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Journal of Sports Sciences

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rjsp20

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To cite this article: Anthony J Miller, Martin J Turner, Wendy Ollier & Alisha A Hattersley (2023) Understanding the influence of irrational beliefs and body image inflexibility on exercise dependence and psychological well-being: A latent profile analysis approach, Journal of Sports Sciences, 41:3, 291-297, DOI: 10.1080/02640414.2023.2208952

To link to this article: https://doi.org/10.1080/02640414.2023.2208952

JOURNAL OF SPORTS SCIENCES
2023, VOL. 41, NO. 3, 291–297
https://doi.org/10.1080/02640414.2023.2208952

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SPORT AND EXERCISE PSYCHOLOGY

Understanding the influence of irrational beliefs and body image inflexibility on exercise dependence and psychological well-being: A latent profile analysis approach

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ABSTRACT

Irrational beliefs are a risk factor for mental ill-health and exercise dependence. In addition to this, researchers have also proposed that body image inflexibility can determine mental health and behavioural outcomes. However, research is yet to explore whether and to what extent irrational beliefs and body image inflexibility align to influence mental health and exercise dependence. We examined the latent profile structure of irrational beliefs and body image inflexibility, and how these latent profiles relate to mental health and exercise dependence in exercise active adults. Results indicate a two class profile, whereby class 1 is characterized by high irrational beliefs and body image inflexibility, and class 2 is characterized by low irrational beliefs and body image inflexibility. Those in class 1 reported significantly greater depression, anxiety, stress, and exercise dependence than those in class 2 ($p \leq .02$). The findings are discussed in relation to the implications for practitioners in the mental health of exercise participants.

ARTICLE HISTORY
Received 20 July 2022
Accepted 21 April 2023

KEYWORDS
Irrational beliefs; exercise dependence; psychological flexibility; mental health

Introduction

There has been significant growth in the application of rational emotive behaviour therapy (REBT; Ellis, 1995) in sport and exercise settings in recent years (Turner & Bennett, 2018). REBT emerged in the 1950s through the work of Albert Ellis (1957) and is the first form of what would later be referred to as Cognitive Behaviour Therapy (CBT). CBT is a family of psychotherapies that includes approaches such as cognitive therapy (CT; Beck, 1976) and acceptance and commitment therapy (ACT; Hayes et al., 2012), alongside REBT. But REBT is distinguished from other CBTs owing to its acute focus on specifically defined irrational beliefs as the key cognitive mediators through which emotional disturbance manifests. REBT also incorporates a GABCDE framework that captures its model of the human psyche. In brief (see Ellis, 1994; Turner, 2022, for protracted portrayals of the framework), human beings have many goals (G) in life, many of which at one point or another are thwarted by adversity (A) because humans are limited creatures and the world is uncontrollable. If irrational beliefs (B) are applied to said adversity, one is likely to experience unhealthy emotional and behavioural consequences (C). As such, in REBT people are not disturbed (C) by events (A) alone, but by their perceptions and beliefs (B) about the event (A). In REBT, practitioners work with clients to help them dispute (D) these irrational beliefs and generate new effective rational beliefs (E) in order to elicit healthy emotional and behavioural consequences (C). Significant research indicates that irrational beliefs underpin unhealthy emotions and behaviours (Browne et al., 2010; Turner, 2016; Visla et al., 2016, for a meta-analysis), including exercise dependence (Knapp et al., 2023). Exercise dependence is characterised by excessive and obsessive exercise behaviour often resulting in injury and illness (Knapp et al., 2023; Outar et al., 2018).

In applying the GABCDE framework to exercise dependence, one could articulate the following formulation:

"My goal is to attain an ideal body (G), but I am dissatisfied with my appearance (A)", reflecting an incongruence between G and A in that my G is thwarted. This incongruence triggers or activates a set of tacit beliefs (B) about the self that can be rational (rB) or irrational (iB). If one applies *irrational* beliefs (iB) to their body image related A, then they are more likely to evince *unhealthy* emotional and behavioural consequences (C). But if one applies *rational* beliefs (rB) to their body image related A, then they are more likely to evince *healthy* emotional and behavioural consequences (C). In relation to body image, ones unhealthy Cs can manifest emotionally in a dimishment of psychological health, and behaviouraly in an overindulgence and dependence upon exercise as a way to ameliorate A.

