

A study on the relationship between compulsive exercise, depression and anxiety

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(Received: November 25, 2014; revised manuscript received: August 13, 2015; accepted: August 13, 2015)

Background and aims: Exercise and physical activity are beneficial both physically and psychologically but a few individuals use exercise excessively resulting in physical and even psychological damage. There is evidence for bi-directional relationship between exercise with depression and anxiety showing that exercise can reduce anxiety and depression, whereas a lack of exercise is associated with higher levels of anxiety and depression. *Methods:* This study used questionnaires assessing compulsive exercise, anxiety and depression among 20 professional regular exercisers and 51 recreational regular exercisers. *Results:* Results showed that ratings of compulsive exercise were associated with ratings of anxiety and depression among individuals who exercise for professional and recreational purpose. Secondly, individuals who exercise for professional purpose were more depressed than individuals who exercise for recreational purpose, but did not exhibit higher trait anxiety ratings. Thirdly, individuals who exercise for recreational purpose showed an association between ratings of compulsive exercise and depression but not with ratings of trait anxiety. *Discussion:* Individuals who exercise for professional and recreational purpose may use it as a means for alleviating depression and anxiety although this small sample of recreational and professional sportsmen showed clinical levels of anxiety and depression that may require further clinical treatment.

Keywords: exercise addiction, compulsive exercise, anxiety, depression

INTRODUCTION

Exercise and sports activity are known to be beneficial both physically and psychologically (Bouchard, Shephard & Stephens, 1994), but some individuals use exercise excessively resulting in physical and even psychological damage that could be harmful (Szabo, 1995, 1998, 2000; Yates, 1991). Exercise addiction incorporates both dependence and compulsion and it is a behavior that can provide either pleasure or relief from discomfort (stress, anxiety, etc.). Repeated failure to control the behavior (state of powerlessness) and maintenance of the behavior in spite of negative consequences is typical of exercise addiction (Goodman, 1990). Accordingly, exercise addiction, among other behavioral and mental disorders, can be defined within the obsessive–compulsive spectrum (Demetrovics & Kurimay, 2008). Individuals with exercise addiction often report an experience of powerful withdrawal symptoms (Szabo, 1995) and suffer physical and medical problems and interference with social life and occupation (see Berczik et al., 2012; Weinstein & Weinstein, 2014 for review). Griffiths (1997, 2002, 2005) suggested that exercise addiction may have features of other addictions namely salience, mood modification, tolerance, withdrawal symptoms, conflict between the individual and his or her peers and other activities and relapse referring to the tendency to return to excessive activity after periods of abstinence or control.

One of the motivations for normal or healthy exercise is increasing positive affect and alleviation of stress and negative affect (Szabo, 1995; Tomkins, 1968). Exercise is useful for alleviating anxiety and depression but the relationships

between exercise addiction and anxiety and depression need clarification. Secondly, although professional athletes enjoy better financial incentives and more time for exercise than recreational athletes do, it is unknown whether they differ in their motivation regarding the enhancement of positive affect and alleviation of stress and negative affect.

If exercise addiction is associated with high levels of anxiety and depression it may imply that their exercise may not be efficient in reducing anxiety and depression as expected. This would have clinical implications, for these individuals may need professional help in coping with anxiety and depression, since exercise may not be sufficient for this purpose.

The purpose of this study was to find out a possible association between exercise addiction anxiety and depression in individuals, who use physical exercise regularly for professional or recreational purpose. Secondly, to investigate whether there are differences in ratings of compulsive exercise, anxiety and depression between professional athletes and individuals who exercise for recreational purposes. We hypothesized that there would be a positive association between compulsive exercise and measures of depression and anxiety in individuals who exercise regularly. This hypothesis is based on the assumption that people who are addicted to exercise use it to enhance positive affect and alleviate negative affect such as depression and anxiety.

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PROCEDURE

Participants

A research assistant recruited the participants who searched for people who exercise for professional and recreational purpose on the Internet and among friends. Seventy-one participants took part in the current study and they included 51 individuals who exercise for recreational purpose and 20 individuals who exercise for professional purpose. The sample consisted of 39 males and 32 females mean age 30 (± 10.1) and age range was 16–68 years. Personal status included 45 bachelors, 19 married and 7 divorced. Types of exercise included walking ($n = 9$), running ($n = 9$), cycling ($n = 2$) fitness center ($n = 20$) and others.

