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Outar, Leon, Turner, Martin , Wood, Andrew and O'Connor, Helen (2021) Muscularity rationality : an examination of the use of Rational Emotive Behaviour Therapy (REBT) upon exercisers at-risk of muscle dysmorphia. *Psychology of Sport and Exercise*, 52. p. 101813. ISSN 1469-0292

DOI: <https://doi.org/10.1016/j.psychsport.2020.101813>

Publisher: Elsevier

Version: Accepted Version

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Additional Information: This is an Author Accepted Manuscript of an article published in *Psychology of Sport and Exercise* by Elsevier.

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Accepted in Psychology of Sport and Exercise, 1st October 2020

Muscularity Rationality: An examination of the use of Rational Emotive Behaviour Therapy
(REBT) upon exercisers at-risk of Muscle Dysmorphia.

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Abstract

Research in the area of body image suggests that muscularity dissatisfaction is a prominent concern among men and women. At its apex, this concern manifests into a convoluted and debilitating body image disorder termed muscle dysmorphia (MD), characterised by a marked preoccupation with ones (subjective) muscularity and leanness inadequacy. Prevention of MD is critical, however, empirical evidence informing intervention protocols are profoundly scarce. The principal aim of this study was to examine the effectiveness of a one-to-one Rational Emotive Behaviour Therapy (REBT) intervention, comprising five, 60-minute one-to-one sessions, in decreasing MD symptomatology, irrational beliefs and increasing unconditional self-acceptance in a mixed-sex cohort of four exercisers at-risk of MD. A single-case, staggered multiple-baseline across participant A-B design was adopted to examine the effects of REBT. Visual and statistical analyses, and social validation data, indicated reductions in MD, irrational beliefs, and increases in unconditional self-acceptance across all participants from pre-post intervention phases, with reductions upheld at a 6-month follow-up. This study highlights the potential role of rational and irrational beliefs in the onset and maintenance of MD. This study is the first to report the application of a CBT approach to MD symptomology, and has demonstrated the use of REBT as a potential preventative approach for individuals at risk of MD. Practitioners working with individuals at risk of MD should take a benefit-focussed approach to support individuals in developing unconditional self-acceptance beliefs, as well as a problem-focussed approach to support individuals in reducing irrational beliefs.

Keywords: Intervention; Cognitive Behavioural Therapy; Body image; Exercise; Positive body image

1 Muscularity Rationality: An examination of the use of Rational Emotive Behaviour Therapy
2 (REBT) upon exercisers at-risk of Muscle Dysmorphia

3 A burgeoning number of males and females are dissatisfied, disturbed, preoccupied,
4 and functionally impaired by concerns pertaining to their muscularity (Schneider et al., 2017;
5 Rodgers et al., 2018). Cognitions of discontent and insecurity often precede compulsive
6 exercise, eating pathology, and anabolic-androgenic steroid abuse, when individuals detect a
7 disparity between their current self and societal ideals, rendering their efforts inadequate. This
8 dynamic interaction between negative body image, compulsive exercise, nutritional intake
9 dysregulation when intensified can increase individuals' risk of developing a debilitating
10 body image condition known as Muscle Dysmorphia (MD).

11 MD as conceptualised by the seminal works of Pope and colleagues (1997) describes a
12 body image disorder characterised by a pathological preoccupation with one's perceived lack
13 of muscularity and high adiposity levels. MD is marked by a constellation of maladaptive
14 practices to address these concerns including excessive exercise, restrictive eating, anabolic-
15 androgenic steroid abuse, and excessive supplementation use. Preoccupations with one's
16 muscularity and adiposity are pervasive and cause significant impairment in daily
17 functioning. Consequently, individuals disregard pertinent social, recreational, and
18 occupational activities due to exercise and dietary scheduling conflict. Individuals with MD
19 often avoid situations where their physique is exposed (e.g., beaches), engage in frequent
20 mirror checking, and excessive social comparison with others, that often leads to a myriad of
21 dysfunctional emotions (Olivaria, 2001).

22 MD has received increasing research attention, leading to its inclusion in the current
23 Diagnostic Statistical Manual of Mental Disorders (DSM-5) as a variant of body dysmorphic
24 disorder (BDD). MD is characterised by the fulfilment of three main criteria: (a)
25 preoccupation with being lean and muscular; (b) negative beliefs about one's body and
26 subsequent body avoidance or anxiety; (c) interference of (a) or (b) in social, occupational, or

1 other important areas of functioning. The overall epidemiology of MD is largely unknown,
2 with estimates indicating prevalence rates of 6.9% among young men (Compte et al., 2015).

3 MD has been considered to be a condition that afflicts men primarily, however,
4 research has also indicated a rise in muscularity concerns among women (Grogan 2008:
5 Homan, 2010). Due to the inherent focus on muscularity and adiposity, the populations most
6 at risk of developing MD include bodybuilders and athletes. The initial conceptualisation of
7 MD was confirmed among a cohort of weightlifters, and since this finding, weightlifting and
8 bodybuilding practices have consistently been associated with increased risk of developing
9 MD (Mosley, 2008). In sporting arenas, sports that focus on high muscle mass (e.g., athletics,
10 rugby, football, combat-sports) are postulated to be at greater risk, with those who participate
11 in such sports being more likely to utilise or abuse anabolic-androgenic steroids (Irving et al.,
12 2002). Furthermore, athletes possess many of the psychological dispositions that can increase
13 the development of MD including high competitiveness, excessive demand of control, and
14 perfectionist tendencies (Hill et al, 2008). Finally, athletes are exposed to a social climate that
15 orientates to a specific body ideal that is idiosyncratic to sport which usually represents an
16 extreme body type (Haase, Prapavesis, & Owens, 2002).

17 The phenomenology of MD has been examined in research in a variety of domains
18 including aetiology, nosology, and comorbidity. However, to date there is a paucity of
19 published research on preventing its onset. This sparsity in intervention protocols may be
20 attributed to nosological disparities, with scholars divided between whether MD should reside
21 as a BDD variant, or an eating disorder (e.g., Murray & Griffiths, 2015). Furthermore,
22 recruiting samples can pose a challenge, in particular among men, who may fear the stigma
23 attached to psychological conditions associated with body image and/or eating disorders
24 (Griffiths et al., 2015). Moreover, the behavioural manifestations of MD often go
25 unrecognised due to its imitation of seemingly “healthy behaviours”. Behavioural expressions
26 such as regular exercise and dietary restraint are potentially rewarded in sport and exercise

1 settings where such behaviours are often desirable or even pertinent for performance
2 (Anderson et al., 2012).

3 Considering the potential prevalence and deleterious nature of MD, there is a dearth of
4 randomized controlled trials (RCT's), and only one study examining the effectiveness of an
5 intervention approach to MD (Murray & Griffiths, 2015). Subsequently, interventions to
6 prevent MD remain in their infancy. Despite these limitations, researchers have proposed a
7 variety of intervention protocols adopted from the approaches employed for the intervention
8 of its ancestral disorder BDD and concomitant disorders (e.g., eating disorders). For example,
9 Cognitive Behavioural Therapy (CBT) efficacy is well-documented for its utility in BDD and
10 eating disorders (e.g., Murphy et al., 2010; Harrison, et al., 2016). The principal tenants of
11 CBT are proposed to have utility in addressing MD. More specifically, techniques such as
12 cognitive reconstruction may address egosyntonic (i.e. beliefs consistent with one's self-
13 concept) and perfectionistic beliefs. Egosyntonic beliefs may be present in those suffering
14 MD as they struggle to acknowledge the negative consequences of MD. Pope (1997)
15 highlighted that those with MD may often amplify the benefits of excessive exercise and rigid
16 dietary protocols. Perfectionist beliefs are a salient factor in BDD models (Veale, 2004; Veale
17 et al., 1996; Wilhelm, 2006) and research indicates that those with MD exhibit a greater
18 degree of the endorsement of perfectionist beliefs (Olivardia et al., 2000). Furthermore,
19 exposure and response prevention is a prominent CBT technique that has been postulated to
20 address the behavioural presentations of MD (e.g., mirror checking, reassurance-seeking,
21 excessive exercise).

