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The Effects of Music Preference and Exercise Intensity on Psychological Variables

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The purpose of this study was to examine the effects of music preference and exercise intensity on exercise enjoyment, perceived exertion (RPE), and attentional focus. Participants were assigned to 1 of 3 music preference conditions (most preferred, least preferred, or no music) and walked/ran on a treadmill at 1 of 3 exercise intensities (low, moderate, or high) for 20 minutes. Measures of exercise enjoyment, RPE, and attentional focus (association, dissociation, distress) were taken. A 3 × 3 ANOVA on enjoyment revealed that when participants paid attention to the music, music accounted for roughly 5% of the variance in exercise enjoyment ($p = .04$). Results of a 3 (music) × 3 (intensity) repeated measures ANOVA on RPE showed a main effect of intensity ($p < .001$) but no main effect for music and no interaction effect. A 3 × 3 ANOVA on attentional focus revealed that those in the high intensity condition reported the greatest association ($p < .001$) and distress ($p < .001$). Although not significant, on average, participants in the most preferred music condition reported the highest levels of dissociation.

The purpose of the present study is to examine the effects of varying music preference and exercise intensities on exercise enjoyment and ratings of perceived exertion (RPE). Further sought will be support for the possible explanations of how attentional focus is affected by music preference and exercise intensity. The music/exercise enjoyment literature appears to be lacking a contrast of music preferences. While there is no known research examining exercise intensity and enjoyment empirical

studies investigating the effects of exercise intensity on mood tend to focus solely on one exercise intensity.

Music

Music has the potential to make exercise enjoyable (Boutcher & Trenske, 1990; Kendzierski & DeCarlo, 1991; Wininger & Pargman, 2003). In a study conducted by Kendzierski and DeCarlo (1991) participants were asked to ride an exercise bicycle at a steady, comfortable pace that they could easily keep for 30 minutes. In actuality, participants were stopped after 20 minutes. After each session, participants filled out the Physical Activity Enjoyment Scale (PACES). Each participant rode under two counterbalanced conditions: a control condition where participants rode in a laboratory devoid of decoration and an external focus condition where the participants rode in the same room but listened to a cassette tape brought in of his or her favorite music. The results of the study indicated that participants reported enjoying the exercise more in the external focus condition (listening to music) than the control condition ($\eta^2 = 0.45$). A crucial limitation of this study was the indistinguishable level of exercise intensity. Participants were told to ride at a pace they could comfortably keep for 30 minutes. However, a low intensity may be a comfortable pace for some participants whereas a moderate or higher intensity may be a comfortable pace for other more physically fit participants. Further, the study only compared a preferred music condition with a no music condition.

Boutcher and Trenske (1990) looked at the effects of a sensory deprivation condition versus a music condition on perceived exertion and affect during exercise. Participants completed 3 experimental sessions: sensory deprivation (participants wore opaque goggles and cotton ball earplugs), music (listened to their favorite music), and control (no music and no sensory deprivation). In each experimental condition participants exercised on a cycle ergometer for a total of 18 minutes. The exercise sessions consisted of 3 successive 6-minute trials at workloads of 60% (light), 75% (moderate), and 85% (heavy) of their maximal heart rate. Affect was measured using a 10-point bipolar scaled developed by Rejeski (1985) in which higher scores indicated positive feelings and lower scores indicated negative feelings. Affect was assessed every 1, 2.5, 4, and 5.5 minutes of each session.

At the moderate workload, results revealed that affect responses of the music condition were significantly higher than the sensory deprivation condition and control condition ($\eta^2 = 0.26$). At the heavy workload, affect responses of the music condition were only significantly higher than the sensory deprivation condition ($\eta^2 = 0.33$).

There were three main limitations to this study. First, the researchers used 60%, 75%, and 85% of the maximal heart rate as light, moderate, and heavy workloads, respectively. All workloads are higher than they should be. According to the American College of Sports Medicine, 60% is classified as "moderate", and both 75% and 85% are classified as "hard" (ACSM, 2006). Also, the duration of the three consecutive workloads is only 6 minutes. This duration may not be long enough to accurately assess the effects on mood. Lastly, the study only compared a preferred music condition with a no music condition.

