

Music's Effect on Exercise Participants by Exercise Session

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We identified exercise participants' music preferences in three exercise sessions and clarified how preferred or randomly assigned music affects perceived psychological helpfulness of exercise. There were 292 fitness center members in Korea who were selected as participants. Participants' preferred music was assessed using frequency analysis and participants were grouped by preferences. Similar percentages were observed for sedative (45.2%) and stimulative (54.8%) music during warm-up, whereas participants preferred stimulative (91.4%) and sedative (75.7%) music during workout and cooldown, respectively. During the warm-up session, sedative music was found to be more psychologically helpful for the sedative music preferred group ($t = 4.86, p < .001$), whereas stimulative music was found to be significantly more psychologically helpful than sedative music for the stimulative music-preferred group ($t = -6.47, p < .001$). During the workout sessions, the sedative music was found to be more helpful for the sedative music-preferred group, albeit with no statistical difference from stimulative music, whereas the stimulative music had similar effects to the warm-up session ($t = -18.37, p < .001$). Finally, during the cool-down sessions, sedative music was found to be more psychologically helpful for the sedative music-preferred group ($t = 7.97, p < .001$), whereas stimulative music was found to be more psychologically helpful to the stimulative music-preferred group ($t = -2.10, p < .05$). The results of this study provide basic information for music usage in health management centers and other interested organizations to improve physical activity.

Music has been a natural part of humans' everyday lives—from prenatal exposure to the melodies of lullabies to our synchronizing with the rhythm of our mother's heartbeat—for generations. From our first exposure to music, humans experience and must respond to a diverse range of emotions, which continues into adulthood. From the perspective of music psychology, the scope of music's application to human life can be broadly classified into the following domains: cognitive development, exercise and the body, psychoanalysis, self-actualization, and transcendence. Among these, the exercise and body domain concerns how music affects human biochemistry, physiology, and neurology—specifically how it can enhance bodily functions through its acoustic or physical properties as cues for physical response. Music is believed to be capable of improving gait performance and strengthening existing motor skills and biorhythms such as body coordination or flexibility (Jung, 2011).

With this background, sport scientists have been particularly interested in the benefits of music over the past four decades and have conducted systematic studies on the effects of music relating to exercise, sports, and physical activities. Perhaps the most effective and popular use

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of music for athletes has been as a method of enhancing emotional regulation (Karageorghis & Priest, 2012).

The foundational model of the effects of music in the field of sport science is that by Karageorghis, Terry, and Lane (1999). This model centers on motivational quality, which is hierarchically influenced by the internal factors of rhythm response and musicality and the external factors of cultural impact and association. Highly motivational music improves arousal control and mood and reduces ratings of perceived exertion (RPE); ultimately, such music encourages exercise participants to continue exercising and serves as an effective preperformance routine for athletes. Based on this model, Karageorghis et al. (1999) developed the first version of the Brunel Music Rating Inventory (BMRI-1). From this initial model, more comprehensive models and questionnaires, namely, the BMRI-2 (Karageorghis, Priest, Terry, Chatzisarantis, & Lane, 2006) and BMRI-3 (Karageorghis, 2008), were developed and utilized to better study the relationship between music and exercise performance.

A closer look at research on the relationship between music and exercise reveals that listening to music during exercise can reduce feelings of fatigue generated by exercise and heightens interest in exercise, which in turn can increase an individual's desire to quickly complete the assigned exercise task (Anshel & Marisi, 1978; Becker et al., 1994; Beckett, 1990; Boutcher & Trenske, 1990; Brownley, McMurray, & Hackney, 1995). In terms of physiology, listening to music during exercise appears to have positive effects on exertion of muscular strength and endurance (Crust, 2004; Karageorghis, 2008; Karageorghis, Drew, & Terry, 1996; Karageorghis & Priest, 2012), presumably because it allows individuals to better reach the optimal level of arousal necessary for task performance. This effect is particularly pronounced when preferred music is played during exercise (North & Hargreaves, 2000). Similarly, in terms of its psychological effects (Birnbaum, Boone, & Huschle, 2009), music appears to positively and significantly influence psychological constructs such as emotion, affect, mood, and cognition among exercise participants, thereby leading to better exercise performance (Karageorghis & Priest, 2012; Simpson & Karageorghis, 2006). Karageorghis and Priest (2012) reported that music is like a legal drug that affords countless benefits to exercise performance (Matesic & Cromartie, 2002; Pujol & Langenfeld, 1999).