As such, it is important to edify what exactly irrational beliefs are in REBT. Irrational beliefs are rigid, extreme, and illogical (Dryden, 2014; Ellis, 1994), and comprise; demandingness (e.g., "I want to, and therefore I must"), awfulizing (e.g., "It not only bad, it is awful"), frustration intolerance (e.g., "It is difficult, and so I cannot stand it"), and depreciation (e.g., "because I failed/transgressed, I am worthless"). Although irrational beliefs have been shown to be associated with poorer mental health in athlete samples (e.g., Turner et al., 2019; Mansell, 2021; Miller et al., 2022), there is limited evidence of the theory and

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Supplemental data for this article can be accessed online https://doi.org/10.1080/02640414.2023.2208952.

application of REBT in exercise settings and populations (see Turner et al., 2022, for an exception). However, REBT is effective in diminishing exercise dependence as well as body dysmorphia (Outar et al., 2021). The potential confluence of irrational beliefs, body image, and exercise behaviour is ripe for exploration, and in the current study we focus upon the role of irrational beliefs in body image, exercise behaviour and psychological health.

The irrational beliefs of REBT are not the only rigid beliefs that could influence exercise behaviour. Body image psychological inflexibility (BIPI) refers to a limited view of ones appearance, where evaluations (by self or others) of said appearance define ones emotionality, wellbeing and behaviour (Callaghan et al., 2015). An inflexible view on personal appearance refers to the rigid connection between dissatisfaction with ones body image and self-downing (e.g., "my mood is determined by the appearance of my body"). A flexible view on body image is one that accepts perceived bodily flaws, and does not associate body dissatisfaction with personal value (e.g., "I am worthy, regardless of my body shape"). BIPI is closely aligned with body dysmorphia, being characterized by an obsession with perfection, and preoccupation with perceived defects and flaws (Vashi, 2016). Though, BIPI accounts for the association between perceptions of body image and self-worth. In small *n* studies, Outar et al. (2018, 2021) has found that reducing irrational beliefs via REBT leads to subsequent reductions in body dysmorphia symptomology and exercise dependence, intimating associations between irrational beliefs, body image, and exercise behaviour. It would be fruitful to understand whether and to what extent irrational beliefs alongside BIPI are indeed associated with exercise behaviour, offering a conceptual bridge between the irrational beliefs nested with REBT, and the distorted and dysmorphic cognitions pertaining to the body as captured in the concept of BIPI.

The presence of both irrational beliefs and distorted cognitions concerning the body (BIPI) is likely to associate with exercise dependence. Because exercise dependence concerns obsessive cognitions and uncontrollable cravings for activity, one is likely to excessively exercise, inducing psychophysiological (e.g., withdrawal, anxiety, depression) symptoms (Gonçalves Baptista et al., 2019; Hausenblas & Downs, 2002). Here to, it would be unsurprising that the endorsement of irrational cognitions surrounding exercise ("I must exercise"), alongside distorted cognitions on bodily appearance ("I don't like myself if I don't like parts of my body"), leads to dependence upon exercise behaviour (i.e., uncontrollable cravings to exercise; Gonçalves Baptista et al., 2019; Hausenblas & Downs, 2002). Given the likely psychological implications of exercise dependence (Knapp et al., 2023), it is also possible to imagine why irrational beliefs and body image inflexibility may present a risk to psychological health. As one's rigid, illogical, and extreme beliefs concerning exercise behaviour grows (i.e., "I cannot stand missing a training session"), and one's fear of judgement from others increases (i.e., "people will think I'm unattractive"), and self-induced pressure inflates, precarity of mental health increases. In addition, when an excessive need ("I must train") to exercise to improve appearance is not possible, self-worth and social anxiety is likely to amalgamate, deteriorating mental health. On one hand, you have self-imposed pressure to engage in exercise behaviour in order to maintain self-imposed physical standards, and on the other you have a sense of worthlessness and a lack of control if you do not. Hence, when rigid beliefs about the self and one's body are ameliorated, self-imposed pressure is more likely to abey, leading to healthier exercise engagement and potential greater overall psychological health.