Wininger and Pargman (2003) examined the role of satisfaction with the music used in the exercise environment and exercise instructor, as well as, salience of exercise role-identity in aerobics dance classes. Results indicated that while all three variables significantly predicted exercise enjoyment, participants' satisfaction with the music in aerobics classes was the strongest predictor explaining 21% of the variance. While the foundation for the support of the positive influence of music on exercise enjoyment is solid, there appears to be a lack of research regarding the effects of varied music preference (preferred and nonpreferred) on exercise enjoyment.

Similar to the way in which music can facilitate an increase in exercise enjoyment, it can also facilitate a decrease in perceived exertion (RPE). A link between listening to music during exercise and rate of perceived exertion (RPE) decrease has been noted in several studies. Results of the previously discussed study conducted by Boutcher and Trenske (1990) also indicated that during a light workload (60% of maximal heart rate) RPE was reported as significantly lower in the music condition compared to both the sensory deprivation and control condition. In a study conducted by Potteiger, Schroeder and Goff (2000) participants completed four counterbalanced conditions: Jazz, or fast music (140–145 bpm), classical (60–65 bpm), self-selected (unknown bmp), and no music. In each of the 4 sessions participants rode a bike

for 20 minutes at 70% of their VO_2 peak. RPE was assessed every 5 minutes using Borg's 15-point scale. Results of this study indicated that while in the no music condition, participants reported significantly higher RPEs at all assessment points compared to all other conditions. This suggests that listening to any type of music during exercise reduces feelings of discomfort. The major methodological flaw of this study was in the music conditions. Participants listened to fast, slow, and self-selected music. It is unknown whether or not the self-selected music matched the tempo or genre of either the slow or fast music conditions. Further, there was no comparison of preferred and nonpreferred music.

Music played during exercise acts as a distracter against the physical demands of the activity. In other words, music helps the exerciser dissociate (or use a cognitive strategy). There are two types of cognitive strategies (also referred to as types of attentional focus): association and dissociation (Morgan & Pollock, 1977). Associative and dissociative cognitive strategies are viewed as internal and external attentional focus. Association involves monitoring bodily sensations, such as heart rate or breathing, and "certain aspects of the exercise activity itself, such as the running pace and distance remaining" (Goode & Roth, 1993, p. 375). On the other hand, dissociation involves anything that distracts attention away from the physical sensations of the activity (Morgan & Pollock, 1977). Rejeski's (1985) parallel processing conceptualization suggests that given the limit on the amount of information that can be processed at one time, external and internal sources of information must compete for the individual's attention since both can not be processed simultaneously. When internal (e.g., monitoring heart rate) and external stimuli (e.g., scenery or music) are both present, the external stimuli must be cognitively salient for dissociation to occur (Pennebaker & Lightner, 1980). Therefore, if music is cognitively appealing it will be processed primarily over the physical sensations of the exercise.

At low to moderate exercise intensities, appealing music may be salient enough to act as a distracter by diverting the exerciser's attention away from the physical discomfort of the activity. Since attention is distracted away from the physical sensations of the exercise, the exerciser perceives the activity to be more enjoyable.

However, at higher intensities the physical discomfort may overpower the influence of music; appealing or not.

Intensity

Although there is a lack of literature on exercise intensity and enjoyment, there is a great deal of literature on the effects of exercise intensity on mood, affect, and other psychological variables. While the terms *mood* and *affect* are not synonymous with the term *enjoyment*, it has been shown that exercise enjoyment may act as a mediator in the exercise/psychological state relationship (Miller, Bartholomew, & Springer, 2005; Motl, Berger, & Leuschen, 2000). Therefore, it is beneficial to examine the literature on exercise and mood and other psychological variables. The effect of exercise intensity on psychological variables fluctuates concomitantly with different intensities (Daley & Huffen, 2003; Dunn & McAuley, 2000). Moderate exercise intensity has been recommended to obtain optimal psychological benefits (Berger & Motl, 2001). Further, while a moderate intensity (60% VO_2 peak) exercise has consistently resulted in improved mood (Dunn & McAuley, 2000), the affective responses to low and high exercise intensities are not as definitive. Exercise at a low intensity may have no impact on positive well-being (Daley & Huffen, 2003), or may result in slight improvements in mood (Berger & Owen, 1998). High exercise intensity, on the other hand, has produced both desirable (Dunn & McAuley, 2000) and undesirable (Goode, 1996) affect responses. In addition, according to Dishman and Buckworth (1997), high intensity activities are more painful and physically demanding, and therefore, make the activity seem less enjoyable.

