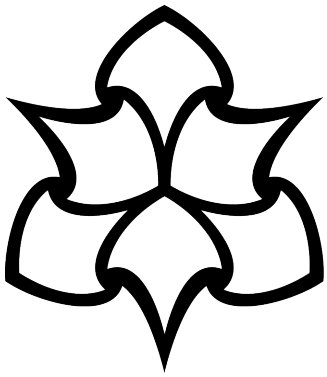

Manchester Metropolitan University

Outar, L, Turner, MJ ORCID logoORCID: https://orcid.org/0000-0003-1975-5561, Wood, AG and Lowry, R (2018) “I need to go to the gym”: Exploring the use of rational emotive behaviour therapy upon exercise addiction, irrational and rational beliefs. Performance Enhancement and Health, 6 (2). pp. 82-93. ISSN 2211-2669

Downloaded from: https://e-space.mmu.ac.uk/624590/

Version: Accepted Version

Publisher: Elsevier

DOI: https://doi.org/10.1016/j.peh.2018.05.001

Please cite the published version

https://e-space.mmu.ac.uk

"I need to go to the gym": Exploring the use of rational emotive behaviour therapy upon exercise dependence, irrational and rational beliefs.

Outar, L*., Turner, M. J., Wood, A. G., & Lowry, R

Accepted: 22nd May 2018

Centre for Sport, Health and Exercise Research, Staffordshire University

*corresponding author: B180, Brindley Building, Staffordshire University, Leek Road, Stoke on Trent, St4 4DF, m.turner@staffs.ac.uk

Abstract

Extant research suggests that irrational and rational beliefs may play an important role in both substance and behavioural addictions. However, the influence of irrational and rational beliefs pertaining exercise addiction has yet to be investigated. Rational emotive behaviour therapy (REBT) is a cognitive-behavioural approach that provides a theoretical framework to identify and change irrational beliefs through cognitive restructuring and endorsing rational beliefs. The principal aim of the current study is to examine the effectiveness of a one-to-one REBT programme in decreasing irrational beliefs and exercise addiction symptoms, and increasing unconditional self-acceptance, in three male exercisers. The exercisers present high symptoms of exercise addiction, and high irrational beliefs. A single-case, staggered multiple-baseline across participant A-B design is used in the current study to examine the effects of a six-week REBT program comprising six 45-minute one-to-one counselling sessions and 5 homework assignments. Visual and statistical analyses, and social validation data indicate strong reductions in low-frustration tolerance, composite irrational beliefs, and exercise addiction from pre- to intervention phase. In addition, all participants report increased unconditional self-acceptance. This is the first study to report the effects of REBT in an exercise population, and the first to demonstrate that exercise addiction symptoms can be attenuated using REBT. This study supports literature suggesting that irrational and rational beliefs are an important mechanism in exercise addiction and provides important implications for the development of its treatment.

Keywords: Intervention; cognitive behavioral; case-study; rational beliefs; exercise

"I need to go to the gym": Exploring the use of rational emotive behaviour therapy upon exercise addiction, irrational and rational beliefs.

A large corpus of empirical evidence exists associating regular practice of physical exercise with a plethora of psychological and physical benefits (Bouchard, Sheppard, & Stephens, 1994). However, research has shown that, as with behaviours such as gambling or internet-use, the practice of physical exercise can acquire an addictive character (Sussman et al. 2011). In such cases, the person adopts a behavioural pattern that is meticulous, and inflexible, making it difficult to reduce intensity, frequency, or time committed to exercise, this occurs even in the presence of negative consequences such physical injury and disregarding social and professional obligations (Freimuth et al. 2011), in such instances of behaviour this relate to exercise addiction.

Exercise addiction is described as pathological pursuit of exercise behaviour, that is marked by psychological dysfunction in which exercise behaviour becomes out of control, compulsive and dependent, resulting in a plethora and psychological and physical impairments (Little, 1969, Szabo, Griffiths, & Demetrovics, 2016). At present, nosology of exercise addiction remains equivocal with no official diagnostic criteria, due to this very few documented cases have emerged. At present, the diagnosis of exercise addiction is largely determined by clinical judgment. Clinicians screen patients to identify underlying motivators pertaining to an individual's exercise behaviour, emotional connection to exercise, and influence on other facets of their life. This information is then corroborated using a valid assessment tool (i.e. Exercise dependence scale; Hassenblas & Hassenblas, 2002b) to ascertain the severity of exercise addiction symptoms. To this end, pathogenic exercisers (i.e. exercise addiction) can be discerned from high-frequency/or committed exercisers (i.e. healthy habit), like athletes or avid exercisers who maintain control over exercise, have

meticulous training regimes, however maintain social and professional obligations, and encounter no deleterious or negative consequences as a result of their exercise practices.

Exercise addiction is often classified as a behavioural addiction (Egorov & Szabo, 2013), analogous to gambling addictions. However, as it stands the DSM-5 in its subsection of "Non-substance-related disorders" includes only gambling addictions as a behavioural addiction (American Psychiatric Association, 2013), with exercise addiction residing as a "compensatory behaviour" of eating disorders such as Anorexia and Bulimia Nervosa. Consequently, scholars working in the area of exercise addiction have relied on theoretical models derived from two kinds of criteria: (1) those proposed and derived from the substance dependence subsection in the DSM-IV (American Psychiatric Association 1994, Hausenblas & Downs, 2002a, b) or (2) those proposed for behavioral addictions by Griffiths (1996, 2005). Extant literature utilising both criteria, have proposed prevalence rates of 2-3% for the general exercising population (Mónok et al, 2012). However, endurance exercise populations have yielded prevalence rates of up to 20% (Griffiths et al. 2015).

De Coverley Veale (1987) discerned between primary and secondary exercise dependence. Primary exercise dependence entails pathological exercise behaviour which is driven solely for psychological gratification from exercise behaviour alone (Bamber, Cockeril & Caroll, 2000), whereas secondary exercise dependence relates to the use of exaggerated exercise as means to regulate and control another disorder (e.g. Anorexia Nervosa, Bulimia Nervosa). Thus, to avoid conceptual confound, when considering exercise addiction this paper will adopt a "primary" conceptualisation, therefore utilising Hausenblaus & Symons-Downs (2002b) perspective to assess, describe and define exercise addiction. To this end, exercise addiction is defined as "a craving for leisure time physical activity that results in uncontrollable excessive exercise behaviour that manifest physiological and/or psychological symptoms" (Hausenblaus & Symons-Downs, 2002b p. 90). Therefore, exercise

addiction is marked by psychological, behavioural and social factors including: unhealthy exercise intensity/frequency, exercising more than intended, lack of control over exercise, withdrawal symptoms, a great deal of time pursuing exercise, reduction in other activities due to exercise, and continuing to exercise despite recurring physical and/or psychological problems.

Despite a large corpus of research investigating this phenomenon and its detriments, there remains a paucity of research identifying underlying mechanisms that contribute to the onset, development, and maintenance of exercise addiction. Moreover, scant attempts of treatment have been reported within literature, however, as with other behavioural addictions, cognitive behavioural therapy (CBT) has been recommended to help exercisers to reconstruct their maladaptive beliefs concerning exercise (Weinstein & Weinstein, 2014).

To date, etiology studies of exercise addiction have proposed both neurobiological and psychological explicative models (Weinstein and Weinstein 2014; Thompson & Blanton, 1987; Szabo, 1995). Egorov and Szabo (2013) postulated that exercise addiction could manifest by utilising exercise as a coping mechanism arising from the interaction between adversity and one's interpretation of such events. Once this coping method of stress is adopted, the individual becomes reliant on it to function adequately. Furthermore, the individual believes that he/she is engaging in a seemingly health behaviour for stress management given scholastic and public health resources, providing rationalization for their pathogenic exercise behaviour that begin to impede upon social and professional obligations. However, eventually when life-obligations forces the individual to reduce frequency of exercise bouts, causing exercise privation, consequently, psychological hardship resurfaces and manifests as withdrawal symptoms (e.g. anxiety, depression, agitation, irritability). Moreover, theoretical postulates have highlighted psychological traits such as trait anxiety (Coen & Ogles, 1993), perfectionism (Cook, 1996), and obsessive compulsiveness (Spano,

2001) as predispositions to the development of exercise addiction. Finally, Egarov & Szabo (2013) conceived the notion of a "black box", relating to the idiographic mindset of an individual with exercise addiction. The black describes the possible interactions between personal and situational factors, which increase the onset, development and maintenance of exercise addiction. Key components of the black box entail ongoing, unbearable or suddenly appearing adversities (e.g. loss, break ups, bullying) which causes pain that the individual has no control over. This also interacts with attentional cognition in that prior experience, inter- and intra-personal thought, beliefs and conviction will influence exercise behaviour as means for escape path. Considering the aforementioned, one psychological construct that has been linked to the above, and thus could be valuable in understanding exercise addiction, is that of irrational and rational beliefs.