In the present paper, a latent profile analysis approach (LPA; see Turner et al., 2022; Ullrich-French & Cox, 2020) is adopted in order to understand the confluence of REBT and BIPI, and to then examine how this confluence is related to exercise dependence and psychological health. LPA allows researchers to identify individual subgroups drawn from data, and enables a person centred approach to hypothesis testing (Spurk et al., 2020). Specifically, in the present study, LPA is to explore the emergence of differentiable latent profiles bourne out of the convergence between irrational beliefs and body image inflexibility. Given the conceptual overlap between the two constructs, it is hypothesised that two distict profiles will emerge; one reflecting low irrational beliefs and body image inflexibility (i.e., adaptive), and one reflecting high irrational beliefs and body image inflexibility (i.e., maladaptive). The primary aim of the present paper is to examine the latent profile structure of irrational beliefs and body image inflexibility, and to test the extent to which these profiles relate to exercise dependence and psychological health. We hypothesise that an adaptive profile will be associated with lower exercise dependence and greater psychological health.

Methods

Participants

Following institutional ethical approval, convenience and snowball sampling took place, contacting individuals who regularly exercise via emails, word of mouth, and social media. Convenience sampling was achieved by liaising with fitness groups (e.g., running groups). Snowball sampling was achieved by encouraging individuals on completion to send details of the study to other potential individuals that may be interested. A total of 302 (M_{age} = 39.15 ± 14.33; 76 males) regular exercisers ($M_{days/week}$ = 2.31 ± 2.65; $M_{minutes/week}$ = 57.50 ± 35.44) took part in the study. Replicating similar research (Turner et al., 2022), individuals were eligible for the study if they took part in at least 30 minutes of moderate to vigorous leisure time activity in a typical 7-day period. We were interested in individuals' beliefs about their exercise behaviours, rather than the type of exercise behaviour, or whether individuals meet national exercise guidelines (150 minutes of moderate to vigorous physical activity per 7-day period; GOV.UK, 2019). Once ethically approved, a Qualtrics (online) survey was administered to participants.

Design

An atemporal cross-sectional design was employed to investigate the latent profile structure of irrational beliefs and body image inflexibility, and how these latent profiles associate with psychological well-being and exercise dependence. LPA identifies distinct, non-overlapping latent classes based on

individual responses (Tein et al., 2013). LPA returns multiple solutions that describe the data, providing six profile structures.

Measures

Irrational beliefs

The Irrational Performance Beliefs Inventory II (iPBI-II; Turner & Allen, 2018) is a 20-item measure of the four-core irrational beliefs (demandingness, awfulizing, frustration intolerance, and self-depreciation) that has been used in exercise populations (e.g., Outar et al., 2018). Higher scores reflect greater irrational beliefs. Cronbach's α and McDonalds Omega (ω) demonstrated at least good internal consistency for demandingness, awfulizing, frustration intolerance and depreciation ($\alpha \geq .82$, $\omega \geq .82$).

Body image psychological inflexibility

The body image psychological inflexibility scale (BIPIS; Callaghan et al., 2015) is a 16-item measure of body image inflexibility. The BIPIS highlights bodily disturbances and dysmorphia on a 7-point Likert scale from 1 (*Never true*) to 7 (*Always true)*. Highers scores indicate reflect greater body image inflexbility. Cronbach's α and McDonalds Omega (ω) demonstrated excellent internal consistency for body image inflexibility ($\alpha = .95$, $\omega = .95$).

Exercise dependence

The Exercise Dependence Scale-21 (Hausenblas & Downs, 2002) indicates a risk of exercise dependence across seven subscales; tolerance (i.e., increase in need to exercise to get the same effect), withdrawal (i.e., symptoms of withdrawal when not exercising), intention effect (i.e., exercising for longer amounts of time), lack of control (i.e., an inability to control exercise behaviour), time (i.e., a lot of time is spent exercising), reduction in other activities (i.e., social activities given up for exercise) and continuance (i.e., continuing to exercise even with psychological/physical problems). Each subscale is rated on a 6-point Likert scale, ranging from 1 (*Never*) to 6 (*Always*), allowing for categorization, being "at risk" (i.e., potential exercise dependence; score 5–6) "non-dependent symptomatic" (i.e., symptoms of dependency; score 3–4) or "non-dependent asymptomatic" (i.e., no symptoms of dependency; score 1–2). Means for cut-off points can be found in the Supplementary file. Cronbach's α and McDonalds Omega (ω) scores were good to excellent across subscales ($\alpha \geq .86$, $\omega \geq .86$).