The linear relationship between exercise intensity and RPE is well documented (Chen, Fan, & Moe, 2002). The relationship has been validated by evidence of physiological changes (i.e., heart rate, blood lactate) that accompany changes in exercise intensity and RPE (Chen et al., 2002).

The strength of the parallel processing activation during exercise is dictated by physical load (exercise intensity). It is much more difficult for the external stimuli to maintain the individual's attention when efforts are high and, therefore, internal stimuli are extremely demanding. Attention narrowing (e.g., association) with resulting increased RPE is unavoidable

under high-level workload (Tenenbaum, 2001). When exercising at light or moderate intensity, attention focus can shift easily from one attention mode to the other, because the afferent bodily sensory signals are non-demanding. Once physical effort is extensive, the body is required to cope with the afferent sensory signals in the form of pain, discomfort, and exertion, shifting attention to an associative mode.

The purpose of this study was to examine the effects of music preference and exercise intensity on exercise enjoyment, RPE, and attentional focus. To meet these aims, the study's participants were asked to walk/run on a treadmill for 20 minutes (consistent with Kendzierski & DeCarlo, 1991, and Potteiger et al., 2000) under one of nine conditions: three possible music conditions (most preferred music, least preferred music, or no music) and three possible exercise intensity conditions (low, moderate, or high). Research has examined the effects of preferred music and no music on exercise enjoyment, however, to the authors' knowledge, there has been no examination of the effects of less preferred music. Further, findings on the influence of varying exercise intensities on mood suggest there may be a similar pattern for exercise enjoyment. In the current study, measures of exercise enjoyment were obtained immediately following the exercise bout. RPE was reported at the 10 and 20 minute mark of the exercise bout. Attentional focus was assessed and immediately following the exercise bout. Based on the previously discussed research, it was expected that exercisers in the moderate intensity workload condition listening to their most preferred music would experience the highest levels of enjoyment, and that participants in the low intensity and most preferred music conditions would report the lowest RPE scores. It was also expected that exercisers in the most preferred music condition would experience higher levels of dissociation and those in the high intensity exercise condition will experience higher levels of association and distress.

Method

Participants

Two hundred participants (126 female, 74 male), average age 20.69 (SD = 4.41), took part in the study. Participants were placed into one of nine experimental conditions: low intensity/no

music (n = 23), moderate intensity/no music (n = 23), high intensity/no music (n = 22), low intensity/least preferred music (n = 23), moderate intensity/least preferred music (n = 22), high intensity/least preferred music (n = 22), low intensity/most preferred music (n = 22), moderate intensity/most preferred music (n = 21), high intensity/most preferred music (n= 22). Participants were recruited from psychology classes. Extra credit was offered for participation.

Measures

Five questionnaires were administered: Music preference questionnaire, music satisfaction questionnaire, attentional focusing questionnaire, Borg rating of perceived exertion scale, and exercise enjoyment questionnaire. Two screening protocols were administered: Physical Activity Readiness Questionnaire and ACSM Risk Stratification questionnaire.

Music preference questionnaire. A brief questionnaire developed by the authors was used to assess the participant's musical preferences for running on a treadmill. The questionnaire listed 6 types of music: classic rock, country, rap, hip hop, alternative, and oldies. Participants were required to rate on a scale of 1 (*not at all*) to 7 (*very much*) how much they would prefer to listen to each type of music while running on a treadmill. They were also asked to select which one of the 6 types of music were their most preferred and least preferred types of music to listen to while running on a treadmill. Most preferred and least preferred music types used during the exercise session were selected using the selection portion of the questionnaire.