Derived from the postulates of rational emotive behaviour therapy (REBT; Ellis, 1957), irrational and rational beliefs allude to cognitive pattern in which individuals holds in the face of adversity (rejection, failure, loss). Rational emotive behaviour therapy is a cognitive-behavioural approach to the promotion of psychological health and well-being, and postulates, that all disturbance occurs as a consequences of dysfunctional information processing (Ellis, 1962, 1994). REBT delineates between irrational (e.g., demandingness, low frustration tolerance, awfulizing, and self-, other-, or world-depreciation) and rational beliefs (e.g., preferences, high frustration tolerance, anti-awfulizing, and self-, other-, or world-acceptance; Ellis & Dryden, 1997), and adopts a binary theory of emotional distress, discerning between dysfunctional and functional emotions, thus being qualitatively different than quantitatively. Irrational processing to internal stimuli (e.g., a pain in your leg) or external stimuli (e.g., receiving negative feedback) are hypothesised to produce unhealthy or maladaptive emotions reactions (i.e., UNEs; anxiety, rage, depression). In contrast rational processing of stimuli are hypothesised to produce healthy or adaptive emotional reactions

(i.e., UNEs; concern, assertiveness, sadness). Beliefs are evaluative or appraisal mechanisms and are consistent with Albeson and Rosenberg's (1958) conceptualisation of hot cognitions. Beliefs evaluate representations of reality in terms of their personal significance to that individual. Therefore, the primary objective of REBT is to change irrational beliefs through cognitive restructuring, and to promote rational beliefs to propagate psychological health and well-being (Ellis & Dryden, 1997; MacInnes, 2004). Indeed, REBT holds that neurotic disturbances are a by-product of escalating one's rational, flexible, preferences into irrational, inflexible, demands. To this end, people develop our irrational beliefs by what they greatly desire. Furthermore, REBT posits that beliefs, irrational/and or rational, engender emotional experiences that create specific action tendencies. Thus, irrational beliefs facilitate behaviour tendencies to engage in escape or avoidant behaviours, contrarily rational beliefs generate emotions that facilitate approach behaviours (Ellis, 1994; Dryden, 2002). More precisely, Dryden delineates a gamut of behaviours/action tendencies associated with holding irrational beliefs, viz. withdrawing from reinforcement, isolation, avoiding feared situations, self-harming, searching for constant reassurance, repetitive behaviour, ignoring attempts to restore social equilibrium. Examples of overt operant behaviours include avoiding anxiety provoking situations because we have endorsed the belief that we must not experience it because to do so would be completely awful, and we could not stand it. Such postulates, may provide understanding to the psychological processes of an exercise addiction, with the exerciser holding irrational beliefs about the prospect of missing an exercise bout, and therefore displaying an array of unhealthy negative emotions (i.e. anxiety, guilt), and accompanying avoidance/safety behaviours (rigid programmes, missing social obligations, training whilst injured).The theory and efficacy of REBT has received support (David, Szentagotai, Kallay, & Macavei, 2005) from within both clinical and non-clinical populations

and with youth and adult samples (e.g., Turner, 2016; Visla, Fluckiger, Holtforth, & David, 2016).

Extant research has positively associated irrational beliefs with substance (e.g. cocaine; Moller et al. 2007; Greven, 1985; Penn & Brooks, 2000) and behavioural addictions (e.g. Internet use and gambling: Petry et al. 2007; Young, 2007; Lupu & Lupu, 2013; Cardak, Koc, & Kolac, 2009). Indeed, Ellis (1994) in his only formal contribution within sport and exercise psychology literature highlighted the potential problem of overindulgence in exercise, remarking "like avoidance, overindulgence usually has strong elements of low frustration tolerance that sparks it and keeps it going. Thus, compulsive exercising and playing in sports often stems from irrational beliefs such as, "Because I like exercise [or sports] I should be able to participate in it all the time without harming myself. I can't stand limiting myself. It's awful if I'm restricted." (p. 258). To this end, REBT interventions fundamental goal would be to identify irrational beliefs in addictive behaviours that result in maladaptive emotions and behaviours (i.e. anxiety, guilt, substance abuse, gambling). More precisely, Ellis et al. (1988) postulated that treatment involves changing self-defeating thinking about discomfort and maintaining abstinence through development of high frustration tolerance (HFT), this contention was supported by Ko et al. (2008), highlighting Low frustration tolerance (LFT) as a principal antecedent of addictive behaviours. Low frustration tolerance is one of the central concepts in REBT theory and arises from beliefs that frustration (or discomfort) is unbearable and therefore must be avoided regardless of cost. Low frustration tolerance can be depicted in beliefs such as "things should be as I want them to be, I can't stand it when they are not," and are considered to be driven by immediate gratification, at the expense of long-term damage (Ellis, 2002). In exercise addiction, this relates to the individual's inability to reduce exercise intensity or stop exercise especially when medically prohibited, due to wanting to avoid the discomfort that exercise withdrawal

brings (e.g. anxiety, depression, irritability). To date, only one study has highlighted the role of beliefs (rational) in exercise addiction. Halls et al. (2009) reported a relationship between rational beliefs and exercise addiction, holding that unconditional self-acceptance played a mediating role in exercise addiction, in that low levels of unconditional self-acceptance preceded high levels of exercise addiction. However, this study did not measure irrational beliefs. Past research has highlighted the importance of assessing both irrational and rational beliefs, because irrational and rational beliefs are relatively orthogonal, and low irrational beliefs do not necessarily mean high rational beliefs (i.e., they do not correlate highly; Ellis, David, & Lynn, 2010); therefore, the specific role of irrational beliefs pertaining to exercise addiction remains unknown.

In sum, exercise addiction represents a condition that poses a threat to physical and psychological health and wellbeing (e.g., Hausenblas & Symons-Downs, 2002b). At present there is a dearth of literature implicating potential underlying mechanisms that pertain the development and maintenance of exercise addiction. Furthermore, given exercise addictions complicated history establishing conceptualisation, definitions, and theoretical frameworks there remains a paucity of literature providing sound empirical approaches to its treatment, with mere mentions of suitable treatment methods (Weistein & Weistein, 2014).

Therefore, the current study aims to elucidate the influence of irrational and rational beliefs on exercise addiction (e.g., Ellis, 1994; Hall et al., 2009), and in doing so will examine the efficacy of an REBT intervention with exercisers reporting exercise addiction symptoms, using a single-case design in line with previous literature (e.g., Turner & Barker, 2013). Providing examination of the effects of REBT on irrational beliefs (particularly low frustration tolerance), rational beliefs (particularly unconditional self-acceptance; USA), and exercise addiction symptoms. To the researcher's knowledge, no research has examined the role of irrational beliefs upon exercise addiction, furthermore no research has intervened with

exercise addiction symptoms. Thus, considering theoretical underpinnings, it was hypothesised that an REBT intervention will reduce irrational beliefs (particularly low frustration tolerance), increase Unconditional self-acceptance, and reduce exercise addiction symptoms, from pre- to intervention, with the effects remaining stable at follow-up.