Assessment methods

All participants answered the following questionnaires via the Internet (Google Docs) or by phone:

- 1) Demographic questionnaire including details such as age, sex, personal status, number of children, country of birth, place of living, education level and employment status.
- 2) Beck Depression Inventory (BDI) Beck, Steer and Brown (1996). Published results of a validation study among Psychiatric patients ($n = 1,086$, mean age = 36.35 (S.D = 12.41) years) established Cut off scores of 10.9 (SD = 8.1) for minimal depression, 18.7 (SD = 10.2) for mild depression, 25.4 (SD = 9.6) for moderate depression, 30.0 (SD = 10.4) for severe depression (Beck, Steer & Garbin 1988). Among non-psychiatric patients it has internal consistency of Cronbach's alpha = 0.81 (Beck et al., 1988). In this study, the BDI had a Cronbach internal reliability of $\alpha = 0.82$.
- 3) Spielberger State-Trait anxiety inventory STAI (Spielberger, Gorsuch, Luschene, Vagg & Jacobs, 1983) has 40 items: 20 trait anxiety and 20 state anxiety items. Scores on a Likert scale range from 1 "not at all" to 4 "agree very much". The North American manual reported means and norms for the STAI for a sample of working adults. Men had a mean STAI Trait score of 34.89 (SD = 9.19); women had a mean STAI Trait score of 34.79 (SD = 9.22) (Spielberger et al., 1983). The questionnaire had been validated with mean Cronbach internal reliability of

$\alpha = 0.88$ for Spielberger Trait anxiety. A recent study by Kvaal, Ulstein, Nordhus and Engedal (2005) has established higher norms for clinical and healthy populations. The mean STAI sum score in patients suffering from anxiety and depression was 56.3, compared with 39.2 in participants without any psychiatric diagnosis. The optimal cut-off score on the STAI mean sum score corresponding to the highest accuracy of 0.87 was 55–54. In this study the Spielberger Trait Anxiety Inventory had a Cronbach internal reliability of $\alpha = 0.66$.

- 4) Compulsive Exercise Scale CES assesses ten often cited symptoms of compulsive exercise and it was validated by Tuttle (1992) on a hundred and twenty-nine exercisers. A factor analysis of the CES indicated that the two most salient factors underlying compulsive exercise were: (1) the addictive and compulsive aspects of the behavior, and (2) the biosocial consequences of the behavior. Furthermore, these two factors were the most powerful predictors of psychopathology among compulsive exercisers. In this study, the CES had a Cronbach α internal consistency of 0.88.

Statistical analysis

Pearson r correlation was used to measure association between measures of compulsive exercise, depression (BDI), and trait anxiety (STAI). A post-hoc one-way analysis of variance (ANOVA) compared measures of compulsive exercise, depression, and Trait anxiety in all groups of participants. Statistical Package for Social Science (SPSS) IBM (2013) was used for analysis of the results.

Ethics

The study was approved by the Institutional Review Board (IRB, Helsinki committee) of the Ariel University. All participants signed an informed consent form.

RESULTS

Table 1 shows questionnaire measures in all participants (professional exercise group, recreational exercise group). The table indicates that the recreational exercise group falls

Table 1. Questionnaire measures in all participants (professional exercise group and recreational exercise group)

		Number	Mean (SD)	Group comparisons
Depression	Recreational exercise group	51	26.82 (7.15)	$F(2, 92) = 3.12; p < 0.05$
	Professional exercise group	20	30.65 (6.63)	
	Total	71	28.74 (6.89)	
Anxiety	Recreational exercise group	51	47.2 (5.7)	$F(2, 92) = 0.59, p = N.S$
	Professional exercise group	20	52 (3.7)	
	Total	71	49.6 (4.7)	
Compulsive exercise	Recreational Exercise group	51	23 (6)	$F(2, 60) = 9.74, p < 0.01$
	Professional exercise group	20	33.1 (10)	
	Total	71	28.6 (8)	

within the norms of mild depression whereas the professional exercise group falls within the norms of severe depression of the BDI (Beck et al., 1996). The average norms of Spielberger Trait Anxiety Inventory in all groups were 48 that were above the average of 35 for men and women in North America (Spielberger et al., 1983) or 39 according to the norms established in the Kvaal et al. (2005) study. These findings should be regarded with caution due to the small sample size that may not represent the population of individuals with exercise addiction.

A correlational analysis shows that among all participants there was a positive correlation between levels of depression and trait anxiety measures $r = 0.4$; $p < 0.01$. Secondly, among those who exercise regularly (both professional and recreational), compulsive exercise was positively associated with depression $r = 0.495$; $p < 0.01$. Thirdly, among those who exercise regularly (both professional and recreational), there was a positive association between compulsive exercise and trait anxiety $r = 0.288$; $p < 0.05$.

In order to test the study hypotheses associating levels of compulsive exercise and levels of anxiety and depression we have performed the Pearson correlation test on the recreational exercise group. Table 2 shows correlations between all questionnaires specifically among the recreational exercise group.