Mental health

The depression anxiety and stress scale (DASS-21; Lovibond & Lovibond, 1995) is a 21-item measures of depression (e.g., loss of self-esteem and depressed mood), anxiety (e.g., fear and anticipation of negative events) and stress (e.g., persistent state of over arousal). Participants were asked to rate how many of the items applied to them in the past week, from 0 (*did not apply to me at all*) to 3 (*applied to me very much, or most of the time*). To calculate comparable scores with the full DASS questionnaire, each 7-item scale was multiplied by two. Means for cut-off points can be found in the Supplementary file. Data were not collected from participants with medically diagnosed health conditions, because this is likely to influence results (Ranjbar et al., 2015). Cronbach's α and McDonalds Omega (ω) demonstrated good to excellent internal consistency (Depression $\alpha = .92$, $\omega = .92$; Anxiety $\alpha = .91$, $\omega = .91$; Stress $\alpha = .89$, $\omega = .89$).

Analytic strategy

Descriptive statistics including means (Ms), standard deviations (SDs), and intercorrelations were calculated for all main study variables (see Table 1). Next, LPA identified patterns across irrational beliefs and body image inflexibility. The distribution of irrational beliefs and data on body image inflexibility across psychological distress cut-points can be seen in Table 2. The R package (v. 4.1.3) tidyLPA was used to identify latent profiles (Rosenberg et al., 2019). A standardised *z*-score of ±0.50 indicated high and low estimations, while scores in between (i.e., +0.50 to−0.50) indicated moderate estimations (Martinent et al., 2013). A combination of indicators were used to decide on the best-fitting model; (a) information-theoretic method, and (b) entropy-based criterion. These included; Akaike Information Criteria (AIC), Bayesian Information Criteria (BIC), Sample Adjusted Bayesian Information Criteria (SABIC), and entropy values. The Bootstrap Likelihood Ratio Test (BLRT) was used to determine whether the *k*-1 class model should be rejected in favour of a *k* class model. The bootstrap method has powerful means for statistical inference and is widely employed

Table 1. Descriptive statistics and inter-correlations.

	Mean ± SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Demandingness	14.17 ± 2.89	-														
2. Awfulizing	13.58 ± 3.21	.78*	-													
3. Frustration Intolerance	15.01 ± 3.22	.64*	.63*	-												
4. Depreciation	11.19 ± 4.42	.66*	.67*	.75*	-											
5. Body Image Inflexibility	2.84 ± 1.51	.50*	.50*	.65*	.58*	-										
6. Depression	17.08 ± 12.93	.35*	.38*	.57*	.56*	.72*	-									
7. Anxiety	17.45 ± 12.69	.38*	.40*	.57*	.58*	.75*	.95*	-								
8. Stress	13.99 ± 11.55	.30*	.35*	.53*	.55*	.72*	.89*	.91*	-							
9. Withdrawal	3.27 ± 1.65	.03	−.01	.003	.04	.08	−.01	.01	.02	-						
10. Intention Effect	2.66 ± 1.39	−.05	−.09	−.07	−.08	−.04	−.09	−.09	−.05	.52*	-					
11. Lack of control	2.19 ± 1.36	.03	.03	.02	.08	.02	.02	.03	.03	.53*	.49*	-				
12. Time spent exercising	2.75 ± 1.46	−.02	−.05	−.04	−.02	.006	−.05	−.06	−.05	.62*	.63*	.62*	-			
13. Reduced Activity	2.00 ± 1.21	−.001	.004	−.01	.001	.03	−.04	−.04	−.03	.55*	.63*	.60*	.66*	-		
14. Continuance	2.64 ± 1.47	−.02	−.07	−.05	−.02	−.08	−.02	−.04	.01	.25*	.43*	.49*	.51*	.44*	-	
15. Tolerance	2.88 ± 1.46	−.02	−.03	−.02	−.01	.03	.004	−.02	.02	.50*	.69*	.55*	.74*	.60*	.47*	-

Table 2. Means and standard deviations of main study variables within mental health and exercise dependence cut off points.