Method

Participants

After liaising with a U.K. leisure centre based in the Midlands, verbal consent was attained to recruit participants from their facility. The participants were three of eleven volunteers that expressed an interest in taking part in a program that was advertised to bring greater self-awareness of exercise beliefs. Participants were three male exercisers (*M*age = 22.00; *SD* = 1.73; *Participant age;* p1 = 22; p2 = 20; p3 = 23), with 3-5 years of gym experience (*M*exp = 4.33; *SD* = 1.54), who were not engaged in any other sport or physical activity during the data collection for this study. Experience refers to exercising at or over the government exercise guidelines for physical activity (150-minutes of moderate intensity activity, and two muscle-strengthening exercise sessions per week). All participants reported that they exercised 4-6 times weekly, which entailed a mixture of aerobic and resistance training. Participants were selected using a screening process, which indicated that the three participants reported high exercise addiction symptoms (i.e., scoring at risk of exercise addiction or non-dependent symptomatic; Hausenblas & Symon-Downs, 2002), and high irrational beliefs scores (compared to adult norms; Turner et al., 2016). The ED-s classification postulates that less than 5% of individuals would be classified as at risk for exercise dependence, 62.5–62.6% as nondependent symptomatic and 30.6–33.8% as nondependent (Downs et al. 2004). Considering the postulations of Freimuth, Moniz, & Kim (2011) four phase of the development of exercise addiction, at stage two (at-risk) occurs when individuals perceive the intrinsically rewarding benefits of regular exercise (i.e. mood-

altering effects). Thus, considering the aforementioned, both exercise addiction risk and non-dependent symptomatic was considered suitable for selection given risk being high and ED diagnosis (<5%) being scant. Informed consent was obtained, and ethical approval granted from the University before all data collection.

Design

The study utilised a single-case, staggered multiple-baseline across participant A-B design (Barker, McCarthy, Jones, & Moran, 2011), which has been used in previous REBT research (Turner & Barker, 2013). Participants established a stable baseline (iPBI, EDS, USAQ) before the intervention onset, which is important because a stable baseline aids the establishment of whether any change (statistical, meaningful, or both) has occurred. The A-B design is a robust procedure for assessing effect of the intervention (i.e. REBT) on the target variables (i.e. exercise addiction, irrational beliefs, and USA), and it allows the practitioner to ascertain whether the intervention brought about change (Kazdin, 1982). REBT was applied sequentially across participants at different time points, to allow for changes in the dependent variables to be attributed to the intervention rather than extraneous variables (Kazdin, 1982). Specifically, participant 1 commenced the intervention phase in Week 4, participant 2 in Week 5, and Participant 3 in week 6. Through this design one would expect changes to occur in the target participant(s) only, with the participant's data in the baseline phase remaining stable (Barker et al., 2011).

Measures

Irrational beliefs. The irrational Performance Beliefs Inventory (iPBI; Turner et al., 2016) was used to measure irrational performance beliefs. The iPBI comprised 28-items that measure the four core beliefs (demandingness, awfulizing, low-frustration tolerance, and depreciation), as well as providing a composite value (Comp) for all four core irrational beliefs. Participants are asked to indicate their agreement on the 28-items on a Likert-scale

between 0 (*strongly disagree*) to 5 (*strongly agree*). The iPBI has shown construct validity, and correlates well with established irrational beliefs measures, and with anxiety, depression, and anger, demonstrating concurrent and predictive validity. For Comp, Cronbach's alpha coefficient displayed acceptable to excellent internal reliability (α = .50 to .99).

Exercise addiction. The Exercise Dependence Scale-21 (EDS; Hausenblas & Symons-Downs, 2002a, 2002b) is a multi-dimensional measure used to establish individuals' risk of exercise dependence. It considers individuals risk by presence of exercise dependence symptoms and derives from the DSM-IV criteria for substance dependence (American Psychiatric Association, 1994). The scale includes 21 items grouped into seven subscales, which relate to different aspects of exercise dependence (tolerance, withdrawal, intention effect, lack of control, time, reduction in other activities and continuance). Participants rate items on a 6-item Likert-scale from 1 (*Never*) to 6 (*Always*), which allows for categorization as 'at risk', 'non-dependent symptomatic' or 'non-dependent asymptomatic' based upon their responses. 'At risk' categorization refers to potential exercise dependence, non-dependent symptomatic and 'non-dependent asymptomatic' refer to a lack of dependence however symptoms pertaining to dependence for the former. In this study participants one and three were categorised as "at risk" and participant two as "non-dependent symptomatic." The scale has been used in a plethora of research and has demonstrated content and concurrent validity. Furthermore, the ED-S has demonstrated adequate test-retest reliability. Cronbach's alpha coefficient displayed good to excellent internal reliability (α = .86 to .97)

Unconditional self-acceptance. The Unconditional Self-Acceptance Questionnaire (USAQ; Chamberlain & Haaga, 2001) is a 20-item scale with 11 reversed items. Participant's rate items on a 7-item Likert-scale from 1 (*almost always true*) to 7 (*almost always untrue*). The USAQ has been used previously in sport (Cunningham & Turner, 2016), and measures the belief that one fully and unconditionally accepts oneself regardless of behaviour,

achievement, approval, respect, or love from others (Ellis, 1977). Cronbach's alpha coefficient displayed low to good internal reliability (α = .18 to .76). Whilst reporting of Cronbach's alpha is important, the reader should consider the alphas reported in this study cautiously due to the sample size used. Indeed, some suggest that a sample size of n = 30 (Yurdugül, 2008) or even n = 50 (Javali, Gudaganavar, & Raj, 2011) is required for reliable Cronbach's alpha calculation.

Social validation. Social validation allows for the addition of subjective data as a supplement to objective data (Wolf, 1978). Furthermore, it allows the practitioner to ascertain participant satisfaction of the intervention which is important as it ties the intervention effect with the social context and guides future applied work (Storney & Horner, 1991). Social validation data were collected at the end of the follow-up phase to establish clinical significance of the intervention. A focus group format was utilised to collect qualitative data from all three participants with regards to the perceptions of intervention, delivery, and efficacy (Hrycaiko & Martin, 1996; Kazdin, 1982; Schwartz & Baer, 1991). The social validation focus-group was conducted by a third-person, not known to the participants, to minimize social desirability. The focus-group allowed for divulgence of their personal and joint experiences with reference to changes in the dependent variables and broader implications in life, furthermore the focus group involved topics which highlighted the social significance of goals, social importance of effects and social appropriateness of the procedure of the intervention, which are outlined as the key requirements for the evaluation of social validation (Page & Thewell, 2013).

Data collection

Data were collected over a five-month period. Participants were required to complete the iPBI, EDS, and USAQ twice a week during the baseline phase (3 weeks). Thereafter, the clients were required to complete the iPBI and USA twice per week through the intervention

phase (6 weeks) and the follow up phase (2 weeks). The EDS was required to be completed at the start, middle and end of the intervention phase (week 1, 3, and 6) and at the end of follow up phase (research completion). The intervention took place in the private personal training consultation room of a leisure centre, that comprised conventional office amenities viz. desk, chair, white board, and television screens.

Intervention

The intervention comprised a six-week REBT program comprising six 45-minute one-to-one counselling sessions and 5 homework assignments (between each session) conducted by the first author. The first author was a 27-year-old male with a degree in psychology and Master of Science degree in sports and exercise psychology. Furthermore, he had undergone REBT training at the Albert Ellis institute at the University of Birmingham and was under supervision of a British Psychological Society (BPS) Chartered, Health Care Professions Council Registered, and REBT-trained sport and exercise psychologist (second author). Session agendas were planned prior to sessions and followed a pre-determined structure to ensure intervention procedural reliability across participants. Sessions adhered to guidelines within REBT literature (Dryden & Branch, 2008; Dryden & DiGiuseppe, 1990; Ellis & Dryden, 1997; Turner & Barker, 2014).

The program included three phases: education, cognitive restructuring, and reinforcement.