22 Third-wave CBT approaches have also been considered including Acceptance-
23 Commitment Therapy (ACT; Hayes, et al., 1999) have been proposed as a potential
24 intervention for MD. Albeit ACT has not been examined in the context of MD, mechanisms
25 of its approach have been considered to have utility (Murray et al., 2017). For example,
26 features of MD such as excessive exercise and restrictive dietary protocols in order to exert

cognitive and emotional control, can be conceptualised as experiential avoidance. These behaviours often alleviate negative affect in the short-term, however, reinforce the beliefs pertaining to the salience of one's muscularity and adiposity level. To address this, ACT helps individuals to develop acceptance of unpleasant cognitions and emotions to minimise the "urge" to employ maladaptive modalities to avoid them (Hayes, 2004). Finally, Family Based therapy (FBT; Le Grange et al., 2010) is the only psychotherapeutic approach to demonstrate empirical efficacy. Murray and Griffiths (2015) published a case-study examining the efficacy of an FBT intervention upon MD. The results indicated a reduction in MD symptomology utilising the MDDI inventory (MDDI; Hildebrandt et al., 2004). Albeit promising, typically the onset of MD occurs in late adolescence/early adulthood in which individuals may live a completely autonomous life, living independently, therefore the plausibility of FBT may warrant further examination.

The preliminary findings and postulations concerning CBTs are encouraging, but limitations arise in empirical support and generalizability of their results (e.g. FBT; Murray & Griffiths, 2015). Therefore, to address this dearth and advance MD literature it is pertinent to examine the efficacy of interventions that can prevent the onset of MD. Research suggests that CBT offers a plausible approach for MD given the nosological similarities with BDD. A cognitive-behavioural approach that is receiving increased attention in sport and exercise psychology is Rational Emotive Behaviour Therapy (REBT; Ellis, 1955; Turner, 2016). A growing literature – consisting of single-case experimental studies, one to one case studies, and group-based interventions – indicates that REBT is effective across a range of sporting and exercise related issues including reducing competitive anxiety (e.g., Turner & Barker, 2013), reducing social anxiety (Turner et al., 2020), enhancing resilient qualities (Deen et al. 2017), enhancing self-determined motivation (e.g., Turner & Davis, 2018), improving wellbeing (Davis & Turner, 2019), increasing self-efficacy (Chrysidis, Turner, & Wood, 2020), reducing exercise addiction (Outar et al, 2018), and enhancing performance (Wood et

al., 2017). Therefore, examining the application of REBT to symptoms of MD is a worthwhile and plausible undertaking.

REBT is a CBT approach that operates by the philosophical proverb “People are not disturbed by things, but by the view which they take of them” (Epictetus 1948, 55-135 A.D). Distinct from other psychotherapeutic approaches, REBT proposes that in response to adverse events (e.g., failure, poor treatment, setbacks), unhealthy negative emotions (UNEs: anxiety, depression, anger) and maladaptive behaviours (e.g., avoidance, withdrawal, overindulgence) arise from specific irrational beliefs (demandingness, frustration intolerance, awfulizing, and self-other-, or world-depreciation). Contrarily, healthy negative emotions (HNE’s: concern, sadness, assertiveness) and adaptive behaviours (e.g., preparation, approach, expression) arise from specific rational beliefs (preferences, frustration tolerance, anti-awfulizing, and self-, other-, or world-acceptance; Ellis & Dryden, 1997). Irrational beliefs have been shown to be associated with a host of deleterious affective and behavioural outcomes (Visla et al., 2016). Therefore, in REBT the principal objective is to dispute irrational beliefs and encourage the endorsement of rational beliefs to propagate psychological health and well-being (Ellis & Dryden, 1997; MacInnes, 2004). A key theoretical and practice component of REBT is the ABCDE framework (Ellis & Dryden, 1997). The ABCDE framework holds that, when presented with an adversity (A), it is our beliefs (B) about A rather than A itself, that determines the adaptiveness of our response (C). Whereby, irrational beliefs (B) held regarding A underpin unhealthy negative emotions and dysfunctional behaviour (C), contrarily, rational beliefs held regarding A underpin healthy negative emotions (C). Once the client comprehends the ABC, the practitioner collaborates with the client to dispute (D) their irrational beliefs and generate and commit to rational alternatives (E). The disputation process helps individuals to understand that their irrational beliefs are empirically invalid, illogical, and unhelpful, and that rational beliefs are empirically valid, logical, and helpful (Dryden, 2009). The theory and efficacy of REBT has a wealth of empirical support (David et al.,

2005) within both clinical and non-clinical populations and with youth and adult samples (e.g., see Turner, 2016, for a review).

REBT in the context of MD can be conceptualized in terms of the role of irrational and rational beliefs pertaining to muscularity size and adiposity tissue, which is a process of self-schema development via acculturation processes. Such beliefs are activated in situations (A) emphasising ones' appearance (e.g., gymnasium) or body image threats (e.g., comments by others) and social comparisons (e.g., via the media). Such situations can activate a series of irrational or rational beliefs (B) which dependent on their investment can underpin qualitatively different cognitive, emotional, and behavioural responses. In the event that irrational beliefs are held, the individual may experience disturbed emotions (C) including anxiety, shame, hurt, depression, or envy. The individual may attempt to neutralize these emotions by engaging in ritualistic safety, avoidance, or escape behaviour, that manifest as excessive exercise, restrictive dieting, reassurance seeking, anabolic-androgenic steroid use/abuse, or physique concealment. This method appears somewhat effective in the short-term as it appeases the individuals emotional and cognitive distress, however, the latent irrational beliefs remain present, being further reinforced each time this approach is adopted. This postulation is evidenced in literature which implicates irrational beliefs in body dissatisfaction, eating pathology and exercise addiction. First, Moller and Bothma (2008) highlighted the role of irrational beliefs in body dissatisfaction and eating pathology, specifically, awfulizing, frustration intolerance, and self-deprecation beliefs. Results showed participants that reported greater body image disturbance and eating pathology reported greater irrational beliefs. Second, Outar et al. (2018) examined the effects of REBT on exercise addiction symptomology, finding that reductions in irrational beliefs and increases in rational beliefs brought about significant reductions in exercise addiction symptomology. Finally, Tomotake et al. (2002) examined the role of irrational beliefs as a moderator of

1 disordered eating patterns. The data indicated that greater endorsement of irrational beliefs
2 correlated positively with greater disordered eating.