	Minimal	Mild	Moderate	Severe	Extremely Severe
Depression					
Demandingness	12.86 ± 2.89	14.26 ± 2.47	13.67 ± 2.54	15.01 ± 2.24	15.69 ± 2.72
Awfulizing	12.22 ± 3.45	13.73 ± 2.71	13.35 ± 2.48	13.91 ± 3.91	15.22 ± 2.76
Frustration Intolerance	12.90 ± 3.15	14.62 ± 2.57	14.75 ± 2.16	15.92 ± 2.87	17.61 ± 2.15
Depreciation	8.26 ± 3.92	10.92 ± 4.00	10.85 ± 3.58	12.09 ± 3.33	14.79 ± 3.27
Body Image Inflexibility	1.49 ± .90	3.27 ± 1.35	2.50 ± 1.23	3.19 ± .98	4.36 ± .78
Withdrawal	3.11 ± 1.66	3.86 ± 1.49	3.08 ± 1.46	3.59 ± 1.66	3.14 ± 1.75
Intention Effect	2.71 ± 1.47	2.84 ± 1.49	2.67 ± 1.15	2.87 ± 1.65	2.40 ± 1.23
Lack of Control	2.09 ± 1.35	2.40 ± 1.50	2.10 ± 1.18	2.35 ± 1.47	2.17 ± 1.35
Time Spent Exercising	2.77 ± 1.54	2.97 ± 1.58	2.64 ± 1.25	3.07 ± 1.61	2.53 ± 1.31
Reduced Activity	2.02 ± 1.22	2.05 ± 1.26	1.93 ± 1.13	2.27 ± 1.41	1.85 ± 1.10
Continuance	2.57 ± 1.49	2.83 ± 1.53	2.65 ± 1.44	2.91 ± 1.55	2.52 ± 1.42
Tolerance	2.81 ± 1.49	2.99 ± 1.63	2.96 ± 1.27	2.99 ± 1.67	2.79 ± 1.35
Anxiety					
Demandingness	13.17 ± 2.97	12.11 ± 2.87	13.32 ± 2.46	15.38 ± 1.67	15.26 ± 2.70
Awfulizing	12.25 ± 3.49	11.00 ± 2.99	13.30 ± 2.58	14.51 ± 2.00	14.77 ± 2.95
Frustration Intolerance	13.32 ± 3.00	11.91 ± 3.92	13.68 ± 2.57	15.50 ± .67	17.06 ± 2.44
Depreciation	8.45 ± 4.21	7.00 ± 2.44	9.80 ± 3.43	13.15 ± 2.50	13.79 ± 3.67
Body Image Inflexibility	1.58 ± 1.06	1.32 ± .93	2.31 ± 1.21	3.55 ± .96	3.96 ± 1.01
Withdrawal	3.00 ± 1.67	3.68 ± 1.17	3.25 ± 1.64	3.94 ± 1.59	3.23 ± 1.68
Intention Effect	2.67 ± 1.53	2.68 ± 1.26	2.60 ± 1.21	3.39 ± 1.51	2.53 ± 1.35
Lack of Control	1.96 ± 1.24	2.53 ± 1.25	2.21 ± 1.42	2.68 ± 1.61	2.16 ± 1.35
Time Spent Exercising	2.61 ± 1.51	3.46 ± 1.40	2.79 ± 1.45	3.09 ± 1.69	2.63 ± 1.37
Reduced Activity	2.03 ± 1.26	1.92 ± .79	1.81 ± 1.11	2.65 ± 1.60	1.95 ± 1.15
Continuance	2.45 ± 1.52	3.12 ± 1.48	2.70 ± 1.45	2.81 ± 1.56	2.63 ± 1.44
Tolerance	2.86 ± 1.56	2.83 ± 1.35	2.86 ± 1.50	3.30 ± 1.44	2.81 ± 1.40
Stress					
Demandingness	13.36 ± 2.72	15.15 ± 2.35	16.09 ± 2.08	15.76 ± 3.17	13.55 ± 2.11
Awfulizing	12.73 ± 3.13	14.39 ± 2.28	15.30 ± 3.43	15.17 ± 2.93	14.81 ± 2.85
Frustration Intolerance	13.85 ± 3.14	15.09 ± 2.18	17.14 ± 2.49	17.42 ± 2.26	17.35 ± 2.15
Depreciation	9.56 ± 4.20	11.67 ± 2.59	12.83 ± 2.91	14.87 ± 3.66	14.34 ± 3.29
Body Image Inflexibility	2.00 ± 1.18	3.87 ± 1.11	3.49 ± 1.22	4.51 ± 1.01	4.12 ± .83
Withdrawal	3.20 ± 1.61	4.05 ± 1.54	3.70 ± 1.82	2.86 ± 1.68	3.57 ± 1.53
Intention Effect	2.70 ± 1.40	2.80 ± 1.50	3.10 ± 1.60	2.30 ± 1.20	2.69 ± 1.20
Lack of Control	2.16 ± 1.33	2.41 ± 1.48	2.21 ± 1.41	1.96 ± 1.32	2.83 ± 1.33
Time Spent Exercising	2.79 ± 1.48	2.87 ± 1.67	2.97 ± 1.29	2.42 ± 1.36	2.85 ± 1.26
Reduced Activity	1.96 ± 1.17	2.50 ± 1.44	2.15 ± 1.37	1.85 ± 1.15	1.71 ± .84
Continuance	2.63 ± 1.48	2.75 ± 1.45	2.90 ± 1.57	2.49 ± 1.38	2.90 ± 1.75
Tolerance	2.88 ± 1.49	2.89 ± 1.38	3.08 ± 1.54	2.50 ± 1.29	3.90 ± 1.32
Exercise Dependence					
	Non-dependent asymptomatic		Non-dependent symptomatic		At risk
Demandingness	13.92 ± 2.80		15.07 ± 2.92		15.08 ± 2.20
Awfulizing	13.41 ± 3.27		14.18 ± 3.15		14.28 ± 1.88
Frustration Intolerance	14.12 ± 3.19		16.79 ± 2.66		16.65 ± .59
Depreciation	10.70 ± 4.67		12.06 ± 3.87		12.66 ± 2.56
Body Image Inflexibility	2.43 ± 1.53		3.47 ± 1.06		4.64 ± .44
Depression	14.47 ± 12.40		21.47 ± 11.81		27.14 ± 15.40
Anxiety	15.28 ± 12.64		20.71 ± 11.42		28.29 ± 11.71
Stress	12.46 ± 11.60		16.34 ± 10.83		21.42 ± 10.44