The ***education phase*** principle aim was to teach participants the fundamentals of REBT. Thus, participants were educated on how to identify beliefs (i.e. rational and irrational), differentiation between irrational (i.e. demands, awfulizing, low frustration tolerance, self-depreciation) and rational beliefs (preferences, anti-awfulizing, high frustration tolerance, self-acceptance), and how such beliefs in the face of adversity (challenge, difficulty, upset) can create either unhealthy negative emotions (e.g. anxiety,

depression, unhealthy envy) or healthy negativity emotions (e.g. concern, sadness, healthy envy). Furthermore, clients were educated that it was their beliefs (B) that determined their emotional and behaviour consequences (C), and not the event or adversity (A). In this phase, great emphasis was placed on accountability of emotional and behavioural responses. Thus, participants were taught that irrespective of the adversity, they can have autonomy over their beliefs, and therefore emotional and behavioural responses being either irrational (dysfunctional) or rational (functional). For example, participant 1 expressed irrational beliefs (B) regarding achievement (e.g. "I want to achieve, therefore I must achieve, it would be unbearable if I did not and I would be a complete failure"). In relation to exercise this manifested into anxiety (C) when missing exercise bouts(A), which led to avoidance strategies (C) including missing social/employment obligations and rigid exercise routines or over compensatory behaviour (exercising twice a day) when a bout was missed. A fundamental component of the ABCDE process is goal setting, in the form of beliefs, emotions and behaviour, thus, participants were asked to consider how they would like to respond (C), and how such change would aid their goals (e.g. exercise enjoyment, improved social life etc). For example, participant one wanted to not feel extremely anxious when missing an exercise bout, and subsequently adopt a plethora of avoidance strategies, rather, instead feel concerned/nervous and subsequently having a more flexible approach to exercise (e.g. attending social events even when conflicting with exercise regimes)

The ***cognitive restructuring phase*** (also known as disputation) is the most critical aspect of the intervention phase, this took place over two sessions. A core tenant of REBT when restructuring cognitions (i.e. irrational beliefs) is to assume that the adversity (A) is correct, and therefore reconstruct the irrational beliefs held regarding the A rather than reconstruct the A (Ellis & Dryden, 1997), additionally rational beliefs are constructed and promoted, thus promoting healthy emotions, and adaptive behaviour. The practitioner

followed a directive formulaic approach to reconstruct participant irrational beliefs, this process entailed three strategies based upon evidence (where is the evidence?), logic (does it make sense?), and pragmatics (is it helpful?) (DiGiuseppe, 1991).

The ***reinforcement phase*** entails rehearsal of new strategies and beliefs (i.e. rational beliefs). This occurred throughout the intervention and specifically in the latter stages. First, this is achieved through setting homework assignments to support self-awareness, self-reflection, and affirmations of its principles (Ellis & Dryden, 1997) Moreover, participants were educated an array of methods including cognitive, emotional, and behavioural methods to reinforce and internalize their rational philosophy. Cognitive assignments involved working through ABCDE self-help worksheets, reconstructing workbooks and creating rational self-statements. Emotive assignments included rational emotive imagery (REI Dryden, 1997), in which the client utilised imagery techniques to identify emotions and reconstruct cognitions to practice before real life application. Finally, behavioural assignments include testing rational philosophies in challenging situations. For example, participants were asked to go the gym however to not exercise and to simply stand by. This allowed participants to test their rational philosophies in the face of adversity (e.g. "I want to exercise, however that does not mean that I must". Additionally, REBT encourages individuals to abandon self-rating and self-esteem, and instead invest in Unconditional self-acceptance (USA; Chamberlain & Haaga, 2001). Extant literature postulates the importance of USA in exercise addiction, thus, sessions emphasised to role of USA to support a rational philosophy. First, this was achieved by outlining the difference between self-esteem and USA. Second, by utilising Dryden's (2009) Realistic USA Credo, to develop a tailored credo in which the practitioner and participant worked in collaboration, this supported the comprehension, and investment of the construct. Finally, the final session included a review of the content to test the clients understanding of REBT. Here the practitioner used the

method "rational reverse role-play" (RRR; Kassinove & DiGiuseppe, 1975), in which the practitioner became the participant and role-played an exerciser with irrational beliefs, while the participants identified, reconstructed and reinforced new effective rational beliefs.

Results

Data analysis

Visual analysis of the data was conducted to ascertain whether the REBT intervention brought about any meaningful changes upon the dependent variables (Bloom, Fischer & Orme 2009). The graphical display has adopted a single data point format to allow the data level between and within intervention phases to reveal intervention effectiveness (Franklin, Alison, & Gorman, 1996). Through graphical interpretation it is possible to determine whether a meaningful change in the data has occurred. Hrycaiko and Martin (1996) proposed that this can be achieved by (a) the immediacy of effect at intervention phase (b) the number of overlapping data points between the pre-intervention, intervention, and follow-up phases, and (c) the magnitude of the effect following the intervention. Visual analysis of low-frustration tolerance, composite irrational beliefs, and USA occurred for each participant using graphs and descriptive statistics. Low-frustration tolerance has been specifically examined due to its consideration as being fundamental in the development and maintenance of exercise dependence. Cohens *d* (1988) was generated, to allow indication of the effect size in changes between pre-intervention, intervention, and follow-up phase mean levels (Table 1).

To further determine intervention effects, statistical analysis was performed to accompany visual analysis (Barker & Jones, 2008; Wolfe et al, 1982). Following relevant guidelines (Ottenbacher, 1986), the data were assessed for serial dependency via autocorrelation analysis to ensure that the data qualified for parametric tests. Participant's dependent variables (irrational beliefs, exercise addiction, unconditional self-acceptance) were analysed

for serial dependency, apart from participants 3's exercise addiction scores, as there were too few data points (< 10 data points; Ottenbacher, 1986). Autocorrelation analyses revealed significant autocorrelation in iPBI scores for participant 1 and 2, however not in participant 3 (P1, $r = 0.93$; P2, $r = 0.86$, P3, $r = 0.66$), with all other data yielding non-significant autocorrelation in exercise addiction (P1, $r = 0.58$, P2, $r = 0.42$) and USA (P1, $r = 0.44$; P2, $r = 0.50$, P3, $r = 0.36$). The autocorrelated data were rendered suitable for statistical analysis utilising guidelines for first difference data transformation (Ottenbacher, 1986), producing non-autocorrelated data for participant 1's and 2's iPBI scores, thus permitting statistical analysis, with the retention of original scores for visual analysis. The dependent variables (irrational beliefs, USA, and exercise addiction) were examined for changes across timepoints using independent-samples *t*-tests. For irrational beliefs and USA, for each participant two *t*-tests were performed (pre-intervention to intervention, and intervention- to follow-up). For exercise addiction, for each participant only one *t*-test was performed (pre-intervention to intervention) because the follow-up phase included only one exercise addiction data point. For statistical analyses, statistical alpha was set at $p < .005$, after Bonferroni correction (9 tests) and for brevity, only statistically significant *t*-tests are reported, raw data can be found in Table 1.

Low frustration tolerance

The mean levels indicated that for low frustration tolerance beliefs, each participant's scores decreased from pre-intervention to intervention phases (Figure 1). Participants reported this change immediately after the first REBT session, and there was one overlapping data point for participant 1 and 2, and no overlapping data points for participant 3. Furthermore, participant 1 showed a 19.87% decrease ($d = 1.70$), participant 2 showed a 32% decrease ($d = 3.03$) and participant 3 showed a 32.33% decrease ($d = 2.92$), from pre-intervention to intervention phases. Moreover, participant 1 showed a 38.99% decrease ($d =$

2.52), participant 2 a 17.65% decrease (d = 1.19) and participant 3 a 23.72% decrease (d = 1.65), from intervention to follow-up (M = 13.54; SD = 2.10) intervention phases.

Statistical analyses revealed that participant 3, $t(15) = 5.05$, $p = .001$, reported a significant reduction in low-frustration tolerance from pre- intervention to intervention phases.

Composite irrational beliefs

The mean levels indicated that for composite data, each participant's scores decreased from pre-intervention to intervention phases. Participants experienced this change immediately after the first REBT session, additionally there were no overlapping data points for all three participants. Moreover, participant 1 showed a 21.00% decrease (d = 1.80), participant 2 showed a 26.93% decrease (d = 4.15) and participant 3 showed a 26.84% decrease (d = 2.73), from pre-intervention to intervention phases. Participant 1 showed a 41.12% decrease (d = 2.75), participant 2 a 7.10% decrease (d = .82), and participant 3 a 14.36% decrease (d = 1.28), from intervention to follow-up (M = 10.08; SD = 1.37) phases.