Music satisfaction questionnaire. Following the exercise a questionnaire concerning music satisfaction served as a manipulation check for the music preference questionnaire. For example, the measure was used to ensure that those in the most preferred music condition were, in fact, satisfied with the music listened to during the experimental session. The questionnaire consisted of 3 items on which the participants indicated the degree to which they were satisfied with the type (i.e., country, oldies, etc.), tempo, and volume of the music. They rated each item on a scale from 1 (*not at all*) to 5 (*completely satisfied*). These items were used individually to determine participant satisfaction with each aspect of the music.

Attentional focusing questionnaire (AFQ; Brewer, Van Raatle, & Linder, 1996). The AFQ is a 31-item Likert-type scale, ranging from 1 (*did not do at all*) to 7 (*did a lot*), used to assess an individual's focus of attention. The AFQ was completed following the exercise bout and participants were asked to indicate how often they engaged in the behavior listed *while on the treadmill.* There are 3 subscales of the AFQ: association (11 items), dissociation (13 items) and distress (7 items). Coefficient alpha values observed for subscale measurement were: Association 0.90, Dissociation 0.70, and Distress 0.86.

Rating of perceived exertion scale (RPE; Borg, 1982*).* The RPE is a one-item scale ranging from 6 (*no exertion at all*) to 20 (*maximal exertion*) on which participant are asked to rate their perceived exertion. It allows participants to provide a subjective indication of exertion at any point during the activity. It has been reported to have sufficient reliability and validity (Russell & Weeks, 1994) and to be highly correlated (0.80–0.90) with heart rate and a number of other physiological measures of exertion (Borg, 1982).

Interest/Enjoyment Scale. The interest/enjoyment scale of the Intrinsic Motivation Inventory (IMI) (McAuley, Duncan, & Tammen, 1989; McAuley, Wraith, & Duncan, 1991) was used to measure enjoyment. The full IMI measures four individual dimensions of intrinsic motivation: interest/enjoyment, competence, effort/importance, and pressure/tension. McAuley et al. (1991) note that the IMI is unique in that it has rarely been used in its full form and the exclusion/inclusion of any one factor does not adversely affect the remaining factors. The original IMI was developed by Ryan (1982) as a multidimensional measurement device intended to assess participants' subjective experience related to a target activity in laboratory experiments. According to the Self Determination Theory website (http://psych.rochester.edu/SDT/measures/intrins.html) the interest/enjoyment subscale is considered "the" self-report measure of intrinsic motivation. Responses are scored on a 7-point Likert scale ranging from (1) strongly disagree to (7) strongly agree. The IMI has been shown to have strong construct validity via confirmatory factor analyses (McAuley et al., 1991). The interest/enjoyment scale as compared to the other scales of the IMI has exhibited the highest levels of internal consistency, coefficient alpha of 0.92 per McCauley et al. (1991). Internal consistency of the interest/enjoyment scale for the current study was 0.90.

Physical Activity Readiness Questionnaire (PAR-Q; Thomas, Reading, & Shephard, 1992). The PAR-Q is a seven-item checklist of symptoms presented in a YES/NO format. It assesses an individual's general medical condition by screening for a history of physical problems. Items reflect issues such as heart conditions, bone and joint problems, and prescription drugs. Participants were not permitted to participate in the study if they answered "yes" to any of the questions.

American College of Sports Medicine (ACSM) Risk Stratification Questionnaire (Balady et al., 2000). The risk stratification questionnaire is used to screen for history of physical problems. It consists of a checklist of risk factors (i.e., smoking, high blood pressure, diabetes, etc.) and risk symptoms (i.e., irregular heart rate, shortness of breath at rest or mild exertion, swelling at the ankles, etc.). Results from the checklist are used to stratify participants into one of three risk categories: low, moderate, and high. Participants were permitted to continue with the experiment only if they were stratified as low risk ("Males: younger than 45, females: younger than 55 who have no signs/symptoms and no more than 1 risk factor").

Procedures

Prior to data collection, all procedures were approved via full board review by the University Human Subjects Committee. Due to the potential rigorous nature of the experimental exercise session, the two screening protocols (PAR-Q and ACSM risk stratification) were implemented to assure the acquisition of low risk participants. A copy of the PAR-Q was posted by the sign up sheet. Students were informed that if they answer "yes" to any of the seven questions on the PAR-Q that they should not participate in this study. In addition, the following age restrictions were stated: "males between the ages of 18 and 44, and females between the ages of 18 and 54 are eligible to participate in this study" and "If you are or may be pregnant do not participate." A copy of the ACSM risk stratification questionnaire was also posted by the sign up sheets for perspective participants to review. All participants answered the ACSM risk stratification questions prior to participating in the actual study.