3 Theoretically rational beliefs may provide means to prevent and abate symptoms of
4 MD. MD presents a disorder that derives from negative body image. Literature in the body
5 image space advocates the importance of fostering positive body image rather than solely
6 attenuating negative body image (Cash, 2008). Positive body image is a multifaceted
7 construct qualitatively distinct from negative body image, that depicts favourable, accepting,
8 and functional beliefs regarding one's appearance. Positive rational acceptance (Cash, 2005)
9 is a construct of positive body image that is characterised by the development of a repertoire
10 of rational coping mechanisms to body-image threats, including developing an awareness and
11 understanding of the diverse, vagarious and multidimensional nature of human beings. The
12 psychological underpinnings of positive rational acceptance appear theoretically analogous to
13 unconditional self-acceptance (USA; Ellis, 1977). USA is a fundamental concept within
14 REBT theory and practice. Ellis defined USA as "the individual fully and unconditionally
15 accepts himself whether or not he behaves, intelligently, correctly or competently and
16 whether or not other people approve, respect or love him" (Ellis, 1977, p.101). Therefore,
17 USA advocates that individuals relinquish their pursuit for self-esteem (i.e., contingent self-
18 worth) in which self-worth is derived from accolades, praise, love, affection, and in the case
19 of MD, appearance; instead, accept oneself unconditionally, regardless of the aforementioned.
20 For example, adversities (A) such as body image-threats are greeted by rational beliefs such
21 as "I have worth despite my physical appearance" rather than "If I am not muscular and lean
22 I am completely worthless and unlovable". This consequently reduces the probability of the
23 adoption of maladaptive practices (e.g., excessive exercise). Research supports such
24 postulations highlighting the role of rational beliefs in psychological health and exercise
25 addiction (Chamberlain & Haaga, 2001; Hall et al., 2009). For example, Hall et al. (2009)
26 examined the role of USA in perfectionism and exercise addiction. Results indicated that

USA played a mediating role in exercise addiction, in that low levels of USA preceded higher levels of exercise addiction.

MD is a severe disorder depicted by a myriad of maladaptive cognitive, behavioural, and emotional consequences. Despite the nascent examination of the condition there remains a large paucity of research examining the effectiveness of intervention approaches (e.g., Cunningham et al., 2017). To date, only one study exists that has examined the effectiveness of an intervention upon MD, which is confined to a male population. In consideration of the above, REBT provides an approach that may prevent and abate symptoms of MD. In the absence of empirically examined intervention protocols, individuals are at risk of developing MD, especially those in sporting and weight-lifting populations, and as a result their psychological health and quality of life may be compromised. An efficacious approach for MD would be mutually beneficial for researchers and practitioners working in the field of Sport and Exercise Psychology. REBT provides a theoretical framework to examine unhelpful and helpful beliefs pertaining to appearance, which builds upon previous literature by exploring the potential protective factors of functional, healthy and flexible beliefs (USA).

Furthermore, in the present study we seek to expand upon the intervention literature pertaining to MD (e.g., Murray & Griffiths, 2015) by applying one-to-one REBT, among a mixed-sex population comprising of four exercisers at high-risk of developing MD with a view of decreasing MD symptomology, irrational beliefs and increasing rational beliefs (USA). This study contributes to the growing research in idiographic approaches in sport and exercise psychology (Chrysidis et al., 2020; Meredith et al., 2018), a methodological approach advocated by scholars to seek enhancements in empirical understanding to inform applied practice (Martens, 2007; Tenenbaum et al., 2012). In addition, this study builds upon the growing literature base of the use of REBT within sports and exercise psychology (Turner & Bennett, 2018). In keeping with contemporary research this study adopts a single-case research design to examine and evaluate the effectiveness of REBT (e.g., Turner & Davis,

2019). To the researcher's knowledge, this is the first study to examine the efficacy of a CBT (REBT) intervention upon MD, and the first to examine a mixed-sex cohort. It is hypothesized that REBT will bring about reductions in MD and irrational beliefs, and increases in rational beliefs (USA), from pre- to post- intervention, with effects remaining stable at follow up.

Method

Participants

The first researcher liaised with a U.K. leisure centre based in the Midlands, and consent was attained to recruit participants from their facility. The participants were four of twenty-five volunteers that expressed an interest in taking part in an intervention that was advertised to bring greater self-awareness of health and wellbeing beliefs. Participants were two male and two female exercisers aged between 18 and 26 ($M_{age} = 22.5$; $SD = 3.40$; Participant age in years; $p1 = 24$; $p2 = 18$; $p3 = 23$; $p4 = 26$), with 3–7 years of exercise experience ($M_{exp} = 5.43$; $SD = 2.18$), who were not engaged in any other sport or exercise during the data collection for this study. Experience refers to exercising at or over the government guidelines for physical activity (150 min of moderate intensity activity, and two muscle-strengthening exercise sessions per week [Davies et al., 2019]). All participants reported that they exercised 4–6 times weekly, which included a mixture of cardiovascular and resistance training. Participants were purposely selected from an opportunity sample after a needs analysis, which involved a screening process in which participants ($n = 25$) completed a battery of psychometrics that included: demographics, exercise engagement, previous mental health conditions, muscle dysmorphia symptomology (MDDI) and irrational beliefs (iPBI). Four participants were invited to participate in the study after indicating during the screening process high scores of MD (i.e., scores >39 indicative of greater MD symptoms; Hilderbrand et al., 2004), and high irrational beliefs (i.e., scores 18–35; Turner et al., 2018). High MDDI scores illustrate high symptoms of MD, however, are not a formal diagnosis of

the condition. Participants were selected to accommodate the idiographic and rigorous analysis of intervention effects in which greater comprehension is acquired by examining fewer participants (Normand, 2016). Informed consent was obtained, and ethical approval granted from the University before all data collection.

Design

A single-case, staggered multiple-baseline across participants (MBAP) A-B design was utilized in the current study, offering an idiographic (e.g., Turner et al., 2018) and empirical platform to examine the intervention effects in an ecologically valid manner (Barker et al., 2011). Methodologically, single-case designs are favourable as they afford the meticulous examination of each subject and the data from a few subjects provides a comprehensive narrative. (Normand, 2016). In a recent review of single-case designs (Barker et al., 2020), compared to MBAP designs, other approaches tend to give rise to larger intervention effects, and so researchers should endeavour to apply a design such as the MBAP design used in the current study, that does not inflate intervention effects. In addition, it was found that studies with no procedural reliability report larger effect sizes compared to more precise, smaller effects reported in studies with procedural reliability. The current study employs procedural reliability, reflecting the methodological rigor and study quality (e.g., Kazdin, 2011).

An idiographic single-case design permits the report of the intervention effects for each participant (Neil et al., 2013), and can link previous theory in an ecologically rich milieu (Willig, 2013). Furthermore, it enables specific manipulation, measurement, and assessment of variables (Barlow & Nock, 2009), which is highly sought after in monitoring and evaluating the course of an intervention (Lyon et al., 2017).

Data were collected over a six-month period from baseline to six-month follow up. Baseline data was established across at least four stable data points, before the intervention onset. A stable baseline relates to finite deviations of scores prior to the intervention

implementation. This affords the ability to ascertain whether change (statistical, meaningful, or both) has occurred, offering insights into trait rather than state scores. The A-B design is a robust procedure for assessing the effectiveness of the intervention (i.e. REBT) on the target variables (i.e. MD, irrational beliefs, and USA), and it allows the practitioner to determine whether the intervention brought about change (Kazdin, 1982). The multiple-baseline-across-participants design (MBD) is characterized by an A (baseline phase) B (intervention phase) design where the intervention is sequentially delivered across participants at different time points, to allow attributions of change upon the dependent variables to the intervention rather than extraneous variables (Kazdin, 1982). Specifically, participant 1 commenced the intervention phase in Week 4, participant 2 in Week 5, Participant 3 in week 6, participant 4, week 7. 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 relatively stable (Barker et al., 2011).