Music may afford different benefits depending on the exercise intensity: For instance, music during low-intensity exercise is related to increased mental arousal and improved motion coordination (Karageorghis & Terry, 1997). Furthermore, music during intermediate-intensity exercise (70% of peak VO₂) has positive effects on RPE (Potteiger, Schroeder, & Goff, 2000; Szmedra & Bacharach, 1998). Distractibility caused by fatigue during high-intensity exercise can be almost completely eliminated through fast and slow-to-fast music, thereby leading to optimal exercise performance (Szabo, Small, & Leigh, 1999).

Playing music might be more effective during warm-up and recovery (i.e., cooldown) from exercise than during the actual workout session (Yamamoto et al., 2003). For instance, Yamamoto et al. (2003), in verifying the effects of music played before indoor cycling, found that neither fast nor slow music affected power output during exercise. However, this seemingly contradicts the results of their neurotransmitter analysis, which indicated that slow music lowers arousal and fast music heightens it. Moreover, qualitative research has revealed that listening to preferred music before circuit training enhanced participants' self-reported confidence and reduced their state anxiety (Priest & Karageorghis, 2008). Although the influence of music on the recovery session has not been clearly delineated, effects such as faster lactate clearance, reduced RPE, and increased activity were reported in individuals who had listened to motivational music compared to individuals who had not listened to such music (Eliakim, Bodner, Eliakim, Nemet, & Meckel, 2012).

Priest and Karageorghis (2008) explored the relationship between exercise and music by interviewing individuals who participated in varying levels of exercise. The authors argued that there is a point at which the effects of music are maximized, and utilizing appropriate music at this point helps increase the amount of exercise effort and arousal during exercise. Another study similarly noted that listening to music suited to one's taste for each exercise session can stimulate exercise participants so that mental and physical arousal levels are adequately maintained (North & Hargreaves, 2000). This suggests that the effectiveness of music may depend on the type of sports and exercise practiced (Karageorghis & Priest, 2012).

Despite the aforementioned possibilities, the majority of music-related studies conducted in sports and exercise populations have examined the effects of music under a single experimental condition. As such, it is difficult to make a conclusive decision on how preferred music differently affects performance for different exercise sessions (i.e., warm-up/workout/cooldown). Furthermore, many studies have focused on the potential positive effects of stimulative music on the actual workout session, particularly on the effectiveness of music at different exercise intensities such as maximal exercise (Crust & Clough, 2006; Hall & Erickson, 1995; Hutchinson et al., 2011; Karageorghis et al., 1996; Karageorghis & Terry, 1997). In contrast, there have been relatively few studies of the relationship between music and exercise during warm-up and cool-down sessions, and only a handful of studies have examined how sedative music affects exercise (Karageorghis & Priest, 2012).

In this respect, the present study identified the effects of individuals' preferred music by exercise session (warm-up/workout/cooldown). Although fitness and healthcare centers are using music to promote and maximize the effects of exercise, these efforts may be relatively ineffective if the classification, selection, and provision of music preferred by individual exercise participants are not understood.

The types of music to be examined in this article include sedative and stimulative music, which were defined by Gaston (1968). According to Gaston, all music falls within these two categories. Stimulative music is characterized by high activity and energy and is meant to inspire or arouse listeners; an example of such music is military march music. In contrast, sedative music serves to soothe and calm us down; a lullaby is the best example (Radocy & Boyle, 2012).

Therefore, based on the findings that listening to one's preferred music has a positive effect on exercise performance (Razon, Basevitch, Land, Thompson, & Tenenbaum, 2009; Yamasita, Iwai, Akimoto, Sugawara, & Kono, 2006), we conducted the present study to serve two purposes: First, it aimed to analyze what types of music exercise participants prefer for each exercise session (warm-up/workout/cooldown). Second, to examine whether music played at the fitness center improves exercise performance, we compared the extent to which participants considered the music psychologically helpful to their exercise between participants' normally preferred music and the music played at the fitness center on the day of survey.

METHOD

Participants

Data were collected via surveys of 300 members of a fitness center at Seoul National University of South Korea. We approached potential participants after they had finished their exercise at the fitness center and gave them an explanation of the need for the study and its purpose, the study details, and the affiliations and titles of the researchers; then consent forms indicating that participation was voluntary were obtained from all participants. Purposive sampling was used to recruit participants, as we were interested only in participants who

Table 1
Operational Definitions of Music and Exercise Sessions

Term	Definition
Stimulative music	Music that excites or arouses listeners with high energy (e.g., dance, hip-hop, rock)
Sedative music	Music that soothes and calm one down (e.g., R&B, New Age, classic)
Warm-up	Motions that prepare the mind and body in such a way as to increase the effectiveness of a workout (e.g., joint rotation, stretching, walking)
Workout	Exercise targeting various muscles or to achieve a training goal (e.g., anaerobic training for physical strength and fitness such as muscle building and flexibility; aerobic training such as running, cycling).
Cooldown	Motions designed to reduce one's arousal after workout to normal (e.g., stretching, walking, breath control)

normally listened to music during exercise. Furthermore, on the day of the survey, participants who used headphones during exercise were excluded from the survey. This was because participants who used headphones were thought to be naturally excluded from the musical situations preset for the study.