On the day of scheduled testing session each participant entered the "motivation laboratory" upon which he or she was stratified for

risk by the ACSM guidelines and completed the PAR-Q. Only participants classified as low risk (ACSM) and that did not answer "yes" to any of the questions on the PAR-Q were allowed to proceed. Next, participants were asked to read and sign the informed consent form. After the informed consent had been signed the subject began filling out the pre-exercise questionnaires, that is, demographics, trait AFQ, and the music preference questionnaire.

Following completion of the pre-exercise questionnaires, the participant's heart rate was measured. Next, each participant was weighed and measured for height; this information was used to calculate BMI, which in turn was used to estimate VO_2 max (ACSM, 2006). The speed of the treadmill was determined by the calculation of VO_2 max and the assigned intensity condition: low (30% VO_2 max), moderate (50% VO_2 max), and high (70% VO_2 max). Then the participant was placed on the treadmill and asked to select the volume of music at which they would like to exercise. A neutral song (a song which was not one of the experimental songs) of music was played for the participant and they were asked to indicate their desired volume. A neutral type of music was used in order to control for those in the least preferred music condition requesting the volume to be turned off. The experimental music came from 6 compact discs consisting of over 20 minutes of the specified type of music (roughly 4 to 5 songs) each with a tempo of roughly 130 bpm built into the songs to assure all songs had a similar tempo. The six types of music were as follows: country, hip hop, rap, classic rock, alternative, and oldies.

Participants were assigned to 1 of 9 conditions: three music preference conditions (most preferred, least preferred, or no music) and three exercise intensity conditions (low, moderate, or high). Participants assigned to the most preferred music condition were given the type of music they selected as their most preferred on the music preference questionnaire and participants assigned to the least preferred condition were given the type of music they selected as their least preferred on the music preference questionnaire. For example, if a participant assigned to the most preferred music condition selected country as his or her most preferred music type then that participant would listen to country music during the exercise portion of the session.

Next, each participant engaged in a 2-minute warm-up and was given instructions on how to estimate rate of perceived exertion

TABLE 1
Means and Standard Deviations for Enjoyment by Exercise Intensity and Preference Selection

Intensity		No music	Least preferred music	Most preferred music	Total
Low	*Means (SD)*	16.22 (6.56)	15.43 (7.23)	16.00 (6.46)	15.88 (6.67)
Moderate	*Means (SD)*	16.00 (5.99)	16.67 (5.51)	18.86 (5.96)	17.16 (5.86)
High	*Means (SD)*	16.00 (4.33)	15.10 (4.88)	17.55 (4.49)	16.21 (4.61)
Total	*Means (SD)*	16.07 (5.63)	15.71 (5.92)	17.45 (5.73)	16.40 (5.78)

(RPE). After the warm-up the speed of the treadmill was set for 20 minutes to the calculated speed that coincided with the assigned intensity condition. Participants were asked to report RPE at the 10 and 20-minute interval. After completion of a given exercise condition each participant's heart rate was measured again and the participant was asked to complete the measure of enjoyment, the state AFQ, and the music satisfaction questionnaire. The entire session lasted approximately 45–60 minutes.

Results

Manipulation Check

Music satisfaction. A one-way ANOVA was conducted on the music satisfaction score to ensure that those in the most preferred music group were, in fact, satisfied with their music choice. ANOVA resulted in significant music selection effect, $F(1, 130) = 67.56$, $p < .001$, $\eta^2 = 0.34$. Participants' in the most preferred music condition ($M = 4.40$) reported higher levels of satisfaction with music choice than those in the least preferred music condition ($M = 2.46$).

Enjoyment

A 3 (music condition) by 3 (exercise intensity) ANOVA was conducted on enjoyment levels. Descriptive statistics (i.e., means and standard deviations) for enjoyment by music and intensity are reported in Table 1. Neither main effect, nor interaction effect were obtained.