Measures

Muscle Dysmorphia symptomology. The Muscle dysmorphic disorder inventory (MDDI; Hildebrandt, Langenbucher, & Schlundt, 2004) comprises 13-items rated on a 5-point Likert scale ranging from 1 (*never*) to 5 (*always*). Total scores range from 13 to 65, with scores over 40 representing a higher risk to developing MD. The measure includes items such as "I feel like I have too much body fat". The MDDI has demonstrated acceptable internal consistency coefficients (α) between .77 and .85.

Irrational beliefs. The irrational Performance Beliefs Inventory (iPBI; Turner et al., 2018) comprises 28-items that measure irrational beliefs. Participants are asked to indicate their agreement on all items on a Likert-scale between 0 (*strongly disagree*) to 5 (*strongly agree*). The measure includes items such as "I have to be viewed favourably by people who matter to me". The iPBI has demonstrated excellent internal consistency (α reliability) coefficients between .90 and .96

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 measure includes items such as "I feel that some people have more value than others.". The USAQ has demonstrated a moderate internal consistency ($\alpha = .72$).

Social validation. Social validation data were collected at post-intervention. Social validation provides a supplement to objective data, which affords the researcher the opportunity to discriminate participant satisfaction of the intervention which has important ramifications as it correlates with the intervention effect within the social context and guides future practice (Storey & Horner, 1991; Wolf, 1978). A social validation questionnaire (appendix) was completed by each participant to ascertain perceptions and feelings of the intervention delivery and effectiveness (Page & Thewell, 2013). Exercisers responded to seven questions on a 7-item Likert scale ranging from 1 (*do not agree at all*) to 7 (*completely agree*) followed by eleven-open ended questions.

Data collection

Data were collected over a six-month period (October-March). Participants were required to complete the MDDI, iPBI, and USAQ weekly during the baseline phase. Thereafter, the participants were required to complete the iPBI, MDDI and USAQ at the start, middle and end of the intervention phase (week 1, 3, 5, & 7) and at the end of the 6-month follow-up phase (research completion). The intervention took place in the private personal training consultation room of a leisure centre.

Intervention

The intervention was delivered by the lead researcher who was a supervised trainee sports and exercise psychologist registered with the British Psychological Society (BPS) and an accredited primary practitioner in REBT. In addition, second, third, and fourth authors were all HCPC Registered sports and exercise psychologists and trained REBT practitioners

who facilitated the design of the intervention. The intervention followed a Socratic and didactic approach, comprising of a mixture of psychoeducational (e.g., presentations) and experiential components (e.g., cognitive reconstructing, behavioural experiments). Each session was structurally similar, and to maintain procedural fidelity the lead researcher followed a session manual developed by the research team. Broadly, sessions began with a review of the participants week, followed by the main body of the session (e.g., ABC psychoeducation) and concluded with assignment setting (e.g., belief reconstruction worksheet) and session reflections. Participants received a REBT intervention program comprising of five, 60-minute one-to-one counselling sessions and four homework assignments (between sessions). Muscularity concerns were not the sole focus of the intervention, as such irrational and rational beliefs were considered in reference to multiple domains of the participants life (e.g., academia, relationships, performance, exercise). Irrational beliefs represent schemas, therefore, are derived from experiences, and archived as core beliefs, which have a proclivity to manifest and permeate across individuals' lives (Ellis, 1957).

Sessions adhered to guidelines within REBT literature (Dryden & Branch, 2008; Dryden & DiGiuseppe, 1990; Ellis & Dryden, 1997; Turner & Bennett, 2018). The intervention was divided into psychoeducation, cognitive reconstruction and reinforcement phase guided by the ABCDE framework.

The principle aim of the *psychoeducation phase* was to teach participants the central tenets of REBT. Specifically, this included: (1) the philosophical underpinnings of REBT ("People are not disturbed by things (alone), but by the view they take of them"), (2) the role of cognitions (i.e. irrational and rational beliefs) in behaviour and emotion, (3) the ABCDE framework, (4) identifying beliefs and discriminating between irrational (i.e. demands, awfulizing, frustration intolerance, self-depreciation) and rational beliefs (preferences, anti-awfulizing, frustration tolerance, self-acceptance), and finally (5) the emotional and

behavioural responses to irrational beliefs (e.g. anxiety, depression, unhealthy envy; avoidance, procrastination) and rational beliefs (e.g. concern, sadness, healthy envy; approach, perseverance). In this phase, the emphasis was placed on understanding, accountability, and empowerment. It provided participants with the means to understand that they are largely, but not completely, responsible for their emotional and behavioural responses, as such have the capacity to determine whether they experience healthier and more goal-orientated outcomes (Dryden, 1991). For example, participant three expressed irrational beliefs (B) regarding achievement (e.g., “I want to be successful, therefore I must be successful”, “Not being successful would be intolerable”, “If I were not successful it would mean that I am a complete failure”). Not limited to exercise settings, such an irrational belief cascaded into all important facets of their life, in which they dogmatically demanded success. In relation to exercise engaging in exercise was fundamental to success, therefore missing a training session was greeted with anxiety, which led to implementing avoidance and safety strategies such as, missing important social activities, adhering to strict exercise regimes and engaging in compensatory behaviours when regimes were broken (e.g., exercising 2-3 times the following day). A key mechanism of the ABCDE framework is goal setting, in the form of formulating new beliefs, and emotional and behavioural responses. Participants were encouraged to consider how they would like to respond (C), and how such a change would facilitate their goals (e.g., improved psychological wellbeing, improved dietary, and exercise enjoyment, improved social life). For example, participant three desired to feel less anxious in relation to breaking training regimes, to reduce the conflict between training and other important life domains, and consequently to have a flexible approach towards exercise.

The *cognitive restructuring phase* is a fundamental part of REBT and took place over two sessions. When restructuring cognitions (i.e., irrational beliefs) in the first instance REBT practitioners will assume that the individual’s perception of the adversity (A) is true, and therefore will help the individual to restructure the irrational beliefs about A, rather than

1 restructuring A itself. This approach is referred to as the elegant solution, because a change in
2 one's deeply held beliefs, rather than our often-fleeting perceptions of As, provides a more
3 robust and long-term method for attenuating emotional disturbance. Indeed, A's can often be
4 valid and not suitable for disputation (Ellis, 1957). Therefore, the primary goal is to
5 restructure irrational beliefs, and construct and promote rational beliefs to foster more
6 functional and healthier emotional and behavioural responses. The disputation process entails
7 examining beliefs based on three main criteria pertaining to the psychological property of the
8 belief's validity (Is there valid evidence to support this belief?), logic (does this belief make
9 logical sense?), and utility (is this belief helpful?) with the goal to develop and internalise
10 beliefs that meet all three requirements (DiGiuseppe et al., 2013).