in various scientific problems (Good, 2005). It is also important to understand the meaning of the profiles that emerge in order to interpret the results (Martinent & Decret, 2015). As such, in order to identify the best model fit, both statistics and theoretical underpinnings were considered (Martinent & Decret, 2015).

Replicating similar research in sport and exercise, analyses were conducted on up to six potential latent profiles (Turner et al., 2022). An intercorrelation matrix (see supplementary file Table S1) identified that intercorrelations between predictor variables were below the .80 cut-off (Berry & Feldman, 1985). After this, the class structure was screened to identify whether there was a significant difference in exercise time (minutes per week) between the classes. Fourth, analyses of covariance (MANCOVA) tested whether there was a significant difference in reported depression, anxiety, stress and exercise dependence between the identified latent profiles. Because there are reported differences in irrational beliefs between males and females (Turner et al., 2019), sex was used as a covariate within analyses. Whilst power estimations are prudent, LPA depends moreso on profile characteristics than sample size. Thus, we follow recommendations in evaluating power, revealing that sample sizes exceeding 300 people are sufficient when using this approach (Nylund-Gibson & Choi, 2018). Analyses revealed no missing data. Data-points with z scores greater than 3.29 (Hahs-Vaughn, 2017) were Winsorized. This is a process in which extreme values are replaced to reduce the influence of outliers on the data. Overall, .0002% of data were Winsorized ($n = 7$ from 25,972 cases =.0002%; Kwak & Kim, 2017).

Results

Latent profile analysis

Based on theoretical underpinnings, information-theoretic and entropy values, a solution with two latent profiles of varying variance and covariance was favoured. Entropy values were reliable within the two-class solution. Class 1 comprised of 197 participants (65.23% of the sample; 55 males, 138 females, 4 prefer not to say), and Class 2 comprised of 105 participants (34.77% of the sample, 21 males, 84 females). Those in Class 1 reported higher demandingness (moderate (≤.5), frustration intolerance, awfulizing, self-depreciation (high (≤.5)), and body-image inflexibility (high (≥.5)) relative to Class 2 (see supplementary file Figure S1). The patterns evidence two classes (see Figure 1), those who hold high irrational beliefs and high body image inflexibility (Class 1), and those who hold low irrational beliefs, and low body image inflexibility (Class 2). Thus, irrational beliefs (e.g., "I must") are convergent with body image inflexibility (e.g., "my appearance defines my worth").