Statistical analyses revealed that participant 3, $t(15) = 4.79$, $p = .001$, showed a significant reduction in composite scores from pre-intervention to intervention phases.

Exercise addiction

Mean levels indicated that for exercise addiction, participants' scores decreased from pre-intervention to intervention phases. Moreover, participant 1 showed a 23.28% decrease (d = 1.40), participant 2 showed a 13.11% decrease (d = 1.78) and participant 3 showed a 2.51% decrease (d = 1.25), from pre-intervention to intervention phases. Moreover, participant 1 showed a 55.00% decrease (d = 2.54), participant 2 a 3.16% decrease (d = .49) and participant 3 a 2.84% decrease (d = 1.94), from intervention to follow up (M = 2.84; SD = .88) phases.

Unconditional self-acceptance

The mean levels indicated that for unconditional self-acceptance, each participant's scores increased from pre-intervention to intervention phases (Figure 3). Participants experienced this change immediately after the first REBT session, each participant experienced overlapping data points, participant 1 and 3 both experienced one overlap with participant 2 experiencing six overlapping data points. Participant 1 showed a 10.78% increase (d = -1.51), participant 2 showed a 4.14% increase (d = -.92), and participant 3 showed a 3.29% increase (d = -.76), from pre-intervention to intervention phases. In addition, the data illustrates that scores were upheld and slightly increased for USA from intervention to follow-up phase, for example participant 1 displayed a 5.9% increase, participant 2 a 4.25% increase and participant 3 a 2.8% increase, from intervention to follow-up phases. Statistical analyses revealed that participant 1, $t(16) = -3.38$, $p = .001$, showed a significant reduction in composite scores from pre-intervention to intervention phases.

In summary, visual and statistical analysis of the target variables indicated that REBT brought about meaningful reductions in low-frustration tolerance, composite irrational beliefs, and exercise addiction in all participants, changes from pre-intervention to intervention phases were particularly strong in all participants. In addition, all participants reported increased USA. Changes occurred from the introduction of REBT and therefore all changes that occurred can be attributable to the REBT sessions. Moreover, withdrawal (i.e. follow up phase) of the intervention resulted in further reductions in irrational beliefs, exercise addiction, and further increased in USA. Considering visual analysis guidelines (Hrycaiko & Martin, 1996), meaningful changes reductions were shown in low-frustration tolerance, composite irrational beliefs, and meaningful increases were shown in USA. Specifically, for low-frustration tolerance, composite irrational beliefs, and USA, immediate effects occurred (within two data points) after REBT implementation, there were few

overlapping data points between pre-intervention to intervention phases, and the target variables displayed a great magnitude of effect.

Social validation data

Social validation data indicate that exercisers thought that the REBT intervention was significant to their social goals. Exercise played a fundamental role within their lives, thus possessing healthier, functional, and adaptive behaviours and emotions towards exercise was congruent with their own goals. Greater self-awareness of irrational beliefs (B) and subsequently the cognitive restructuring of such beliefs (D), followed by the promotion of rational beliefs (E) lead to such goals. For example, participant one commented that before the REBT intervention "I used to feel anxious or angry if I did not go to the gym, since the sessions now I feel more relaxed as I know that I do not need to come to the gym", whilst participant 3 stated "It helped me identify the difference between rational and irrational and the consequences for each one and therefore I was able to promote the more rational side". Exercisers greater awareness lead to reductions of irrational beliefs and promotion of rational beliefs, which consequently resulted in healthier exercise behaviours, this was supported through their responses in the iPBI, USAQ, and EDS. Furthermore, regarding the importance of these effects, social validation data suggested that exercisers deemed the REBT intervention important.

REBT provides emotional and behavioural control through progression of the ABCDE framework. This framework guides the client to a rational philosophy, which is embodied by greater quality of life through greater relations and fulfilment of goals. For example, participant one commented, "It helped me with my relationships, like with my girlfriend", whilst participant three stated "I didn't think it would help this much, when I'm at work I no longer feel the need to be aggressive". This again corroborated the responses from the iPBI and USAQ. Finally, in regard to appropriateness of the procedures, social validation

data suggested that exercisers deemed the REBT intervention as appropriate. REBT stresses the importance of developing a therapeutic alliance and progression through the ABCDE framework. Exercisers expressed how the practitioner's conduct aided the delivery of REBT and that the ABCDE framework was sufficient in reaching their therapeutic goals. For example, participant three commented "I felt that he cared and wanted us to be better and that he didn't need us to be, but he wanted us to be", whilst participant two stated "For me it was perfect, so I wouldn't change a thing" and another "It gave you enough to go through it properly, I wouldn't change it at all".

In summary, social validation data suggested the REBT intervention brought about intentional changes to reduce irrational beliefs and increase rational beliefs, and this in turn promoted healthier exercise behaviour (i.e., reduction in exercise addiction symptom). Social validation indicated that REBT enhanced emotional and behavioural control that transferred outside of the exercise domain into general life. Specifically, exercisers perceived REBT to be socially important and helpful within their life and relationships with others. Finally, social validation data suggested that exercisers deemed REBT as appropriate, specifically the authors conduct and progression through the ABCDE framework.

Discussion

The principal aim of this study was to explore the effects of an REBT intervention on reducing irrational beliefs, exercise addiction, and increasing unconditional self-acceptance in a sample of male exercisers. This is the first study to explore the postulates of the role of irrational and rational beliefs upon exercise addiction (Ellis, 1994; Hall et al., 2009), however, more importantly to identity potential framework for its treatment. As such, it was hypothesised that an REBT intervention would decrease irrational beliefs and exercise addiction and increase unconditional self-acceptance.

The results from the visual and statistical analysis of the data indicate that REBT was effective in reducing irrational beliefs, exercise addiction and increasing unconditional self-acceptance from pre-intervention to intervention phases. These changes continued from intervention to follow-up phases, illustrating that REBT had a lasting effect on irrational beliefs, exercise addiction and unconditional self-acceptance at 4 weeks, follow up phase. The results were corroborated by social validation data indicating that all participants reconstruction in their exercise beliefs, consequently, changed their behaviour towards exercise.

Low frustration tolerance beliefs were postulated an important antecedent in behavioural addictions (Ellis, 1988, 2002; Ko et al. 2008). This study supported such notions highlighting the reduction of low frustration tolerance (and other beliefs) indeed brought about changes in exercise addiction symptomology. There are a variety of mechanism by which low-frustration tolerance beliefs may contribute to the development and maintenance of exercise addiction. Ellis (1994) conceived that the compulsive nature of exercise derives from the endorsement of beliefs such as "I want to go the gym, therefore I need to go the gym, if I were to not I could not stand it", therefore an exerciser endorsing such beliefs when missing an exercise bout may appraise such situations as unbearable. Indeed, considering the aforementioned literature on the role of emotion generation of irrational beliefs, exercisers holding such appraisals may engage in safety or avoidance behaviours (excessive repetitive behaviour) which manifest as exercise addiction. For example, the injured exerciser may continue to exercise regardless of medial contradiction, as they believe they may not have relevant resources to cope with stressors other than exercise (Dryden, 2008). Therefore, feelings of anxiety, guilt may arise when the individual is forced to miss the gym. Thus, by cognitive reconstruction of an exercisers beliefs (i.e., low-frustration tolerance) to rational beliefs (i.e. high-frustration tolerance), consequently, leading to more functional appraisals

(e.g. I want to go the gym, however, that does not mean I must, thus, I can stand it if I do not), subsequently, this will generate adaptive emotions (i.e.,, concern, remorse), and in turn lead the accompanying adaptive behaviour (i.e. healthy exercise commitment).