11 The ***reinforcement phase*** includes the rehearsal of new effective (rational) beliefs and
12 cognitive-behavioral strategies. This occurred throughout the intervention and specifically in
13 the latter stages. First, this was achieved through setting homework assignments to cultivate
14 self-awareness, self-reflection, and affirmations of REBT principles (Ellis & Dryden, 1997).
15 Moreover, participants were educated on a myriad of strategies including cognitive,
16 emotional, and behavioural methods to reinforce and internalize their rational beliefs.
17 Cognitive assignments involved working through ABCDE self-help worksheets, cognitive
18 reconstructing sheets, and creating rational self-statements. Emotive assignments included
19 rational emotive imagery (REI; Ellis & Dryden, 1997), in which the participants utilised
20 imagery techniques to elicit emotions and restructure cognitions as rehearsal for real-life
21 implementation. Behaviour assignments included behavioural experimentation in which
22 participants worked with the lead author to identify adversities in which irrational beliefs
23 were salient, to then test rational self-statements in the presence of the actual adversity. For
24 example, participant three decided to purposely miss a scheduled training session in order to
25 deal with the adversity in the real world, applying their newly acquired rational beliefs. A
26 core REBT component is unconditional self-acceptance (USA; Chamberlain & Haaga, 2001).

Considering the link between USA and exercise addiction (Hall et al., 2009; Outar et al., 2018), and by extension MD (Hildebrandt, Langenbucher, & Schlundt, 2004), greater time was given exploring and cultivating USA beliefs. First, this was achieved by delineating the differences between self-esteem (contingent self-worth) and USA. Second, we utilised Dryden's (2009) realistic USA Credo, to create a tailored credo in which the lead researcher and participant worked in tandem to identify salient features of the credo to accommodate their idiosyncratic challenges (Turner, 2016). Lastly, the final session included a comprehensive overview of the sessions content to explore the client's comprehension and independent implementation of REBT. Here the lead researcher used "Rational Reverse Role-play" (RRR; Turner et al., 2020), in which the researcher became the 'participant' and role-played an individual who held irrational beliefs regarding an adversity; the participant therefore was tasked with helping the practitioner ('client') to identify and dispute irrational beliefs, and develop and reinforce effective new rational beliefs.

Procedural reliability

To ensure procedural reliability and fidelity, and that each participant was intervened equally a session-by-session manual was utilised to guide the REBT intervention (Turner & Bennett, 2018). Furthermore, data were not viewed until the completion of the intervention, to ensure that the practitioner behaviour toward the intervention was not compromised. Finally, each session began with a review of the previous session, and assignments was assessed for successful completion. Between session assignments are a pertinent part of CBT interventions as they foster greater comprehension of fundamental principles (Dryden & DiGiuseppe, 1990).

Analytical strategy

Visual analysis

Visual analysis of the data was conducted to ascertain whether the REBT intervention brought about changes upon the dependent variables. Visual analysis was conducted via graphical

display (see figure 1) and descriptive statistics tabulated (see figure 2) for each participant. The graphical display adopted a single data point format to allow the data level between and within intervention phases to reveal intervention effectiveness (Franklin, Allison, Gorman, 1996). 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. The tabulated data were inspective to determine if change occurred in MD, irrational beliefs, and rational beliefs (USA).

Statistical analysis

Statistical analyses were conducted to compliment the visual analyses. In keeping with relevant guidelines (Ottenbacher, 1986), the data were assessed for serial dependency via autocorrelation analysis to ensure that the data qualified for parametric tests. Data were assessed between pre-intervention and post-intervention phases (5-weeks post intervention onset). All dependent variables (MD & irrational and rational beliefs) were analysed apart from participants 1's data, as there were too few data points (< 10 data points; Ottenbacher, 1986). Autocorrelation analyses revealed non-significant autocorrelation in irrational beliefs (P2, $r = .39$; P3, $r = .69$, P4, $r = .63$) and MD (P2, $r = .15$; P3, $r = .41$, P4, $r = .67$) and rational beliefs (P2, $r = .01$; P3, $r = .80$, P4, $r = .01$). Data were rendered suitable for statistical analysis, with retention of the original raw data for visual and statistical analysis. To elucidate the magnitude of the intervention effect, Cohen's d was calculated between pre- and post-intervention phases. Single-case data were interpreted in reference to small effect size $<.87$; medium effect size $.87$ - 2.67 ; and large effect size >2.67 categories (Parker & Vannest, 2009). Furthermore, in line with contemporary research and typical of single-case designs, changes in the target variables were assessed utilising an independent t -test for each participant. For brevity, only statistically significant data is mentioned.

Results

1 Muscle Dysmorphia, Irrational beliefs and Unconditional self-acceptance

2 **Participant 1.** Visual analysis of the data (See figure 2) revealed a medium reduction
 3 ($d=1.29$) in MD symptoms (-10.11%) and a large ($d=2.76$) reduction in irrational beliefs (-
 4 33.65%) and medium ($d=2.48$) increase in USA (+17.04%), from pre- to post-intervention
 5 phases. In addition, changes in the variables were maintained from pre-intervention to 6-
 6 month follow-up (MDDI = -9.09%; iPBI = -30.81%; USAQ = + 20.85%). There was an
 7 immediate reduction from pre to post-intervention phase in all variables, with no overlapping
 8 data points from pre- to post-intervention in irrational beliefs. Statistical analyses revealed
 9 that participant 1 showed a significant reduction in irrational beliefs ($t(6) = 8.86, p = .001$),
 10 and increase in USA ($t(6) = 4.10, p = .001$) from pre- to post- intervention phases.

11 In summary, visual analysis and descriptive analysis indicated that pre-to post-
 12 reductions occurred across all variables, maintained at follow up-, which was supported in
 13 part by statistical analysis.

14 **Participant 2.** Visual analysis of the data (See figure 2) revealed small ($d=.16$)
 15 increases in MD symptoms (+1.19%) and medium ($d=1.26$) reductions in irrational beliefs (-
 16 25.88%) and small ($d=1.17$) increases in USA (+12.27%) , from pre to post-intervention, with
 17 changes occurring from post- to follow-up intervention phases (MDDI = -24.06%; iPBI = -
 18 39.29%; USAQ = + 14.00). In addition, across all variable's changes were maintained from
 19 pre-intervention to 6-month follow-up (MDDI = -23.21%; iPBI = -55%; USAQ = + 24.75%).
 20 There was an immediate reduction from pre-to post-intervention phase in MD and irrational
 21 beliefs and increase in USA. Statistical analyses revealed that participant 2 showed a
 22 significant reduction in irrational beliefs ($t(8) = 2.82, p = .002$), and increase in USA ($t(8) =$
 23 $2.08, p = .003$) from pre- to post- intervention phases.

24 In summary, visual analysis and descriptive analysis indicated that pre-to post-
 25 reductions occurred for irrational beliefs, maintained at follow up-, which was supported in
 26 part by statistical analysis. For MD, there was a slight pre-to post-increase, but a decrease in

the follow-up phase. Finally, increases in USA were demonstrated from pre-post intervention phase, and increased in the follow-up phase.

Participant 3. Visual analysis of the data (See figure 2) revealed medium ($d= 1.34$) reductions in MD symptoms (-9.59%) and medium ($d= 1.86$) reductions in irrational beliefs (-24.01%) and medium ($d= 2.13$) increase in USA (+31.72%), from pre- to post-intervention, with further changes occurring from post- to follow up- intervention phases (MDDI = -17.81%; iPBI = -26.96%; USAQ = +18.90%). In addition, across all variable's changes were maintained from pre-intervention to 6-month follow-up (MDDI = -25.69 %; iPBI = -45.49%; USAQ = + 50.27%). There was an immediate reduction from pre- to post-intervention phase in irrational beliefs and MD, furthermore there were no overlapping data points from pre- to post- intervention in irrational beliefs. Statistical analyses revealed that participant 3 and showed a significant reduction in MD ($t(10) = 2.25, p = .048$), irrational beliefs ($t(10) = 3.86, p = .003$), and increase in USA ($t(10) = 4.30, p = .001$) respectively from pre- to post-intervention phases.