Analysis of variance

Regarding exercise time between Class 1 and Class 2, there was a non-significant difference in exercise time ($F(1, 300) = .93$, $p = .34$, $\eta^2_p = .003$). Regarding psychological health, MANCOVA revealed that irrespective of sex, there was a significant main effect of Class on depression, anxiety and stress (Wilks' $\Lambda = .79$, $F(3, 297) = 27.19$, $p < .001$, $\eta^2_p = .22$). Follow-up comparisons identified that depression, anxiety, and stress were significantly higher in Class 1 (higher irrational beliefs, higher body image inflexibility) than in Class 2 (lower irrational beliefs, lower body image inflexibility; $p < .001$).

Regarding differences in exercise dependence between the two classes, MANCOVA (controlling for sex) revealed that there was a significant main effect of Class on exercise dependence (Wilks' $\Lambda = .94$, $F(7, 293) = 2.67$, $p = .011$, $\eta^2_p = .06$). Follow-up comparisons identified that feelings of withdrawal and a perceived lack of control over behaviour was significantly higher in Class 1 (higher irrational beliefs, higher body image inflexibility) than Class 2 (lower irrational beliefs, lower body image inflexibility; $p \leq .02$). Remaining subscales for exercise dependence were non-significant ($p \geq .23$).

Discussion

A two-class solution best fit the latent profile structure of irrational beliefs and body image inflexibility; high irrational beliefs and high body image inflexibility (Class 1) and low irrational beliefs and low body image inflexibility (Class 2). Participants in Class 1 reported higher withdrawal and a perceived lack of control over behaviour, and poorer psychological health (i.e., greater depression, anxiety, and stress), compared to participants in Class 2. Thus, it is possible that a profile characterized by high irrational beliefs and high body image inflexibility is a risk factor for exercise dependence and psychological health.

Perhaps the damaging effects of the convergence between irrational beliefs and body image inflexibility should not be surprising. Based on the findings, it would be anticipated that rigid, illogical and extreme beliefs about exercising alongside a fear of judgement from others is likely to increase instability of mental health. Here, one feels that they must exercise in order to feel worthy whilst simultaneously defining their self worth based on what other people think about their appearance. This co-occurrence of rigid beliefs and externally derived contingent self-worth is only going to increase unhealthy exercise behaviours. And as such, in order to maintain value as a human being and to avoid being shamed by others, one must exercise continuously. As a result of this unhealthy exercise behaviour, risk of injury and illness increases (Symons Downs & Hausenblas, 2003). Indeed, elsewhere in the literature self-depreciation beliefs (i.e., negative evaluations of the self; Dryden, 2019) have been found to be particularly salient for mental health (Turner et al., 2019; Turner et al., 2022; Mansell, 2021). In sum, defining oneself on the basis of one's actions and or appearance, appears to be suboptimal for healthy exercise enagagement and psychological health. If one conflates their self-worth with their bodily appearance, then they are more likely to engage in excessive exercise behaviours enacted for

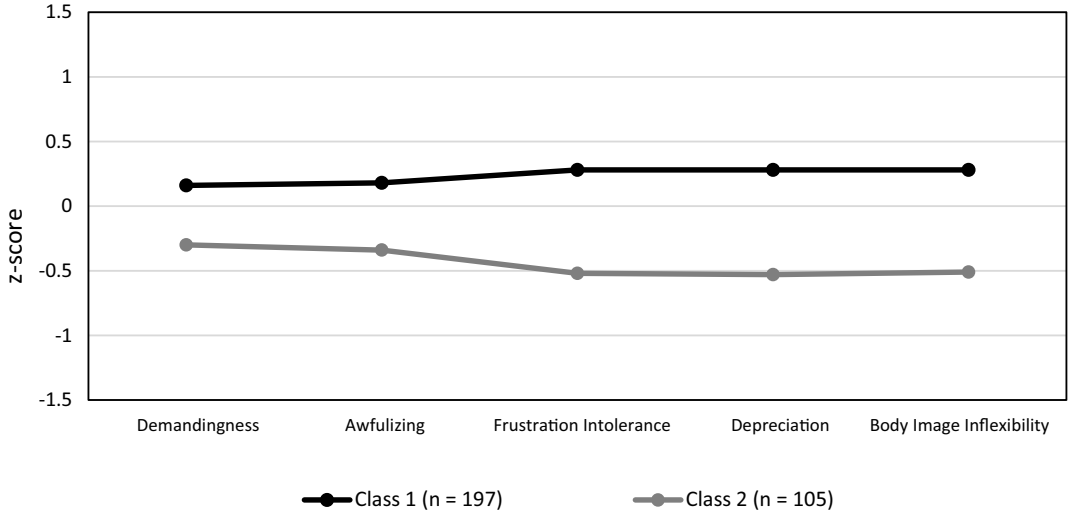

Figure 1. Estimates of the variables for the two latent profile analysis (LPA) classes.

