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Experimental comparison of the psychological benefits of aerobic exercise, humor, and music

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Abstract

The effects of aerobic exercise, humor, and music on the state anxiety and affect of healthy women were investigated by using a 'within participants' design. Twenty women were tested four times at weekly intervals. They were exposed to four 20-minute treatments in a counterbalanced order: 1) stationary cycling at 50% of their maximal heart rate reserve, 2) watching a humorous video, 3) listening to new-age music, and 4) sitting quietly. Participants' state anxiety and affect were measured 5-minutes before and 5-minutes after each treatment. Statistically significant decreases in state anxiety were observed in all four conditions. Negative affect also decreased in all but the sitting quietly (control) condition. The calculated effects sizes, reflecting the meaningfulness of the intervention-induced changes, were highest in response to humor session, followed by music and exercise. It is concluded, therefore, that the immediate psychological benefits of humor and music are comparable to the psychological benefits of a bout of aerobic exercise.

Key words: Aerobic exercise, Anxiety, Humor, Mood, Music

Introduction

Studies into the relationship between physical exercise and mental health have recently become extremely popular in the research area of health psychology. Examination of the PsycINFO and SPORTS Discus databases, by using the proper combination of keywords, reveals that there are over 1000 articles published in the last decade in this field. Analytical synthesis of these reports concludes that aerobic exercise reduces state anxiety while it also triggers positive changes in affect (Berger & Motl, 2000: 76; Biddle, 1995: 295; Biddle & Mutrie, 2001: 201; Ekkekakis & Petruzzello, 1999: 344-347; O'Connor *et al*., 2000: 148; Scully *et al*., 1998: 111).

The implication of the research consensus is that many general practitioners and mental health professionals recommend exercise for improving psychological health (Biddle & Mutrie, 2001: 201, 237). However, not everybody could enjoy the psychological benefits of exercise. Only those individuals who are *able* and *willing* to engage in exercise may experience mental benefits. An important question, then, is whether other relatively passive, or physically less challenging, activities could yield affective benefits comparable to exercise?

Only limited research has examined this question by comparing the mental benefits of aerobic exercise to that of other interventions. To date the latter served as control rather than rival treatments to exercise. Nevertheless, most of these inquiries have shown that a physically undemanding episode of listening to music (Szabo *et al*., 1998: 385), meditation (Jin, 1992: 366), attending a lecture (Parente, 2000: 348), having lunch (Wilson *et al*., 1981: 473), watching a geographical documentary film (Snowball & Szabo, 1999: 68; Szabo *et al*., 1993: 291), resting quietly (Focht & Hausenblas, 2001: 108), or watching a humorous stand-up comedy (Snowball & Szabo, 1999: 68) are as effective as a bout of exercise in improving pre- to post-treatment reports of affect and state anxiety.

There is theoretical justification for the presumption that passive treatments could yield similar affective benefits to that of aerobic exercise. For example, the classical *distraction hypothesis* (Morgan, 1985: 96) advocates that a brief attentional distraction from ongoing challenge or stress results in psychological relief or a break that is manifested though improvement in affect. Another recent reasoning suggests that psychological benefits could emerge in response to most personally satisfying experiences (Parente, 2000: 348; Sandlund & Norlander, 2000: 139). Consequently, preliminary research evidence, theoretical reasoning, and applied practices' interests all justify the need for the direct comparative evaluation of the affective benefits of aerobic exercise and that of other, physically less demanding, interventions.

Based on several research findings, it may be conjectured that humor and music could be effective rival treatments for aerobic exercise. Indeed, White and Winzelberg (1992: 352) showed that watching a humorous video could reduce stress. Snowball and Szabo (1999: 68) revealed that affect was improved as much by humor as by three different forms of aerobic exercises performed at participants' 70% of maximal heart rate reserve. In another report, humor was shown to yield less negative interpretation of stress situations and greater positive affect (Martin *et al.*, 1993: 100). Further research evidence also suggests that a bout of humor decreases negative affect (Newman & Stone, 1996: 106). Therefore, the affective impacts of humor and exercise are well established in the literature, but it is unknown how they compare to each other.