In summary, visual analysis and descriptive analysis indicated that pre-to post-reductions occurred across MD and irrational beliefs and increases in USA, maintained at follow-up phase, which was supported by statistical analysis.

Participant 4. Visual analysis of the data (See figure 2) revealed medium ($d=2.46$) reductions in MD symptoms (-27.93%) and medium ($d= 1.98$) reductions in irrational beliefs (-25.94%), and medium ($d=1.30$) increases in USA, from pre-to- post intervention, with further changes occurring from post- to follow-up intervention phases (MDDI = -25.69%; iPBI = -40.07%; USAQ= + 24.50%). In addition, across all variable's changes were maintained from pre-intervention to 6-month follow-up (MDDI = -34.58%; iPBI = -55.61%; USAQ =37.09%). There was an immediate reduction from pre- to post-intervention phase in and MD and irrational beliefs, furthermore there were no overlapping data points from pre- to post- intervention phases in MD and irrational beliefs. Statistical analyses revealed that

participant 4, showed a significant reduction in irrational beliefs ($t(10) = 4.13, p = .002$), MD ($t(10) = 4.05, p = .002$) and increase in USA ($t(10) = 2.62, p = .001$) from pre- to post-intervention phases.

In summary, visual analysis and descriptive analysis indicated that pre-to post-reductions occurred across MD and irrational beliefs and increases in USA, maintained at follow-up phase, which was supported by statistical analysis.

Social validation

Social validation data indicated that all participants felt that the intervention improved healthy emotions and behaviours ($M = 6.50, SD = 1.00$), for example, Participant 1 highlighted “The sessions helped me look at how to react to situations in vastly different ways, whether that being situations in the past with regards to how they still affected me currently. Also, how I react to new adversities in life when they occur.” Participants expressed that REBT had a positive influence on body image, eating, and exercise practices ($M = 6.75, SD = .50$). For example, participant 3 specified “My family have noticed a massive change, I used to get so agitated and moody if I missed a gym session.” and participant 4 stated “My mum has noticed a big difference in my mood and attitude towards my eating and the gym”. Furthermore, participants perceived the intervention to improve their well-being ($M = 6.75, SD = .50$) and to be effective ($M = 6.75, SD = .50$), engaging ($M = 6.50, SD = 1.00$), exerting themselves ($M = 6.50, SD = 1.00$), and feeling passionate and enthusiastic about the intervention ($M = 6.50, SD = 1.00$), for example, Participant 2 stated “By the end of the sessions I was happy to be filled with knowledge”.

In summary, social validation data suggested that REBT brought about meaningful changes in irrational and rational (USA) beliefs, subsequently, this promoted healthier thoughts, emotions, and behaviour towards their appearance, exercise, and eating.

Discussion

The present study reports the examination of an idiographic single-case REBT intervention upon MD symptomology, irrational beliefs, and rational beliefs (USA), with a mixed-sex cohort of four exercisers at-risk of MD. It was hypothesized that REBT would bring about acute and long-term reductions in MD symptomatology and irrational beliefs and increases in rational beliefs (USA). The findings demonstrate acute and long-term (6-months) reductions in MD symptoms and irrational beliefs and increases in USA. Building on previous literature (i.e., Bothma & Moller, 2008; Murray et al., 2017) the primary aim of this study was to examine the role of a cognitive-behavioural approach (REBT) in the prevention of MD.

The results of the visual and statistical analyses indicated that REBT was effective in reducing MD symptomatology, irrational beliefs, and increasing USA, across all four participants. REBT was effective in reducing MD symptomatology across all four participants illustrating acute and long-term effects. These reductions occurred at post intervention phase for participant 1,3, and 4, however, participant 2 displayed a slight increase (0.39) in the post intervention phase. In the follow-up phase, participant 2,3, and 4 made reductions, with participant 1 making a slight increase (0.5) from post. Overall, all participants reported reductions in MD symptomatology from pre- to follow-up intervention phases. These reductions in MD were aligned with concomitant reductions in irrational beliefs, and by extension increases in USA (rational beliefs), across all four participants. Broadly, REBT brought about immediate changes in target variables across all participants at intervention phase. Changes were upheld at follow-up phase, with participant 2, 3 and 4 making further reductions at follow-up phase.

Social validation data substantiated these changes, in addition highlighted improvements in emotions, and body image, exercise and eating behaviours. REBT, brought about long-term changes among all variables, illustrating its long-term effectiveness in line with previous research (e.g., Turner et al., 2015, Outar et al, 2018; Cunningham & Turner,

2016). This represents an important goal in cognitive-behavioural approaches as participants are educated to self-regulate their own emotions and behaviours autonomously and competently (Turner & Bennett, 2018). This is particularly important in respect to MD, where body image adversities can be pervasive. The concurrent changes in irrational and rational beliefs (USA) and MD symptoms evidence a potential relationship between irrational and rational beliefs and body image symptoms as postulated in previous literature (Bothma & Moller, 2004). Furthermore, given that the intervention specifically targeted irrational and rational beliefs, rather than superficially targeting symptoms themselves, the changes in MD symptoms alongside changes in irrational and rational beliefs suggests a close relationship. These results are promising, however, the causal nature of the relationship between irrational and rational beliefs and MD symptoms should be investigated further.

In agreement to the study hypotheses all participants experienced statistically significant reductions in irrational beliefs and increases in rational beliefs, however, only two participants (3 & 4) experienced a statistically significant reduction in MD symptomatology. Notably, the two participants that experienced statistically significant reductions in MD reported larger increases in USA. Therefore, it appears USA, in particular, may have an important role in the prevention MD, and negative body image. Research examining rational beliefs is scant. Indeed, most research focusses on irrational beliefs, reflecting a negative or problem-focused bias, rather than benefit-focused (Turner, 2016). Thus, by reporting rational beliefs (USA) in addition to irrational beliefs (e.g., Cunningham & Turner, 2016) the current paper provides meaningful conclusions on the benefits of rational beliefs, as opposed to just the benefits of low irrational beliefs. This is a pertinent distinction as irrational and rational beliefs are relatively orthogonal, as such low irrational beliefs do not necessarily indicate high rational beliefs (Ellis et al., 2010).