the purposes of improving their appearance, and therefore paradoxically more likely to suffer poorer psychological health.

Practical recommendations

Given both the findings of this study, and the results of previous studies (Callaghan et al., 2015; Turner et al., 2019), practitioners working with exercisers who present with high irrational beliefs and body image inflexibility should consider both the psychological health and behavioural implications of this profile. Though, this is not to say that reporting irrational beliefs will automatically lead to negative mental health outcomes. The association between irrational beliefs and mental health can be influenced by variables such as automatic thoughts (Buschmann et al., 2018) and multidimensional motivation (Turner et al., 2022). Here then, it is advised to be mindful of the implications of such a profile (i.e., irrational beliefs and body image inflexibility), though understand that other mediating, or contributing factors may be involved in this relationship. It would be fruitful for future research to understand under what conditions mental health and exercise dependence are especially harmful, utilizing a multitude of variables to inform understanding (e.g., irrational beliefs, automatic thoughts, body image inflexibility, multidimensional motivation).

Based on the empirical convergence of irrational beliefs and body image inflexibility, practitioners could utilize REBT to help individuals reduce irrational beliefs (e.g., Outar et al., 2018). Whilst there is no existing evidence that REBT improves body image inflexibility, research has found that REBT can play a part in reducing body dysmorphia and exercise addiction symptomology (Outar et al., 2018, 2021). As such, future research should endeavour to understand whether REBT can diminish both irrational beliefs and body image inflexibility, to in turn improve mental health and healthy exercise behaviours. In sum, the findings of the current study could provide a basis from which practitioners can support the psychological health of exercisers through enabling healthier exercise behaviours. For practitioners and stakeholders of exerciser health, we encourage the use of rational lexicon in interaction with individuals, limiting rigid, illogical and extreme ideologies. This can be done on a one-to-one level with exercisers, and or by adapting the micro- and macro-environment in which the exerciser toils (e.g., King et al., 2022).

Limitations

Maintained in all questionnaire-based research, the authenticity of the data is dependent on participant honesty and ability to introspect. Given the stigma associated with health, it may be so that psychological ill-health is underreported in exercise samples (Carless & Douglas, 2008). Yet, this potential for underreporting is difficult to prove, or disprove. Also, the cross-sectional nature of the study, whilst providing some enlightening findings for future exploration, has some downsides. Cross-sectional research provides a static representation of what can be a dynamic construct. As such, it would be prudent to capture temporal data to understand the causal associations between irrational beliefs, body image inflexibility and mental health and exercise dependence. In addition, we did not include some factors that could influence mental health and exercise dependence due to wanting to limit participant burden, though there are of course other factors that could help explain variance in psychological health and exercise dependence. For example, eating disorders (Cook et al., 2015), perceptions of body image (Chang et al., 2019) and muscle dysmorphia (Hale et al., 2013) could all predict psychological health and exercise dependence alongside the variables captured in the present study. As such, future research should look to identify the latent profile structure of psychological health and exercise dependence amongst a broader range of variables. Overall though, on the basis of the current study, it seems that strategies to improve mental health and exercise dependence will be ones that diminishes both irrational beliefs and body image inflexibility.

Conclusions

This research evidences two distinct profiles that result in either maladaptive or adaptive exercise behaviour and psychological health. A profile characterized by high irrational beliefs and body image inflexibility is associated with greater exercise dependence and poorer psychological health. In contrast, a profile characterized by low irrational beliefs and body image inflexibility is associated with lower exercise dependence and better psychological health. Findings provide useful information for practitioners to consider the effects of irrational beliefs and body image inflexibility. Future research may wish to assess the utility of REBT for body image inflexibility.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

The author(s) reported there is no funding associated with the work featured in this article.

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