With respect to music, only one inquiry compared the affective beneficence of music to that of exercise (Szabo *et al.*, 1998: 379). The authors included the music appreciation group for control purposes while examining the affective effects of four modes of exercise. Szabo *et al.* (1998: 385) reported that the psychological benefits of music appreciation were comparable to those of exercise. A number of reports in the literature also strengthen this finding by showing that music has relaxing

effects (Boldt, 1996: 186; Hanser, 1990: 283; Robb, 2000: 17; Strauser, 1997: 102; Thaut & Davis, 1993: 210). Thus, it could be assumed that music has a favorable impact on people's psychological well-being that is possibly similar to that of exercise.

The aim of this experimental research was to compare the effects of a bout of moderate intensity exercise, humor and music on state anxiety and affect in healthy women. It was hypothesized that the immediate psychological benefits of the three interventions will be alike, but superior to a control condition.

Methods

Participants

Twenty female volunteers consented to participation by signing an informed consent form. The choice of female participants was based on the facts that the two experimenters in contact with the participants were women and that Snowball & Szabo (1999: 67), using a similar test-protocol, have only tested men. Participants' mean age was 21 years (*SD* = 1.2), mean height was 168.4 cm (*SD* = 5.7), and mean body weight was 59.3 kg (*SD* = 7.5). All volunteers were students at the Nottingham Trent University and they all reported involvement in different forms of physical activities at least once a week.

Materials

The Spielberger State Anxiety Inventory (SSAI) (Spielberger *et al*., 1970) was used for measuring participants' anxiety before and after each experimental condition. This questionnaire is a widely used and well-validated instrument. Its internal consistency ranges between (Cronbach alpha) .83 to .92. However, the appropriateness of using this tool in exercise-related studies has

been recently questioned (Ekkekakis *et al*., 1999: 224), due to possible confound between state anxiety itself and physical effort-related tension and/or activation during exercise. To partially account for this appealing surmise, in this inquiry a moderate level of exercise intensity was adopted that has been associated with reduced state anxiety (Raglin, 1997: 116).

An abbreviated version of the Profile of Mood States (POMS) inventory (Grove & Prapavessis, 1992) was used for the assessment of mood. This version of the POMS is a 40-item extensively used and well-validated instrument. It has seven subscales: anger, confusion, depression, esteem, fatigue, tension and vigor. The respondents are required to indicate how they feel on a 5-point rating scale, ranging from 0 (not at all) to 4 (very strongly). Five of the subscales measure negative affect and two measure positive affect. The POMS yields a total mood disturbance score (TMD), which is obtained by subtracting the sum of the ratings on the positive subscales from the sum of ratings on the negative subscales (Grove & Prapavessis, 1992: 100). The TMD was considered as an overall measure of affect in this study. Reliability coefficients reported for this version of the POMS range between .66 and .95 (Cronbach alpha).

The exercising equipment was a Monark (Model: 824E ERGOMEDIC) ergometer. Participants' heart rate during exercise was monitored with a Polar (Model: PolarBeat GBR 161302 B) heart rate monitor. A commercially videotaped episode of the "Friends" (Series 5, Episode 14; Warner Brothers Television, 1999) series was the humor selected for this study on the basis of a previous pilot study in which a similar sample of 10 female students (assumed to be from the same population as the study-participants) were surveyed about: 1) familiarity and appeal, 2) perceived humor content, and 3) preference vis-à-vis other alternatives. The video was presented with a Philips (Model: 'VideoPlus') 14" combined TV/VCR unit placed at 1.5 m distance from the participant. The selection of the music was also based on a pilot study

investigating the relaxing characteristics, for the target sample, of several music selections. The emerging choice was a new-age music album (without lyrics) played by the Japanese artist Kitaro. The title of the album was 'Thinking of you', and it was released in 1999 by Domo Records Inc. (Record # 91014). Evidence from the literature suggests that new-age music reduces tension and state anxiety (Strauser, 1997: 101), thus rendering it suitable for the scope of this research. The music was presented via a Matsui (Model STR 625) stereo unit.