These findings contribute to the growing body of literature applying REBT to sports and exercise milieus (Turner & Bennett, 2018) and the scant empirical examination of CBT

1 applied to MD (Murray et al., 2017). There are a variety of mechanism which REBT may
2 deploy that could potentially assuage MD symptoms. In REBT clients are helped to challenge
3 empirically invalid, illogical, and unhelpful beliefs known as irrational beliefs, and
4 encouraged to develop and commit to flexible, empirically sound, logical, and helpful beliefs
5 known as rational beliefs. This is achieved through the ABCDE psychotherapeutic framework
6 at D and E. Irrational beliefs are pervasive, problematic, and theoretically synonymous with
7 core beliefs, as such they tend to cascade into many facets of individuals' lives (Ellis, 1957).
8 All participants held common irrational beliefs pertaining to "success". It is likely, that
9 participants may have attached success to reaching an aesthetic ideal (e.g., muscular, and
10 lean). This desire to reach their muscular ideal may have manifested into dogmatic beliefs
11 about acquiring this ideal ("I must acquire my ideal body shape"), and furthermore, they may
12 have held egosynotic beliefs about the repercussions of not achieving this beliefs (e.g., "I'll be
13 a failure"), consequently, holding great importance on the engagement in excessive weight-
14 training and dietary restraint as means in achieving this ideal (Pope et al., 1997; Olivardio et
15 al., 2000). For example, participants when faced with adversities (A) such as body exposing
16 situations, missing an exercise schedule, losing muscle and gaining adipose tissue, may have
17 held beliefs such as: "To be successful my body needs to be perfect", "I can't stand not
18 having the perfect body", "To have the perfect body, I need to exercise, regardless of the
19 repercussions", "I need to stick to my calorie intake", "To not exercise would be completely
20 awful", "I'd be unlovable if I did not have the perfect body". Such beliefs may underpin
21 deleterious effects including anxiety from the prospect of not adhering to exercise scheduling,
22 or guilt and shame when failing to adhere to an exercise schedule and eating over or under a
23 defined calorie intake. To appease these emotions participants may elect safety, avoidance,
24 and escape behaviours, which may include developing strict rigid exercise and dietary plans,
25 exercising excessively, and engaging in compensatory exercise (e.g. training twice or three
26 times in a day); all of which are symptoms of MD (Pope et al., 1997). Such contentions have

1 been demonstrated in previous research highlighting the role of irrational beliefs in negative
2 body image, exercise addiction and eating pathology (e.g., Moller & Bothma, 2008; Outar et
3 al., 2018; Tomotakoe et al., 2004). MD represents a dynamic interaction of the above,
4 therefore, its plausible, and evidence suggest that they may have a role in negative body
5 image and body image disorders.

6 Therefore, in REBT the primary role of the practitioner is to collaborate with clients to
7 challenge such erroneous, illogical, and unhelpful beliefs (i.e. irrational), and formulate
8 beliefs that are adaptive, flexible, and helpful (i.e., rational beliefs). In this study, participants
9 were supported to develop flexible, adaptive and helpful beliefs (rational beliefs) regarding
10 “success”, as such hold thoughts such as “ I want to be successful, but that does not mean I
11 must” and “I can accept myself regardless of if I am successful”. As with irrational beliefs,
12 these beliefs may have cascaded into concerns pertaining muscularity and adiposity level.
13 Therefore, in the example above the individual would hold beliefs such as “I’d like my body
14 to be perfect, but it doesn’t have to be”. “I can cope if I do not have the perfect body”, “Not
15 exercising would not be the end of the world”, “It’s not awful if I eat over my calorie intake”
16 and “My worth is not dependent on my appearance”. Such beliefs would bring about
17 qualitatively different emotional and behavioural responses, which may underpin healthy
18 emotions and adaptive behaviours, which in relation to MD may include: regular exercise
19 engagement rather than excessive, adequate rest, upholding social and vocational activities
20 despite exercise scheduling conflicts, dietary flexibility and concern, and remorse regarding
21 failures of the above. Such an approach would create greater flexibility and result in a
22 decrease in the impairment of the individual’s lives.

23 A key part of this study, was to examine the role of rational beliefs, scantily observed
24 in literature, nevertheless, theoretically, and empirically pertinent. In this study we examined
25 USA, which its plausible to conceive as being theoretically akin to positive rational
26 acceptance (Cash, 2005), a construct of positive body image. Adopting a positive rational

1 acceptance coping style is characterised by acceptance of distressing adversities and engaging
2 in rational self-talk, which can be articulated as “Regardless of my appearance I have other
3 good qualities”. REBT holds that humans should strive for unconditional self-acceptance to
4 foster psychological wellbeing, which is characterised by an acknowledgement and
5 acceptance of the multifaceted and fallible nature of human beings (e.g., “my appearance is
6 one dimension of my whole person, and therefore cannot determine my self-worth”).
7 Therefore, theoretically USA beliefs may not only buffer the impact of negative body image,
8 but also forge a pathway towards developing positive body image. In relation to MD USA
9 beliefs may prevent individuals from engaging in maladaptive practices to achieve an
10 aesthetic goal (e.g., excessive exercise). Such postulations have been demonstrated in
11 previous literature highlighting the role of USA in exercise addiction (Hall et al., 2009).

12 Our findings, and previous research, suggest that USA may have a distinctive role in
13 negative body image, however, further research is required to ascertain whether greater
14 investment of USA brings about greater positive body image. Such research is considered key
15 in the prevention of negative body image, as attenuating negative body image does not
16 necessarily bring about the development of positive body image (Cash, 2005).

17 **Limitations**

18 The limitations of the present study have been recognized. First, the study does not
19 provide any objective measures of unhealthy negative and healthy negative emotions
20 (UNEs/HNEs), nor behaviours. This omission occurred because albeit the postulation of
21 UNEs and HNEs is as focal facet of REBT (Dryden, 2009), a robust and valid psychometric
22 that captures these constructs does not exist. Indeed, the authors opted against the use of
23 unitary measures of emotions (e.g., anxiety, depression, anger) as unitary measures of
24 emotions are not in keeping with REBT’s theoretical underpinnings, additionally, to prevent
25 participants from spending copious amounts of time completing scales. Subsequently, shifts
26 from negative unhealthy emotions to healthy negative emotions cannot be accurately

evidenced. Thus, to wider the scope of the application of REBT measures pertaining to UNEs and HNEs are warranted. To strengthen conclusions made about the use of REBT on MD, implementing behavioural measures would help to strengthen its validity. MD derives from negative body image, and therefore is multifaceted in nature, comprising of cognitive, affective, behavioural, and perceptive dimensions. MD manifests itself in a host of maladaptive behavioural modalities (e.g., dietary restraint, physical concealment). The MDDI (Hildebrandt, Langenbucher, & Schlundt, 2004) is the gold standard psychometric for MD, however, is an attitudinal body image assessment therefore measures only one dimension of body image (i.e., thoughts pertaining MD), rather than one's behaviours associated with it. Albeit, cognitions are key in body image development, measurement of behaviours associated with MD, and changes through intervention protocols require further enquiry. With further regard to measurement, the validation of a measure identifying beliefs relating to body image specifically may reveal more accurate information regarding the role of irrational and rational beliefs in body image. Moreover, rational beliefs were measured via USA. Albeit USA is highlighted in literature as being associated with comorbidities (e.g., exercise addiction), it has not been directly related to body image. Furthermore, USA though important represents one of four key rational beliefs, therefore, to understand the specific relationships between rational beliefs and body image, scales that measure all dimensions of rational beliefs are greatly required.