Results indicate that there was a positive correlation between levels of compulsive exercise and levels of depression $r = 0.311$; $p < 0.05$ but not with trait anxiety levels.

In order to test the study hypotheses associating levels of compulsive exercise and levels of anxiety and depression we have performed the Pearson correlation test on the professional exercise group. Table 3 shows correlations between all questionnaires, specifically among the professional exercise group.

The results indicate that among the professional exercise group measures of compulsive exercise were associated with measures of depression $r = 0.763$; $p < 0.01$ and trait anxiety $r = 0.707$; $p < 0.01$. A following post-hoc one-way analysis of variance (ANOVA) comparison of all groups revealed that the professional exercise group had

higher depression scores than the recreational exercise group [$F(2, 92) = 3.12$, $p < 0.05$]. Secondly, the professional exercise group showed higher levels of compulsive exercise than the recreational exercise group [$F(2, 60) = 9.74$, $p < 0.01$].

Thirdly, there was no significant difference between the professional and recreational exercise groups in STAI trait anxiety [$F(2, 92) = 0.59$, $p = N.S$]

DISCUSSION

The main finding in this study was that ratings of compulsive exercise were associated with ratings of anxiety and depression among individuals who exercise for professional and recreational purpose. Secondly, professional sportsmen were more depressed than recreational sportsmen were but did not show higher trait anxiety ratings. Thirdly, recreational sportsmen showed an association between compulsive exercise and depression but not with trait anxiety.

Previous studies (Babyak et al., 2000; Cooney et al., 2013; Da Silva et al., 2012; Mutrie, 1988, 2000) demonstrated that aerobic exercise could reduce depression and state anxiety in clinical populations. In our study, since there are no baseline measures of anxiety and depression before the participants have become compulsive exercisers, we cannot infer any causal role between compulsive exercise and depression or anxiety. It is unclear why those who are addicted to exercise are more depressed than non-exercising individuals, perhaps obsessive exercise might lead to depression and anxiety.

Since exercise is supposed to be beneficial in enhancing positive affect and alleviating negative affect, it is surprising that professional sportsmen showed higher ratings of depression compared with recreational exercisers in this study. Perhaps the demands imposed on professional athletes to perform and compete led to feelings of depression and helplessness, despite the potential financial and social benefits associated with professional sports.

There are several limitations to this study. First, there is a relatively small number of participants ($n = 71$) and a higher sample would probably be more sensitive to differences in measures of anxiety and depression among groups. Secondly, other variables may explain any associations found such as disordered eating, body image, obsessive-compulsive traits, reputation as an athlete or prior athletic successes, BMI, or sociocultural influences (e.g., pressure to be muscular or thin) that may contribute to compulsive exercise, depression, or anxiety. Thirdly, this is a heterogeneous group of participants in terms of the sports that they exercise, which is a limitation in interpreting the results. Differences in the type of exercise activity, intensity and motivation may have affected the results and with a small sample, it is not possible to assess such differences.

In conclusion, the high ratings of depression in this group may indicate that they need psychological help and that exercise is not sufficient in reducing their depression. Consequently, more studies are required to investigate the role of exercise as a mood enhancement and stress relief mechanism in specific categories of professional and recreational sportsmen.

Table 2. Correlations between questionnaire measures among recreational exercise individuals

	Depression	Anxiety
Anxiety	.547** <i>N</i> = 51	–
Compulsive exercise	.311* <i>N</i> = 44	.107 <i>N</i> = 44

$p < 0.05^*$, $p < 0.01^{**}$

Table 3. Correlations between questionnaire measures among professional sportsmen who perform exercise regularly

	Depression	Anxiety
Anxiety	.692** <i>N</i> = 20	–
Compulsive exercise	.763** <i>N</i> = 16	.707** <i>N</i> = 16

$p < 0.05^*$, $p < 0.01^{**}$

Funding sources: The study was done as part of an academic course in behavioral addiction at the University of Ariel, Ariel, Israel.

Authors' contribution: All individuals included as authors of the paper have contributed substantially to the scientific process leading up to the writing of the paper. The authors have contributed to the conception and design of the project, performance of the experiments, analysis and interpretation of the results and preparing the manuscript for publication.

Conflict of interest: The authors have no interests or activities that might be seen as influencing the research (e.g., financial interests in a test or procedure, funding by pharmaceutical companies for research).