Another important tenet of exercise addiction is the role of unconditional self-acceptance, implicated as a mediator in exercise addiction (Hall et al., 2009). The data reported increases in unconditional acceptance in all participants, with participant one experiencing significant increase. Therefore, the notions postulated by Hall et al. (2009) have been corroborated by this study highlighting the role of rational belief in exercise addiction. More precisely, the underlying notion of unconditional self-acceptance holds that individual's unconditional accept themselves despite unfavourable behaviours (e.g. missing exercise; Ellis, 1997). Therefore, exercisers endorsing depreciation beliefs such as "not exercising would make me a failure, loser, terrible person", may engage in addictive exercise behaviours (e.g. continuance, tolerance, time) and when missing an exercise bout may suffer withdrawal symptoms (anxiety, irritability, agitation, insomnia), contrarily, an exerciser endorsing unconditional self-acceptance beliefs such as " missing an exercise bout would not make me a failure, nor determine my worth" are likely to engage in more adaptive behaviours (e.g. appropriate injury recovery, social engagement, non-compensatory exercise). The role of Unconditional self-acceptance is an important one, as it highlights the role of appraising one's worth in relation to important facets in one's life (i.e. exercise).

Limitations

The current study has some limitations that if addressed could strengthen the findings. First, this study lacked an objective measure of functional and dysfunctional emotions and behaviours. This omission occurred because although the notion of UNEs and HNEs is a central element of REBT (Dryden, 2009), no accurate measure has emerged in literature. The authors decided against using a unitary measure of emotions (e.g., anxiety, anger, depression)

due to the significant time already being spent by participants on completing questionnaire, and because the unitary measurement of emotions is not in keeping with REBT theory. As a result, it is not possible to accurately infer emotional changes in the current study. In addition, Hausenblas, Gauvin, Symons-Downs and Duley (2008) have suggested that positive and negative mood states may be independently influenced by exercise abstinence. Future research should be invested in developing an accurate measure of UNEs and HNEs for use in applied research. Moreover, whilst the present study brought some insight into the role of irrational beliefs (chiefly low-frustration tolerance), one cannot infer that a reduction in low frustration tolerance results in an increase in high-frustration tolerance, because irrational and rational beliefs are relatively orthogonal (Ellis, David, & Lynn, 2010); low irrational beliefs does not equate to high rational beliefs. At present, there is no contrasting rational version to the iPBI and there are very few rational beliefs questionnaires. Therefore, to enhance the rigorous investigation of the influence of cognitive reconstruction from irrational to rational beliefs, a rational performance beliefs inventory (measuring high frustration tolerance, anti-awfulizing, preferences, and acceptance) is warranted. Furthermore, objective measures of exercise behaviour were not measured. Hausenblas and Symons-Downs (2002b) pointed out, exercise behaviour is not a strong predictor of exercise addiction and given that there is no objective amount of exercise that is considered detrimental or harmful, inferences made would be fruitless. To be clear, the current study aimed to reduce exercise addiction symptomology, rather than deter exercise behaviour. Second, a caveat when intervening with exercise addiction is the role of cognitive biases. In this study, the researcher was not blind to research parameters and therefore the halo effect may have taken place, however to circumvent this bias, the researcher followed the ABCDE framework, and adhered to a systematic approach to the intervention delivery, with general beliefs being the main foci of the discussion, rather than exercise beliefs per se. Indeed, the Hawthorne effect too could be

influential, as participants may have deduced the natures of this study, however as stated before this study did not deter exercise behaviour and looked at beliefs in array of life spectrums (academia, relationships, exercise and occupational). Nevertheless, researchers should take caution to such biases when developing interventions and exploring potential underlying mechanisms.

Finally, although the design of the current study is line with single-case research guidelines, data from only three participants is considered who are demographically homogenous (males aged between 20 and 23). Therefore, the results of the current study are difficult to generalise to other populations. Although the effectiveness of REBT has been demonstrated a wide variety of populations (e.g., Turner, 2016), the same study with female exercisers may yield different results, given that primary exercise addiction is more prevalent in males (Costa et al., 2013). Therefore, researchers should conduct larger-scale cross-sectional studies examining the role of irrational and rational beliefs in exercise addiction across a wider range of samples and could also repeat the methods in the current study, but with different populations.

Conclusion

To conclude, as far as the authors are aware the present study is the first to report an intervention to reduce the symptoms of exercise addiction, and the first to examine the effects of REBT on irrational beliefs in exercisers. The current study contributes to the growing literature in exercise addiction and adds to the body of literature concerning the use of REBT in sport and exercise settings (Turner & Bennett, 2018). The findings of this study suggest that irrational and rational beliefs may play an important role in exercise addiction (e.g. Ellis, 1994; Hall et al., 2009) and supports recommendations for the treatment of exercise addiction using cognitive behavioural therapy (Weinstein & Weinstein, 2014). This study has highlighted the role of beliefs in the maintenance of exercise addiction and provides

practitioners and researchers with a framework to reduce irrational beliefs, increase rational beliefs, and reduce exercise addiction symptomology. It is hoped that this research will serve as a catalyst for further research into the deleterious effects of exercise addiction, the treatments for exercise addiction, and to assist exercisers in developing healthy beliefs regarding exercise.

References

American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision. Washington, DC, American Psychiatric Association, 1994.

Bamber, D., Cockerill, I. M., & Carroll, D. (2000). The pathological status of exercise dependence. *British Journal of Sports Medicine, 34,* 125-132. doi.org/10.1136/bjsm.34.2.125

Barker, J. B., & Jones, M. V. (2008). The effects of hypnosis on self-efficacy, affect, and sport performance: A case study from professional English soccer. *Journal of Clinical Sport Psychology*, *2*, 127–147. doi.org/10.1123/jcsp.2.2.127

Barker, J. B., McCarthy, P. J., Jones, M. V., & Moran, A. (2011). *Single-Case Research Methods in Sport and Exercise Psychology*. London: Routledge. doi.org/10.4324/9780203861882

Bloom, M., Fischer, J., & Orme, J. G. (2009). *Evaluating Practice: Guidelines for the Accountable Professional* (6th Ed.). Boston: Allyn and Bacon.

Bouchard, C., Shephard, R. J., & Stephens, T. (1994). *Physical Activity, Fitness and Health: International Proceedings and Consensus Statement*. Champaign, IL: Human Kinetics. doi.org/10.5860/choice.32-0972

Çardak, M., Koc, M., & Çolak, T. S. (2009). The effect of a rational emotive behavior therapy (REBT) group counseling program on the internet addiction among university

673 students. *International Conference on Foreign Language Teaching and Applied*
674 *Linguistics*, *11*, 5-7.
675 Coen, S. P. & Ogles, B. M. (1993). Psychological characteristics of the obligatory runner: A
676 critical examination of the anorexia analogue hypothesis. Journal of Sport & Exercise
677 Psychology, 15, 338–354. doi.org/10.1123/jsep.15.3.338
678 Cook, C. A. (1996). The psychological correlates of exercise dependence in aerobics
679 instructors. Unpublished master's thesis, University of Alberta, Alberta, Canada. (cf.
680 Hausenblas & Giacobbi, 2004).
681 Costa, S., Cuzzocrea, F., Hausenblas, H., Larca, R., & Oliva, P. (2013). The role of age,
682 gender, mood states and exercise frequency on exercise dependence. *Journal of Behavioral*
683 *Addictions*, *2*, 216–223. doi.org/10.1556/jba.2.2013.014
684 Cunningham, R., & Turner, M. J. (2016). Using rational emotive behavior therapy (REBT)
685 with mixed martial arts (MMA) athletes to reduce irrational beliefs and increase
686 unconditional self-acceptance. *Journal of Rational-Emotive and Cognitive-*
687 *Behavioural Therapy*. *34* (4), 289-309. doi.org/10.1007/s10942-016-0240-4
688 David, D., Szentagotai, A., Kallay, E., & Macavei, B. (2005). A synopsis of rational-emotive
689 behavior therapy (REBT): Fundamental and applied research. *Journal of Rational-*
690 *Emotive and Cognitive Behavior Therapy*, *23*, 175–221. /doi.org/10.1007/s10942-005-
691 0011-0
692 De Coverley Veale, D., M. (1987) Exercise Dependence. *British Journal of Addiction 82*,
693 735–740 doi.org/10.1111/j.1360-0443.1987.tb01539.x
694 Dryden, W., & DiGiuseppe, R. (1990). *A Primer on Rational-Emotive Therapy*. Champaign,
695 IL: Research Press.
696 Dryden, W. (2009). *How to Think and Intervene like an REBT Therapist*. London: Routledge.
697 doi.org/10.4324/9780203877944

Dryden, W., & Branch, R. (2008). *The Fundamentals of Rational-Emotive Behavior Therapy*. West Sussex: Wiley.