As with all intervention-based research, cognitive biases need to be observed with caution. In this study, the lead researcher was not blind to the research parameters, thus risking halo effects. The Halo effect reflects a tendency to like or dislike aspects of the assessment target such as those observed and not observed (Kahneman, 2011; Thorndike, 1920). As such, it has the capacity to impede the research coherence of judgement, whether features occur or not. To address the likelihood of this bias, the research utilised a standardised session agenda manual to foster procedural reliability. The guide was led by the

ABC(DE) model, and followed a systematic approach, in which irrational and rational beliefs were discussed in reference to general irrational and rational beliefs (e.g., career, academia, exercise, eating), rather than solely relating to muscularity. In addition, certain response biases may have impeded this research. In particular, social desirability responses (SDR). SDR are characterised by a tendency to distort responses to align with the perceived research parameters or one's self-concept such as to give socially desirable responses. Thus, SDR reflects proclivity to adopt impression management by under or over reporting certain symptoms (Meehl & Hathaway, 1946). SDR are hard to capture, and to abate this bias there have been a range of social desirability scales developed (e.g., SDS; Edwards, 1957). However, just like other self-report questionnaires, SDR are also subject to SDR biases. Therefore, methods to adequately assess SDR are still scant.

Finally, although the design of the current study is in line with single-case research guidelines, data derives from only four participants who are demographically and culturally homogenous (males and female aged between 18 and 26). Thus, the results of the current study are difficult to generalise to other populations and cultures. However, this study expanded upon research by including a mixed sex cohort, greatly unrepresented and scantily examined within MD literature. Additionally, the effectiveness of REBT has been demonstrated in a wide variety of populations (e.g., Turner, 2016). However, to rigorously test the utility of REBT for the prevention of MD, RCT's are required with diverse age ranges and different cultures.

Conclusion

To conclude, to the researcher's knowledge the present study is the first to report a cognitive-behavioural intervention for individuals at-risk of MD. Therefore, this study provides a novel, unique and compelling contribution to the dire paucity of preventative interventions for MD and the growing body of scholarly examination of the use of REBT in sports and exercise psychology (Turner & Bennett, 2018). The findings of this study suggest

that irrational and rational beliefs (USA) may be important antecedents in negative body image (Bothma & Moller, 2004) and supports recommendations of the utility of CBT for MD interventions (Murray et al., 2017). Body image is a crucial facet of our psychological and physical wellbeing, that permeates all important components of our lives. MD presents a debilitating disorder that if not prevented or treated can grossly comprise the quality of life of individuals. Moreover, MD is no longer a mere male infliction solely, as muscularity concerns appear to broach the lives of females putting them at risk of developing MD. Practitioners in sports and exercise psychology operate with a population that are at the greatest risk of developing this problematic condition, as such it is critical that they have an empirical, evidence-based framework to prevent and attenuate MD symptoms to support the psychological and physical health of athletes, exercisers and the general public. This study hopes to serve as a significant catalyst to broaden the scope of MD research, by moving beyond its nosological and symptomological enquiry, but instead to provide means to prevent its existence.

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Table 1.

Mean values, standard deviations of irrational beliefs, Muscle dysmorphia and Unconditional self-acceptance scores from pre- to post- and follow-up intervention phases.

P	IB			MD			USA		
	Pre	Post	Follow-up	Pre	Post	Follow-up	Pre	Post	Follow-up
1	105.5± 3.11	70.00±17.94*	73.00	49.5±2.65	44.5±4.80	45.00	82.75±5.06	95.90±6.23*	100.00
2	75.55±11.02	56.00±18.89*	34.00	35.16±2.99	35.55±1.91	27.00	85.17±4.40	93.30±11.77*	106.25
3	113.50±3.16	86.25±20.50*	63.00	40.37±2.67	36.50±3.11*	30.00	64.88±3.60	82.00±3.13.13*	97.50
4	103.63±2.50	76.75±18.99*	46.00	33.63±3.74	24.25±3.86*	22.00	75.50±3.55	83.10±12.64*	103.50

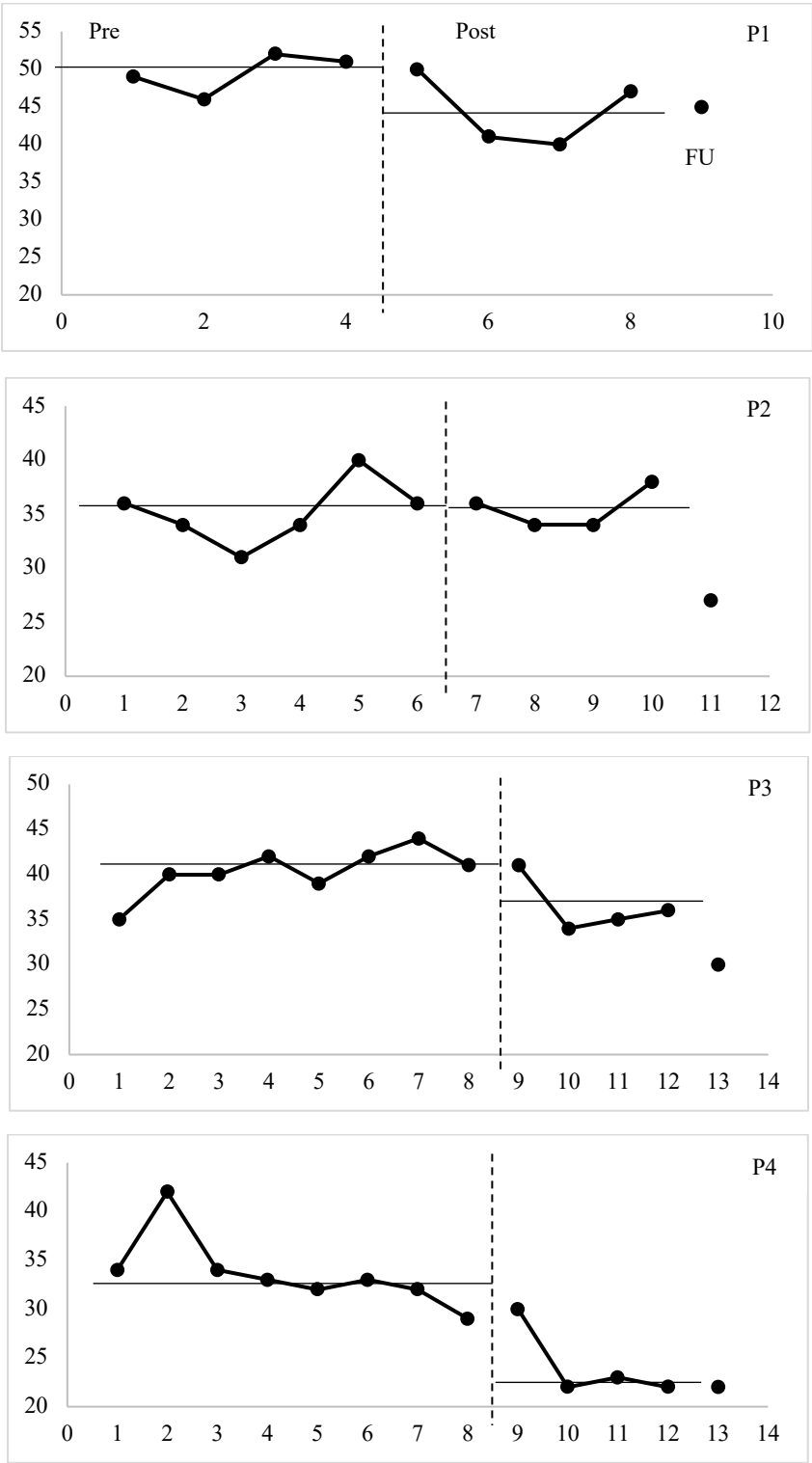


Figure 1. Pre, Post and 6-month follow up – Intervention Muscle dysmorphia (MDDI) Scores