Hyland & Boduszek, 2012). Here, IBs lead to functional negative emotions, whilst RBs lead to dysfunctional negative emotions (Dryden & Branch, 2008). Therefore, both functional and dysfunctional emotions can be experienced under low, medium and high intensities. Accordingly small or marginal reductions in anxiety may be expected as a result of REBT, essentially questioning the validity of unitary measure of emotion within REBT research.

Overall the results indicated that the REBT intervention was effective in enhancing athletic performance. These findings contribute to the dearth of research investigating the effects of REBT on athletic performance (e.g., Elko & Ostrow, 1991) and supports subjective performance benefits outlined in previous research (e.g., Turner & Barker, 2013).
To our knowledge, the current study is the first to evidence the effects of REBT on performance within elite Paralympic athletes (Turner, 2016 review here). Furthermore, these findings contribute to the relatively scant research literature investigating the effects of core beliefs on behavioral consequences (Szentagotai & Jones, 2010). Changes in participants' achievement goals may provide one explanation by which reductions in IBs brought around increases in athletic performance. Although participants reported reductions in approach and avoidance goals, greater and maintained reductions were reported in the latter compared to the former. Indeed, approach goals are associated with positive achievement related processes compared to avoidance goals (Jones et al., 2009; Nien & Duda, 2008). On this basis, when facing an important competition it is plausible that reductions in IBs (e.g., “it would be terrible if I failed and this would make me a complete failure”) lead to experiencing healthy negative emotions (e.g., concern), in turn encouraging a shift in focus from what could go wrong, to what could be achieved. To this end, the investigation into the association between beliefs and motivation may offer a fruitful line of enquiry. Theoretically, the influence of IBs on cognitive appraisals (Lazarus, 1991) may also explain improvements in a participant's performance, whereby, core beliefs influence an individual's representation of reality in terms of its personal significance (Turner & Barker, 2014). Therefore, when facing adversity (i.e., competition simulation) irrational and rational beliefs influence one’s primary and secondary appraisals (David et al. 2002). To illustrate, when approaching or during an important competition we posit IBs may distort and place too great a demand on the athlete and amplify the prospect of failure. Therefore, low levels of IBs will reduce the likelihood of a stress appraisal oriented around harm/loss and threat, and instead promoting a challenge appraisal (e.g., anticipating future gain from encounter; Nicholls et al., 2010).

The results indicated that decreases in participants IBs were coupled with reductions in resting SBP taken prior to an upcoming competition simulation; furthermore, these SBP
reductions were maintained at a 9-month follow-up time point. Moving beyond previous research which utilized irrational and rational manipulations (e.g., Harris et al., 2006), this study evidenced that in reference to an upcoming stressful situation reductions in absolutistic and rigid IBs were associated with lower levels of resting SBP. This supports the premise that mental rigidity leads to autonomic rigidity (i.e., increased SBP), whilst mental flexibility leads to autonomic flexibility (Harris et al., 2006). Furthermore, these findings support previous research showing a positive association between IBs and a maladaptive physiological responses (e.g., increased inflammation; Papageorgiou et al., 2006). Therefore, we propose reduced IBs and increased RBs may signify a biological indicator of health, thus representing an adaptive physiological state when encountering adversity. Although novel, these findings are also reinforced by previous research demonstrating the etiopathogenetic effects of REBT as an intervention to maintain reductions in SBP (e.g., Drazen et al., 1982). This study contributes to the scant scientific research examining the effects of IBs on physiological consequences (David & Cramer, 2010). Our findings linking IBs with a maladaptive physiological response, furthermore, presents the first study to do so within a sporting and elite Paralympic population for the first time. Although requiring further research these findings are potentially important in offering an intervention that promotes an adaptive physiological state when encountering competition, and leads to maintained reductions in SBP that are indicative of improved physiological health.

Social validation data indicated that the REBT intervention positively enhanced athletic performance. Specifically, participants reported greater emotion control and subsequently were better able to overcome challenging situations they encountered. To explain, the ABC (DE) framework central to the REBT intervention provides athletes with a logical and linear insight into both the formation and control over the functionality of their emotions thus, enhancing the athlete’s self-awareness and autonomy over their emotional
response. Furthermore, social validation data also highlighted athletes were better able to re-appraise challenging situations, promoting their level of functional self-talk which resulted in reductions in negative cognitions and improved competition concentration.

Collectively, the study reported promising effects of REBT, however, when interpreting the results there are certain limitations that should be considered. Firstly, the participant’s medical records were not collected prior to the data collection process; thus, we were unable to directly garner the precise effects of any medication on the outcomes measures employed within this study. Second, due to the nature of an outdoor sport we were unable to control for fluctuations in environmental conditions during the competition simulations between each time-point, invariably this may have had some bearing on the participant’s performance scores. Finally, using a single-case research design the current study provided a rigorous idiosyncratic investigation (Barker et al., 2011) into intervention effects. However, the nature of longitudinal applied research makes it vulnerable to various contextual and individual fluctuations over the course of the research period. Nevertheless, the use of self-report, objective and social validation measures in a triangulated manner (as used in this present study) goes someway to mitigate against these effects (Barker et al., 2013).

REBT is most effective individualized and delivered on a one-to-one basis (Turner & Barker, 2014) and as previously found (e.g., Turner et al., 2013) the current study reported maintained reductions in IBs. However, due to availability constraints one participant received only three out of the five REBT sessions accordingly reported no maintained reductions in IBs. Whilst underlining that three sessions for this case were insufficient in reducing the IBs social validation data collected from the lead sport psychologist brings to light various complexities and applied considerations when working
with Paralympic athletes. Specifically, the athlete’s disability, medical history, and traumatic experiences were reported to influence the participant’s ability to learn, comprehend and adopt principles associated with REBT. Therefore, to ensure effective application, the length and duration of the REBT intervention should be tailored to meet the individual’s needs. In contrast to previous research one participant reported a marginal increase in IBs. This brings to attention the resistance and conflict practitioners may encounter when attempting to dispute IBs (Ellis, 2007) that an athlete perceives to be helpful for competitive performance, yet seemingly detrimental for psychological health. Thus demanding future research to further examine and distinguish the precise effects of irrational and rational beliefs on athletic performance.