Egorov, A. Y., & Szabo, A. (2013). The exercise paradox: An interactional model for a clearer conceptualization of exercise addiction. *Journal of Behavioral Addictions*, 2(4), 199–208. doi.org/10.1556/jba.2.2013.4.2

Ellis, A. (1957). Rational psychotherapy and individual psychology. *Journal of Individual Psychology*, *13*, 38–44. doi.org/10.1353/jip.2017.0023

Ellis, A. (1994). The sport of avoiding sports and exercise: The rational emotive behavioural therapy perspective. *The Sports Psychologist, 8*, 248-261. doi.org/10.1123/tsp.8.3.248

Ellis, A., & Dryden, W. (1997). *The Practice of Rational-Emotive Behavior Therapy*. New York: Springer Publishing Company.

Ellis, A. (2002). *Overcoming Resistance. A Rational Emotive Behavioural Therapy Integrated Approach*. New York: Springer Publishing.

Ellis, A., David, D., & Lynn, S. J. (2010). Rational and irrational beliefs: a historical and conceptual perspective (pp. 3–22), in *Rational and Irrational Beliefs: Research, Theory, and Clinical Practice*, D. David, S. J. Lynn, and A. Ellis (Eds.). New York, NY: Oxford University Press). doi.org/10.1093/acprof:oso/9780195182231.003.0001

Franklin, R. D., Allison, D. B., & Gorman, B. S. (1996). *Design and Analysis of Single Case Research*. Mahwah, NJ: Lawrence Erlbaum. doi.org/10.4324/9781315806402

Freimuth, M., Moniz, S., & Kim, S. R. (2011). Clarifying exercise addiction: differential diagnosis, co-occurring disorders, and phases of addiction. *International Journal of Environmental Research and Public Health, 8(10)*, 4069–4081 doi.org/10.3390/ijerph8104069

722 Greven, G. L. (1985). Effects of a rational emotive therapy program on the irrational beliefs
723 of inpatient alcoholics. *Dissertation Abstracts International, 47,* 2166.
724 Griffiths, M. D. (1996). Behavioural addiction: an issue for everybody? *Employee*
725 *Counselling Today, 8(3),* 19– 25. doi.org/10.1108/13665629610116872
726 Griffiths, M. D. (2005). A "components" model of addiction within a biopsychosocial
727 framework. *Journal of Substance Use, 10(4),* 191–197.
728 doi.org/10.1080/14659890500114359
729 Griffiths, M. D., Urbán, R., Demetrovics, Z., Lichtenstein, M. B., de la Vega, R., Kun, B.,
730 Szabo, A. (2015). A cross-cultural re-evaluation of the Exercise Addiction Inventory
731 (EAI) in five countries. *Sports Medicine, 1(5),* 1–7. doi.org/10.1186/s40798-014-0005-5
732 Hall, H., Hill, A., Appleton, P. R., & Kozub, S. (2009). The mediating influence of
733 unconditional self-acceptance and labile self-esteem on the relationship between
734 multidimensional perfectionism and exercise dependence. *Psychology of Sport and*
735 *Exercise, 10*, 33-45. doi.org/10.1016/j.psychsport.2008.05.003
736 Hausenblas, H. A., & Symons Downs, D. (2002a). Exercise dependence: A systematic
737 review. *Psychology of Sport and Exercise, 3*, 89-123. doi.org/10.1016/s1469-
738 0292(00)00015-7
739 Hausenblas, H. A., & Symons Downs, D. (2002b). How much is too much? The development
740 and validation of the Exercise Dependence Scale. *Psychology and Health, 17*, 387-
741 404. doi.org/10.1080/0887044022000004894
742 Hausenblas HA, Gauvin L, Symons Downs D, Duley AR. (2008). Effects of abstinence from
743 habitual involvement in regular exercise on feeling states: an ecological momentary
744 assessment study. *British Journal of Health Psychology, 13*, 237-55.
745 doi.org/10.1348/135910707x180378

Hrycaiko, D., & Martin, G. L. (1996). Applied research studies with single-subject designs: Why so few? *Journal of Applied Sport Psychology*, *8*, 183–199. doi.org/10.1080/10413209608406476

Javali, S. B., Gudaganavar, N. V., Raj, S. M. (2011) Effect of Varying Sample Size in Estimation of Coefficients of Internal Consistency. *Webmed Central*, *2*, 2

Kazdin, A. (1982). Single-case experimental designs. In P. C. Kendall & J. N. Butcher (Eds.), *Handbook of Research Methods in Clinical Psychology* (pp. 461–490). New York: Wiley. doi.org/10.1037/14805-029

Ko, C., Chen, C., Yen, C., & Yen, J. Wang, S. (2008). The association between internet addiction and belief of frustration intolerance: The gender difference, *CyberPsychology and Behaviour*, *11*, 273-278. doi.org/10.1089/cpb.2007.0095

Little, J. C. (1969). The athlete's neurosis: A deprivation crisis. *Acta Psychiatrica Scandinavica*, *45*, 187-197 doi.org/10.1111/j.1600-0447.1969.tb10373.x

Lupu I. R., & Lupu, V. (2013). Gambling prevention program for teenagers. *Journal of Cognitive and Behavioural Psychotherapies*, *13*, 575–584.

MacInnes, D. (2004). The theories underpinning rational emotive behavior therapy: Where's the supportive evidence? *International Journal of Nursing Studies*, *41*, 685–695 doi.org/10.1016/j.ijnurstu.2004.02.004

Moeller, F. G., Schmitz, J. M., Steinberg, J. L., Green, C. M., Reist, C., Lai, L. Y., Swann, A. C., & Grabowski, J. (2007). Citalopram combined with behavioral therapy reduces cocaine use: A double-blind, placebo-controlled trial. *The American Journal of Drug and Alcohol Abuse*, *33*, 367–37 doi.org/10.1080/00952990701313686

Mónok, K., Berczik, K., Urbán, R., Szabo, A., Griffiths, M. D., Farkas, J., Demetrovics, Z. (2012). Psychometric properties and concurrent validity of two exercise addiction

771 measures: A population wide study. Psychology of Sport and Exercise, 13(6), 739–
772 746 /doi.org/10.1016/j.psychsport.2012.06.003
773 Ottenbacher, K. J. (1986). *Evaluating Clinical Change: Strategies for Occupational and*
774 *Physical Therapists*. Baltimore: Williams & Wilkins.
775 Page, J., & Thelwell, R. (2013). The value of social validation in single case methods in sport
776 and exercise psychology, *Journal of Applied Sport Psychology, 25,* 61-71.
777 doi.org/10.1080/10413200.2012.663859
778 Penn, P. E., & Brooks, A. J. (2000). Five years, twelve steps, and REBT in the treatment of
779 dual diagnosis. *Journal of Rational-Emotive & Cognitive-Behavior Therapy, 18* (4), 197-208.
780 Petry, N. M., Litt, M. D., Kadden, R., & Ledgerwood, D. M. (2007). Do coping skills
781 mediate the relationship between cognitive behavioral therapy and reductions in
782 gambling in pathological gamblers*? Addiction 102 (8),* 1280–1291.
783 doi.org/10.1111/j.1360-0443.2007.01907.x
784 Schwartz, I. S., & Baer, D. M. (1991). Social validity assessments: Is current practice state of
785 the art? *Journal of Applied Behavior Analysis*, *24*, 189–204.
786 doi.org/10.1901/jaba.1991.24-189
787 Spano, L. (2001). The relationship between exercise and anxiety, obsessive-compulsiveness,
788 and narcissism. *Personality and Individual Differences*, *30(1)*, 87–93.
789 doi.org/10.1016/s0191-8869(00)00012-x
790 Storey, K., & Horner, R. H. (1991). An evaluative review of social validation research
791 involving persons with handicaps. *Journal of Special Education*, *25*, 352–401.
792 doi.org/10.1177/002246699102500307
793 Sussman, S., Lisha, N., & Griffiths, M. D. (2011). Prevalence of the addictions: a problem of
794 the majority or the minority? *Evaluation & the Health Professions, 34(1),* 3–56.
795 doi.org/10.1177/0163278710380124

Szabo, A. (1995). The impact of exercise deprivation on well-being of habitual exercisers. *The Australian Journal of Science and Medicine in Sport*, *27*, 68–75.