Procedure

Each participant was tested four times in a *counterbalanced* order. The four test-sessions were scheduled at weekly intervals at the same time of the day. Testing occurred between 9.00 h and 16.00 h. In all test-sessions, participants completed the SSAI and the POMS five minutes before and five minutes after the corresponding interventions which consisted of: 1) cycling at 50% maximal heart rate reserve (MHRR), 2) watching the humorous video, 3) listening to music, and 4) sitting quietly. The order of testing varied among the participants, in accord with the counterbalancing method to prevent possible bias of the results by order effects.

All interventions and the control session lasted for 20 minutes and, apart from cycling, participants were seated in a comfortable armchair. In the cycling session the participant was given a warm-up and a cool-down period of 2-minute duration that was contained within the total of 20 min of cycling period. She was instructed to maintain her heart rate within the 10% range of her 50% MHRR for the rest of the cycling session. To this effect, she received feedback from her heart rate monitor that was also observed by the experimenter. The contact between the experimenter and participant was limited to the greeting period at the beginning and to the debriefing period at the end of each test-session. During the actual test-phase the participant was

alone in the laboratory while the experimenter observed her continuously through a one-way mirror from an adjacent observation room.

Results

The Statistical Package for Social Sciences (SPSS) software (version 11.0) was used in the data analyses. In accord with the experimental design, the principal analysis consisted of a condition (four separate treatments) by test period (pre- and post-treatment) multivariate repeated measures analysis of variance. The dependent (multivariate) measures were state anxiety and total mood disturbance (TMD). This analysis yielded a significant multivariate main effect for test period (Wilk's Lamda = .498, F (2, 18) = 9.07, p< .002) as well as a statistically significant condition by period interaction (Wilk's Lamda = .762, F (6, 112) = 2.71, p< .02).

To follow up on the multivariate results, the univariate repeated measures analyses of variances, based on the Greenhouse-Geisser method of correction for degrees of freedom, were examined. These tests revealed that the condition by period interaction was significant for TMD (F (3, 57) = 2.91, p < .05), but not for state anxiety, for which only a statistically significant period main effect (F (1, 19) = 17.94, p < .001) could be observed. The means of the dependent measures and their standard deviations are summarized in Table 1.

Apart from the traditional visual examination of the interaction (Fig. 1), one-tailed paired t-tests were calculated to see whether pre- to post-intervention changes in TMD were statistically significant in all but the sitting condition. These tests have confirmed that TMD decreased significantly after humor (t(19) = 4.06, p < .001), after music (t(19) = 4.01, p < .001), and after exercise (t(19) = 2.00, p < .05), but not after sitting quietly (t(19) = -0.1, p > .05). Finally, effect sizes (d) were calculated to examine the meaningfulness or importance of the observed effects (Table 1).

Insert Table 1 and Fig. 1 about here

Discussion

The results of this experimental study demonstrate that watching an episode of entertaining humorous video or listening to new age music is at least as effective as a bout of moderate intensity stationary cycling in improving affect by decreasing TMD which is an aggregate measure of negative affect. In fact examination of Table 1 shows that the highest effect sizes were obtained in the humor session, followed by the music and the exercise session. In behavioral research an effect size of 0.2 or less reflects small, an effect size around 0.5 reflects moderate, and an effect size of 0.8 or above reflects large differences (Thomas & Nelson, 1996, 109). Therefore, all three treatments, but not the control sitting session, yielded moderate effect sizes of which the one obtained with humor was the largest. These results agree with and strengthen previous research reports claiming that humor (Houston *et al*., 1998: 330; Mannell & McMahon, 1982: 152; Martin *et al*., 1993: 99; Moran, 1995: 37; Newman & Stone, 1996: 101, 106-107; White & Winzelberg, 1992: 353) and music (Boldt, 1996: 186; Hanser, 1990: 283; Robb, 2000: 14-17; Strauser, 1997: 102; Thaut & Davis, 1993: 210) yield psychological benefits. These results complement previous research by showing that two physically relatively passive behaviors could trigger identical psychological benefits to a bout of aerobic exercise.