RPE

A 3 (music condition) by 3 (exercise intensity) repeated measures ANOVA was conducted for RPE. There was a significant

TABLE 2
Means and Standard Deviations for RPE (20 min) by Exercise Intensity and Music Preference

Intensity		No music	Least preferred music	Most preferred music	Total
Low	*Means (SD)*	8.27 (2.10)	7.39 (1.92)	7.64 (1.84)	7.76 (1.96)
Moderate	*Means (SD)*	10.71 (2.70)	10.82 (2.65)	10.48 (2.42)	10.67 (2.56)
High	*Means (SD)*	13.61 (1.61)	13.91 (2.67)	14.40 (2.28)	13.98 (2.25)
Total	*Means (SD)*	10.69 (3.07)	10.66 (3.60)	10.73 (3.52)	10.69 (3.40)

main effect for intensity, $F(2, 182) = 11.40$, $p < .001$, accounting for 11% of the variance in RPE scores. A post hoc analysis using Bonferroni's correction indicated that participants in the high intensity (70% VO_2max) exercise condition reported significantly higher RPE ($M = 13.98$, $p < .001$) scores than those in the moderate (50% VO_2max) ($M = 10.67$, $p < .001$) and low (30% VO_2max) ($M = 7.76$, $p < .001$) intensity exercise conditions, and those in the moderate intensity exercise condition reported significantly higher RPE scores than those in the low intensity exercise condition. No significant main effects for music condition were found and no interaction was revealed. Descriptive statistics for RPE by music preference and intensity are reported in Table 2.

Attentional Focus

A 3 (music condition) by 3 (exercise intensity) ANOVA was conducted on each of the AFQ subscales. The significant effect of exercise intensity, $F(2, 197) = 7.63$, $p = .001$, $\eta^2 = 0.07$, indicated that those in the low intensity condition associated significantly less than those in the moderate ($p = .45$) and high ($p < .001$) intensity conditions. Results also revealed that those in the high intensity condition reported higher levels of distress than those in both the moderate and low intensity conditions, $F(2, 197) = 25.29$, $p < .001$, $\eta^2 = 0.21$. Although there were no significant differences in attentional focus between music conditions, averages were in the hypothesized direction. Participants in the most preferred ($M = 41.19$) music condition reported higher levels of dissociation than the least preferred ($M = 38.16$) and no music ($M = 37.13$) condition. There were no significant differences for association or distress across music conditions. There were no significant interactions. Means and

standard deviations of the dissociation, distress, and association subscales are reported in Table 3.

Attend to Music

In retrospect, one weakness of the previous analyses is that there was no control for whether or not the participants actually paid attention to the music. Although the state AFQ did contain a question specifically asking how much the participants concentrated on the music, it was not part of the hypothesized analyses. As an exploratory analysis, a 3 (Music) × 3 (Intensity) ANOVA was conducted on enjoyment using only the portion of the sample that had paid attention to the music. This portion of the sample consisted of participants that scored above the mid-point on state AFQ Item 31 ("Concentrating on the music") and therefore only contained participants in either the most preferred or least preferred music conditions. Results revealed a significant main effect for music, $F(1,86) = 4.18$, $p = .04$, accounting for roughly 5% of the variance in exercise enjoyment. Therefore, when participants paid attention to the music, those in the most preferred music condition ($n = 55$, $M = 17.90$) enjoyed the exercise significantly more than those in the least preferred music condition ($n = 37$, $M = 15.57$). There was no significant main effect for intensity and no significant interaction. Further, a 3 (Music) × 3 (Intensity) ANOVA was conducted on RPE using only the portion of the sample that had paid attention to the music. Results revealed no significant interaction and no significant main effects for either music or exercise intensity.