Szabo, A., Griffiths, M. D., & Demetrovics, Z. (2016). Exercise addiction. In V. R. Preedy (Ed.). Neuropathology of drug addictions and substance misuse volume 3: General processes and mechanisms, prescription medications, caffeine and areca, polydrug misuse, emerging addictions and non-drug addictions (pp. 984–992). London: Academic Press

Turner, M. J. (2016). Rational Emotive Behavior Therapy (REBT), irrational and rational beliefs, and the mental health of athletes, *Frontiers: Movement Science and Sport Psychology*, doi:10.3389/fpsyg.2016.01423

Turner, M. J., Allen, M., Slater, M. J., Barker, J. B., Woodcock, C., Harwood, C. G., & McFadyen, K. (2016). The development and initial validation of the irrational performance beliefs inventory (iPBI). *European Journal of Psychological Assessment*, published online 22nd April 2016. doi.org/10.1027/1015-5759/a000314

Turner, M. J., & Barker, J. B. (2013). Examining the efficacy of Rational-Emotive Behavior Therapy (REBT) on irrational beliefs and anxiety in elite youth cricketers. *Journal of Applied Sport Psychology*, *25*, 1, 131-147. doi.org/10.1080/10413200.2011.574311

Turner, M. J., & Barker, J. B. (2014). Using Rational Emotive Behavior Therapy with athletes. *The Sport Psychologist*, *28*, 75-90.

Turner, M. J., Slater, M. J., & Barker, J. B. (2014). Not the end of the world: The effects of Rational Emotive Behavior Therapy on the irrational beliefs of elite academy athletes. *Journal of Applied Sport Psychology*, *26*, 144-156. https://doi.org/10.1080/10413200.2013.812159

Turner, M. J., & Bennett, R. (2018). *Rational emotive behaviour therapy in Sport and Exercise*. London: Routledge.

Thompson, J. K. & Blanton, P. (1987). Energy conservation and exercise dependence: A sympathetic arousal hypothesis. Medicine and Science in Sports and Exercise, 19, 91–97. doi.org/10.1249/00005768-198704000-00005

Young K.S. (2007) Treatment Outcomes with Internet Addicts. *CyberPsychology and Behaviour, 10 (5),* 671–679.

Yurdugul, H. (2008). Minimum sample size for cronbach's coefficient alpha: a monte-carlo study. *Hacettepe university journal of education, 35,* 397-405

Visla, A., Fluckiger, C., Grosse Holtforth, M., & David, D. (2016). Irrational beliefs and psychological distress: A meta-analysis. *Psychotherapy and Psychosomatics, 85,* 8–15. https://doi.org/10.1159/000441231

Weinstein, A., & Weinstein, Y. (2014). Exercise Addiction- Diagnosis, Bio-Psychological Mechanisms and Treatment Issues. *Current Pharmaceutical Design, 20* (25), 4062-4069. https://doi.org/10.2174/13816128113199990614

Wolfe, D. A., Lawrence, J., Graves, K., Brehong, K., Bradbyn, D., & Kelly, J. A. (1982). Intensive behavioural parent training for a child abusive mother. *Behavior Therapy, 13,* 438–451. doi.org/10.1016/s0005-7894(82)80006-3

Wolf, M. W. (1978). Social validity: The case for subjective measurement or how applied behavior analysis is finding its heart. *Journal of Applied Behavior Analysis, 11,* 203–214. doi.org/10.1901/jaba.1978.11-203

Figure 1. Graphed data for low frustration tolerance across timepoints for each participant.

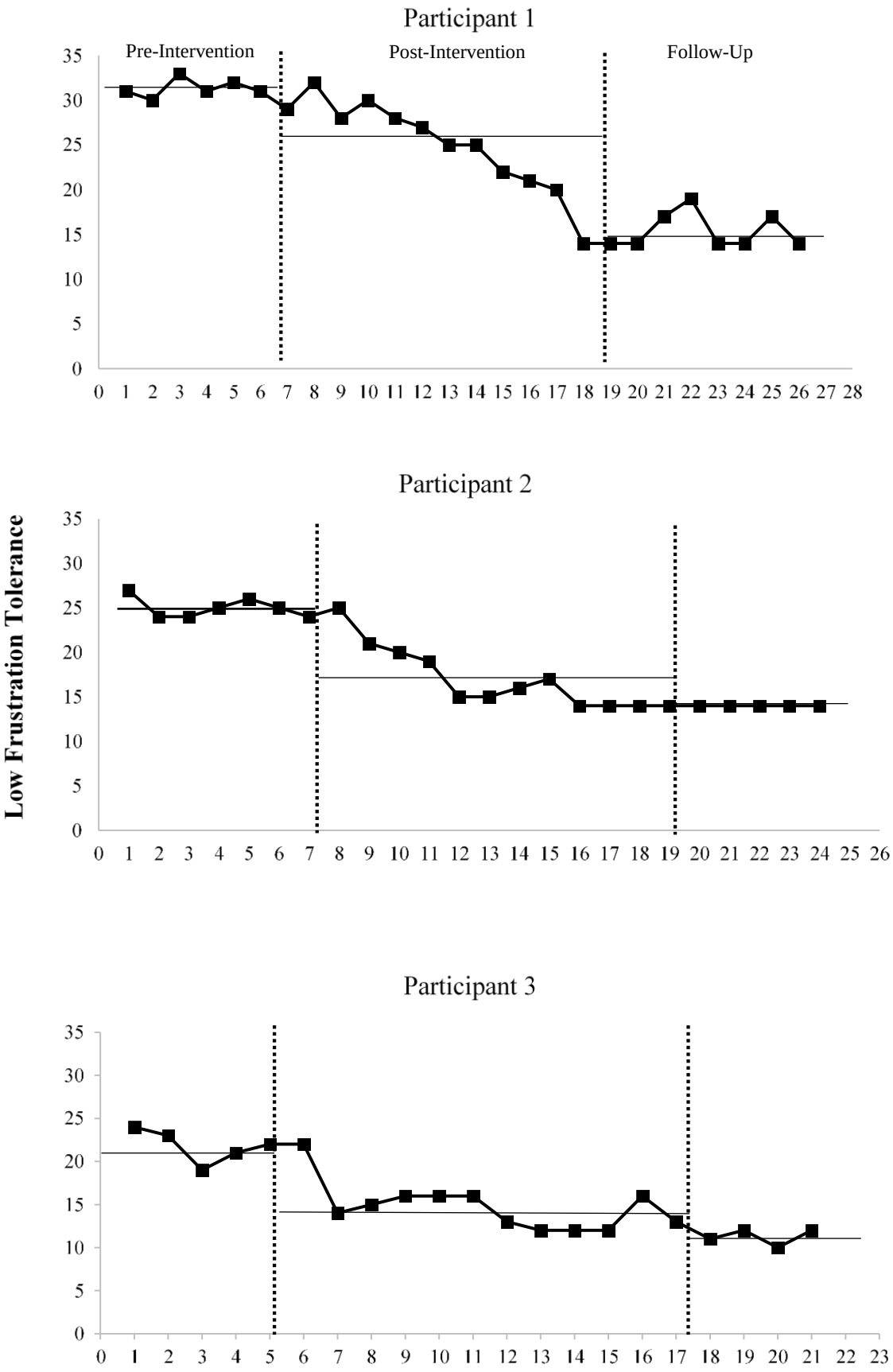

Figure 2. Graphed data for unconditional self-acceptance (USA) across timepoints for each participant