The limitations of the current study also suggest potential areas for future research. The current study utilized the SGABS as a validated and pragmatic measure of total IBs, with a relatively short completion time of 4 minutes. Considering this, researchers posit that IBs and RBs are not polar opposites; thus within this study low levels of IBs would not necessarily signify high levels of RBs (David et al., 2010). Furthermore, the SGABS provides only a general rather than performance-specific measure of IBs. In light of this, future research is recommended to employ a measure of rational RBs and irrational beliefs IBs (i.e., irrational Performance Beliefs Inventory; Turner et al., 2016) specific to performance contexts. Finally, contemporary REBT research supports a binary model of emotion, emphasizing a qualitative rather than quantitative distinction of emotion (Hyland & Boduszek, 2012), therefore, to ensure greater consistency with REBT theory future research is recommended to capture functional and dysfunctional emotional consequences to better ascertain the effects of REBT.

**Perspective**
REBT IN PARALYMPIC SPORT

The current study contributes to extant literature providing an idiosyncratic and triangulated investigation into the effects of REBT on physiological, performance and psychological markers in elite Paralympic athletes, indeed, an unrepresented population within the sport psychology literature. In line with previous research (e.g., Turner, et al., 2013) the current study reported immediate and maintained sustained reductions in IBs, whilst only marginal changes were reported in athletes’ trait anxiety scores. The present study moves beyond adds to previous research indicating REBT brought around reductions SBP indicative of autonomic flexibility (Harris et al., 2006), as well as improvements in athletic performance. Such changes could be explained by reductions in IBs led to smaller decreases in approach goals compared to avoidance goals. Furthermore, social validation data reported the REBT intervention promoted greater self-awareness and emotional control in turn athletes felt they were better able to overcome challenges and concentrate during competitive situations.

Future research is encouraged to investigate the relationship between irrational/rational beliefs, and the functionality of the emotional, behavioral and physiological consequences and the corresponding effects on performance with athletes. In this study we have further elaborated and supported the positive effects of REBT as a valuable intervention for sport psychologists to implement with athletes.

Acknowledgements

The authors wish to thank the sport psychologist and coaching staff that were central to the organization of this study.
References (Maximum 40 References)


factors in stress.

Figure Captions

Figure 1. Mean state Shortened General Attitudes and Belief Scale scores taken over pre-intervention and, post-intervention phase,

Table 1. Mean, Standard Deviations, Percentage Change Scores, Immediate Change, Non-overlapping Data Points and Effect Sizes of state Irrational Beliefs scores from Pre- to Post-Intervention Phases. As well as Trait Irrational Beliefs and Percentage Changes Scores between a 9-month follow-up time point and post-intervention phases.
Note. *p < .05, **p < .001.

Table 2. Mean Trait Anxiety, Approach Goals, Avoidance Goals and Competition Simulation Performance Scores Taken at Pre-intervention, Post-intervention and 9-month Follow-up Time Point.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Trait Anxiety</th>
<th>Approach Goals</th>
<th>Avoidance Goals</th>
<th>Simulation Performance Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Follow-up 2.5</td>
<td>Pre</td>
</tr>
<tr>
<td>1 (JS)</td>
<td>16.67 ± 3.51</td>
<td>18.69 ± 2.54</td>
<td>18.65 ± 3.60</td>
<td>152.04 ± 6.58</td>
</tr>
<tr>
<td>2 (HC)</td>
<td>20.36 ± 2.43</td>
<td>10.77 ± 2.49</td>
<td>20.96 ± 2.59</td>
<td>141.24 ± 4.43</td>
</tr>
<tr>
<td>3 (JW)</td>
<td>20.23 ± 2.93</td>
<td>85.99 ± 0.32</td>
<td>21.56 ± 2.29</td>
<td>152.66 ± 6.92</td>
</tr>
<tr>
<td>4 (PB)</td>
<td>18.80 ± 3.71</td>
<td>61.26 ± 9.47</td>
<td>19.96 ± 5.37</td>
<td>163.70 ± 11.95</td>
</tr>
<tr>
<td>5 (JC)</td>
<td>20.91 ± 1.52</td>
<td>75.53 ± 1.58</td>
<td>21.86 ± 3.89</td>
<td>145.33 ± 3.73</td>
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<tr>
<td>6 (SP)</td>
<td>21.21 ± 3.21</td>
<td>82.44 ± 7.77</td>
<td>N/A</td>
<td>151.26 ± 4.81</td>
</tr>
<tr>
<td>7 (CB)</td>
<td>21.48 ± 5.06</td>
<td>77.02 ± 4.26</td>
<td>N/A</td>
<td>133.26 ± 5.73</td>
</tr>
<tr>
<td>8 (VJ)</td>
<td>65.20 ± 4.35</td>
<td>91.73 ± 4.18</td>
<td>76.70 ± 4.03</td>
<td>139.36 ± 5.62</td>
</tr>
</tbody>
</table>

Table 3. Mean and Standard Deviations of Resting Heart Rate, Diastolic Blood Pressure and Systolic Blood Pressures prior to competition simulations.
Figure 1. Pre-intervention, Post-intervention phase and 9-month follow-up Shortened General Attitudes and Belief Scale scores.