Discussion

Enjoyment by Music Condition

There was partial support for the expectation that exercisers in the most preferred music condition would experience the highest levels of enjoyment. Results of the study indicated that music preference does have a small effect on exercise enjoyment, as long as the music was salient enough to command the exerciser's attention. Attending to music during exercise will result in more enjoyment of the activity when listening to preferred music compared to nonpreferred music. On the other hand, not attending to music reduces the effect of music preference. Although

TABLE 3
Means and Standard Deviations for Association, Dissociation, and Distress Exercise

		Association			Dissociation			Distress		
	Music	No	Least	Most	No	Least	Most	No	Least	Most
Intensity										
Low	*Means* (*SD*)	39.30	31.83	32.73	37.35	39.13	42.32	14.13	11.91	11.68
		(13.93)	(9.76)	(12.84)	(11.30)	(7.70)	(10.56)	(5.79)	(5.03)	(5.51)
Moderate	*Means* (*SD*)	40.30	43.30	36.10	37.17	38.30	40.00	15.00	12.90	12.43
		(13.61)	(11.40)	(11.32)	(10.30)	(9.20)	(10.41)	(8.59)	(5.36)	(5.25)
High	*Means* (*SD*)	41.20	43.05	45.00	36.86	37.05	41.18	18.27	21.64	22.77
		(12.42)	(13.00)	(14.00)	(10.53)	(12.43)	(11.18)	(9.14)	(10.50)	(9.10)

there were no significant differences among the participants that did not pay attention to the music, observed differences indicated that participants who listened to music they preferred did enjoy their exercise bout more than those who listened to music they did not prefer or who did not listen to any music. Despite the small effect (5%) of music preference on exercise enjoyment, it is important to point out that individual differences may exist that may be of practical importance. Therefore, music preference may have a greater influence on exercise enjoyment for some.

The higher levels of enjoyment in participants listening to their most preferred music may have been due to a better mood as a result of the music (Karageorghis & Terry, 1997). Allowing the participant to listen to music they like may have positively influenced his or her mood, leading the individual feeling as though they were enjoying the exercise. On the other hand, the participants that were required to listen to music they disliked may have experienced a negative change in mood. Another explanation may be that the participants that listened to music they liked dissociated more by paying more attention to the music and less to their physical discomfort caused by the exercise. On the other hand, participants that were required to listen to music they did not like may have tried to block out the music by focusing their attention on other aspects such as physical sensations caused by the exercise. Although there were not significant differences in state dissociation among music conditions when trait dissociation was factored out, observed differences did show that participants in the most preferred music condition did dissociate more than participants in the least preferred music condition.

Following from the results of this study, future research should allow participants to bring in self-selected music. Although it will not be as easy to control for tempo, self-selected music would be more representative of the participant's most preferred music. A second suggestion is to include video as another independent variable. It may be that different mediums (i.e., music, video) will have a different impact on dissociation of certain individuals. Also, since many health facilities also include television screens it would be beneficial to determine if video has different effects than music on exercise enjoyment.

Results of the current study may also be useful for music therapy clinicians. Music therapy has been shown to be

exceptionally influential on a number of psychological issues such as anxiety and physiological arousal to stress (Bolwerk, 1990; Knight & Rickard, 2001; Pelletier, 2004). However, based on the results on music preference and exercise enjoyment, future research should examine the effects of preferred versus non-preferred music in music therapy. If the patient enjoys the music used during therapy, the effects of the music may be more personal and therefore, more salient.

Enjoyment by Intensity Condition

It was expected that exercisers in the moderate intensity workload condition experience the highest levels of enjoyment. Although results concerning the effects of exercise intensity on exercise enjoyment were not significant, they were in the expected direction. Those in the moderate intensity condition reported the highest levels of enjoyment. These results are consistent with the findings on the effects of exercise intensity on affect (Berger & Motl, 2001). The lack of significance may be explained by a limitation of the sample characteristics. Due to Institutional Review Board requirements, participants were only allowed to participate if they were classified as low risk by ACSM guidelines. Unfortunately, it was discovered that it is not very prudent to have low risk persons exercise at a low intensity. Whereby higher intensities have detrimental effects on affect because of the extreme physical discomfort, it is a strong possibility that low intensity exercise elicited feelings of boredom and being held back. Subsequently, when the low intensity exercise condition is dropped from the analysis, the difference in enjoyment between the most preferred and least preferred music conditions is even more evident. Mean differences on enjoyment between the most preferred music condition and least preferred music condition increased from 0.43 to 2.17 when the low intensity condition was dropped. Similar results were found in the previously mentioned study conducted by Boutcher and Trenske (1990). Participants had a greater positive affective response to music compared to sensory deprivation in a moderate and high intensity exercise condition but not in a low intensity condition. Future research that only involves apparently healthy participants should concentrate on moderate and high intensity exercise, as low intensity conditions are not particularly useful.