REFERENCES

- Babyak, M., Blumenthal, J. A., Herman, S., Khatri, P., Doraiswamy, M., Moore, K., Craighead, W. E., Baldeewicz, T. T. & Krishnan, K. R. (2000). Exercise treatment for major depression: Maintenance of therapeutic benefit at 10 months. *Psychosomatic Medicine*, 62, 633–638.
- Beck, A. T., Steer, R. A. & Brown, G. K. (1996). *Manual for the Beck Depression Inventory-II*. San Antonio, TX: Psychological Corporation.
- Beck, A., Steer, R. & Garbin, M. G. (1996). Psychometric properties of the Beck Depression Inventory: Twenty-five years of evaluation. *Clinical Psychology Review*, 8(1), 77–100.
- Berczik, K., Szabó, A., Griffiths, M. D., Kurimay, T., Kun, B., Urbán, R. & Demetrovics, Z. (2012). Exercise addiction: Symptoms, diagnosis, epidemiology, and etiology. *Substance Use and Misuse*, 47(4), 403–417.
- Bouchard, C., Shephard, R. J. & Stephens, T. (1994). *Physical activity, fitness and health: International proceedings and consensus statement*. Champaign IL: Human kinetics.
- Cooney, G. M., Dwan, K., Greig, C. A., Lawlor, D. A., Rimer, J., Waugh, F. R., McMurdo, M. & Mead, G. E. (2013). Exercise for depression. *The Cochrane Library*, DOI: [10.1002/14651858.CD004366.pub6](https://doi.org/10.1002/14651858.CD004366.pub6)
- Da Silva, M. A., Singh-Manoux, A., Brunner, E. J., Kaffashian, S., Shipley, M. J., Kivimäki, M. & Nabi, H. (2012). Bidirectional association between physical activity and symptoms of anxiety and depression: The Whitehall II study. *European Journal of Epidemiology*, 27, 537–546.
- Demetrovics, Z. & Kurimay, T. (2008). [Exercise addiction: A literature review.] *Psychiatria Hungarica*, 23(2), 129–141. [Article in Hungarian]
- Goodman, A. (1990). Addiction: Definition and implications. *British Journal of Addiction*, 85(11), 1403–1408.
- Griffiths, M. D. (1997). Exercise addiction: A case study. *Addiction Research and Theory*, 5, 161–168.
- Griffiths, M. D. (2002). *Gambling and gaming addictions in adolescence*. Blackwells, Leicester: British Psychological Society.
- Griffiths, M. D. (2005). A “components” model of addiction within a biopsychosocial framework. *Journal of Substance Use*, 10, 191–197.
- Kvaal, K., Ulstein, I., Nordhus, I. H. & Engedal, K. (2005). The Spielberger State-Trait Anxiety Inventory (STAI): The state scale in detecting mental disorders in geriatric patients. *International Journal of Geriatric Psychiatry*, 20, 629–634.
- Mutrie, N. (1988). Exercise as a treatment for moderate depression in the UK National Health Service. In *Sport, Health, Psychology and Exercise Symposium Proceedings*, (pp. 96–105). London: The Sports Council and Health Education Authority.
- Mutrie, N. (2000). The relationship between physical activity and clinically defined depression. In S. J. H. Biddle, K. Fox & S. H. Boutcher (Eds.) *Physical activity and psychological well-being*, (pp. 46–62). London: Routledge.
- Spielberger, C. D., Gorsuch, R. L., Lushene, R., Vagg, P. R. & Jacobs, G. A. (1983). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists.
- Szabo, A. (1995). The impact of exercise deprivation on well-being of habitual exercisers. *Australian Journal of Science and Medicine in Sport*, 27, 68–75.
- Szabo, A. (1998). Studying the psychological impact of exercise deprivation: Are experimental studies hopeless? *Journal of Sport Behavior*, 21, 139–147.
- Szabo, A. (2000). Physical activity and psychological dysfunction. In: S. Biddle, K. Fox & S. Boutcher (Eds.), *Physical activity and psychological well-being*, (pp. 130–153). London: Routledge.
- Tomkins, S. (1968). A modified model of smoking behavior. In Borgatta by continued bouts of exercise in order to gain EF, in R. R. Evans, (Eds). *Smoking, health and behavior transient relief from cytokine-induced symptoms*, (IO), (pp. 165–86). Chicago: Aldine,
- Tuttle, L. W. (1992). Compulsive exercise: The symptomatology, associated psychopathology, and diagnostic validity of a compulsive exercise syndrome. PhD Dissertation, New School for Social Research, New York, USA.
- Weinstein, A. M. & Weinstein, Y. (2014). Exercise addiction—Diagnosis, bio-psychological mechanisms and treatment issues. *Current Pharmaceutical Design* 20(25), 4062–4069.
- Yates, A. (1991). *Compulsive exercise and the eating disorders: Toward an integrated theory of activity*. New York: Brunner/Mazel.