Examination of the results obtained on state anxiety shows that the effects of the three experimental interventions were not superior to the control condition. These findings agree with

previous reports showing no differences between the psychological impact of exercise and quiet rest (Brown et al., 1993: 305; Focht & Hausenblas, 2001: 108; Koltyn & Schultes, 1997: 290). Therefore, in contrast to TMD, results obtained for state anxiety do not support the *distraction hypothesis* (Morgan, 1985: 96). The main reason for this interpretation is that in the control condition the participants could have been preoccupied with stressful thoughts. Therefore, the participants were not distracted in the control condition, yet they still demonstrated decrements in state anxiety. In line with recent propositions (Parente, 2000: 348; Sandlund & Norlander, 2000: 139) these results could have emerged because the quiet rest was perceived as a pleasant experience sufficient enough to yield lower state anxiety without concomitant effects on mood. An alternative explanation is that some anxiety is present at the commencement of participation in a laboratory research that dissipates, regardless of the treatment, upon completion of participation. Again, similar impact on TMD or the general negative mood is absent. In appreciating this explanation, it should be admitted that state anxiety and negative affect are different psychological constructs.

Another plausible explanation may be related to the level of enjoyment of the various treatments. Indeed, mood improvements could be expected to occur when one engages in pleasant activities. Accordingly, exercise, humor, and music could have been enjoyed more than simply sitting quietly. It has been shown that the enjoyment of a given activity mediates changes in TMD more than the type of activity (Motl *et al*., 2000: 357). In future studies of similar nature the comparison of the enjoyment of the rival interventions needs to be determined.

There are some limitations in the current research that need to be highlighted. First, in this research a healthy student population was tested who was accustomed to exercise. Hence, expectations associated with exercising may have biased the results in favor of exercise that would

lessen the observed effects of humor. In favor of the humor intervention, if this exercising population was biased indeed, then the effects of humor could be expected to be stronger in a non-exercising population. Second, humor involves several dimensions such as sense of humor, appreciation of humor and laughter, as well as generation of humor (Moran & Massam, 1999: 36). None of these aspects were addressed in this study. Consequently, again in favor of humor, it may be conjectured that the psychological impact of humor could be stronger when the possible mediating factors are controlled. Thus, some limitations of the current study may have diminished the here observed psychological effects of humor even though these effects emerged to be the most prominent.

Future research needs to examine the *duration* of these effects. Van Landuyt *et al*., (2000) are right in stating *"...previous research has examined the effects of several seconds or several minutes of exercise (treatment) recovery rather than the effects of exercise per se*." (p.213; text between brackets added). Thus, to identify the value of such results in health settings, it is essential to determine how long the effects of the three different treatments last. Garvin *et al*., (1997: 475) have found that the anxiolytic effects of exercise were longer than that of quiet rest. A similar time-effectiveness, in relation to exercise, needs to be determined for humor and music as well before the strength of these findings is appraised overoptimistically.

In conclusion, these results suggest that the acute mental benefits of exercise can be reproduced with other physically less challenging, and "virtually effortless" interventions such as humor and music. The latter both reduce state anxiety whilst improve affective states. A practical implication of the findings is that inexpensive and enjoyable activities, resulting in affective benefits similar to that of exercise, can be prescribed with more confidence for those individuals *who are unable or wish not to engage in physical activity.* An important note of caution, however, should be

added. Given the well-documented physical benefits of exercise on health, when exercise is possible it should be the preferred intervention even though other passive treatments could elicit comparable mental states. Humor and music may be used in addition to, or in combination with, exercise to maximize the gain for one's health.

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Table 1. Means and standard deviations (*SD* - in brackets) of the two dependent measures (which changed statistically significantly from pre- to post-treatment) in four experimental conditions. The effect sizes (*d*) of the differences between pre- and post-treatment are shown in bold (n/s = not significant).

		Exercise	Humor	Music	Sitting
State	Pre-	40.9	35.8	41.7	38.2
	Post-	37.9	33.0	36.4	36.3
Anxiety	Pre-	**- 0.33**	**- 0.63**	**- 0.56**	**- 0.20**
TMD	Pre-	- 3.3	- 10.5	- 1.6	- 7.5
	Post-	- 9.4	- 16.4	- 8.5	- 7.3
	Pre-	**- 0.39**	**- 0.53**	**- 0.47**	**+ 0.01**

Fig. 1. Pre- to post-treatment effects illustrating the patterns of change in four conditions: cycling exercise (♦), humorous video (■), new-age music (▲), and sitting quietly (●), in negative affect reflected by the total mood disturbance (TMD) scores.