RPE by Music Condition

Results of the current study did not support the expectation that exercisers in the most preferred music condition would report the lowest RPE scores. There were no differences among those exercising while listening to music they liked, music they did not like, or while not listening to any music during the exercise. It is possible that the effects of exercise intensity or RPE overshadowed the effects of music condition resulting in no differences between the music conditions. According to Pennebaker & Lightner (1980), the external stimuli (music in the current study) must be cognitively demanding (interesting) in order to result in dissociation. As previously stated one of the limitations of the study was the limited selection of music and therefore the individual's choice of preferred music may have not be an absolute indicator of absolute preferred music. Hence, the music may have not been interesting enough to overpower the physical sensations caused by the exercise.

RPE by Intensity Condition

Aligned with our expectations, participants in the low intensity reported the lowest RPE scores. Results also revealed that the higher intensity exercise increases the perceived required effort. It is no surprise that participants reported significantly higher RPE scores when exercising at a high intensity and significantly lower RPE scores when exercising at a low intensity. Results of relationship between exercise intensity and cognitive strategy may help clarify the relationship between exercise intensity and RPE scores.

Attentional Focus by Music Condition

Although the expectation that exercisers in the most preferred music condition would report the highest levels of dissociation was not fully supported, the observed means were in the expected direction. Results provide marginal support for evidence of parallel processing during exercise. According to Rejeski's (1985) conceptualization of parallel processing, there is a limit to the amount of information that can be processed at one time, external and internal sources of information must compete for the individual's attention since both can not be processed simultaneously. When internal and external stimuli are both

present, the external stimuli (e.g., music) must be cognitively appealing for dissociation to occur. Therefore, according to Rejeski, the lack of significance is most likely due to the fact that the music failed to be cognitively appealing. The lack of cognitive demand can clearly be explained by the fact that the most preferred music may have not been the exerciser's absolute most preferred music. As discussed in previous sections, the most preferred music available to participants in this study may not have been the participants' absolute favorite music. If the music was not the exerciser's absolute most preferred type of music then it is possible that the music did not demand enough attention away from the physical sensations of the activity. Therefore, there is further evidence that future research would benefit from allowing the participants to provide their most preferred music as preference has the ability to meaningfully affect attentional focus.

Attentional Focus by Intensity Condition

It was expected that exercisers in the high intensity exercise condition would experience higher levels of association and distress. Results revealed that participants in the high intensity exercise condition reported higher levels of association and distress than those in the moderate and low intensity exercise conditions. These results are supportive of the model proposed by Tenenbaum (2001) in which the narrowing of attention at high intensities forces attention to become internal. The physical demand of high intensity exercise facilitates a narrow attention that only allows the individual to focus on physical sensations, whereas the low and moderate intensities allow for a broader attentional focus.

Conclusions

The current study is important for two main reasons: it fills a gap in the existing body of literature and has considerable practical implications. Previous research has, for the most part, compared the effects of listening to music to not listening to music with regards to exercise enjoyment (Boutcher & Trenske, 1990; Kendzierski & DeCarlo, 1991). Also, past studies involving music have mostly concentrated on one exercise intensity. Accordingly, this study built upon previous research by including a least preferred or disliked music condition and assessed the

effects of music on enjoyment across exercise intensities ranging from low to high.

In sum, listening to music one likes during exercise may result in higher levels of enjoyment if one attends to the music. Although exercise intensity has not been shown to significantly affect enjoyment, mean differences suggest that exercising at a moderate rate may result in higher levels of enjoyment compared to exercising at a low or high intensity. Despite the fact that music preference did not appear to influence feelings of perceived exertion, it is possible that the effects of exercise intensity may have masked any effects of music condition. Further, exercisers will dissociate more during a moderate intensity bout of exercise compared to a low or high intensity bout of exercise. Following from the findings of the current study, it is suggested that health facilities evaluate whether or not patrons pay attention to music during exercise to determine the financial benefits of individualizing music. Future studies involving examining the effects of video on exercise enjoyment would be beneficial to help determine if the benefits of installing televisions in health facilities out ways the cost.

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