Participants were recruited from the campus fitness center because we wanted to avoid the limitations most previous studies faced; that is, in using highly skilled exercise participants, it is difficult to generalize findings to ordinary exercise participants (Karageorghis & Priest, 2012). Another reason for this was that participants in their 20s and 30s frequently listen to music while exercising, and thus those from this age group were judged to be better suited to the study purposes.

Among the retrieved questionnaires, 292 were included in the analysis after excluding eight because of incomplete answers. Of these 292, there were 208 male (71.2%) and 84 female (28.8%) participants. The major ethnicity of the sample was East Asian, predominantly Korean. In terms of age distribution, 245 participants were in their 20s (83.9%) and 47 were in their 30s (16.1%). Regarding exercise frequency, 163 participants answered "less than three times a week" (55.8%) and 129 said "more than four times a week" (44.2%). Finally, for duration of exercise participation, 161 answered "less than 1 year" (55.1%), whereas 51 (17.5%) and 80 (27.4%) said "between 1 and 2 years" and "more than 2 years," respectively.

Measures

To achieve the study purposes, three meetings of three experts holding doctorates in sport psychology were held to derive the questionnaire items. Furthermore, a meeting with one expert in music psychology was held to select the random music that we would play on the day of the survey. The questionnaire was subjected to five rounds of content validity testing before it was administered. Data were then collected using these items. Before they completed the questionnaire, participants received an explanation about the characteristics of music types (sedative/stimulative) and exercise sessions (warm-up/workout/cooldown; see Table 1 for a list of definitions).

The questionnaire comprised two questions (see the appendix). First, it identified participants' preferred music under normal exercise circumstances. We did this by asking participants to indicate which type of music (sedative/stimulative) they preferred for each type of exercise session. Then, the questionnaire assessed the degree to which randomly played music at the fitness center on the day of the survey helped participants' exercise. This was done by asking participants what type of music (stimulative or sedative) was played that day during their

Table 2
List of Music Randomly Assigned on the Day of Experiment and Beats Per Minute (bpm)

Sedative music				Stimulative music		
	Artist	Title	bpm	Artist	Title	bpm
1	Yiruma	Chaconne	91	Keri Hilson	Pretty Girl Rock	160
2	Yiruma	Maybe	108	Lady Gaga	Applause	140
3	Andy Williams	Moon River	103	Katy Perry	E.T.	151
4	Yanni	One Man's Dream	105	OK Go	This Too Shall Pass	160
5	Sakamoto Ryuichi	Merry Christmas Mr. Lawrence	98	Passion Pit	Make Light	159
6	Sasaki Isao	Always in a Heart	94	Pharrell Williams	Happy	160
7	Yuhki Kuramoto	Shape of Love	95	Queen	Don't Stop Me Now	156
8	Yuhki Kuramoto	Romance	108	Rihanna	Cheers (Drink To That)	159
9	Yuhki Kuramoto	Lake Louise II	91	Woodkid	Run Boy Run	135
10	Yuhki Kuramoto	Meditation	103	Zedd	Beautiful Now	148

exercise and to rate on a 5-point scale from 1 (*not helpful at all*) to 5 (*very helpful*) how psychologically helpful it was to their exercise during each exercise session.

Psychological helpfulness indicated here does not refer to specific psychological constructs (e.g., motivation, confidence, etc.) but rather a comprehensive psychological state wherein the participants were able to carry out their exercise at a certain level of comfort and stability. Furthermore, it encompasses the feelings perceived by the individual thereof. In other words, this study sought to measure the level of psychological helpfulness provided by music to the participants, and thereby to indirectly measure the psychological effects of listening to music during exercise.

The criteria for selecting the music at the fitness center on the day of survey were based on the music types suggested by Gaston (1968) and the beats per minute (bpm) proposed by Karageorghis et al. (2011). Music at or below 120 bpm was classified as medium or slow tempo, whereas music at or above 135 bpm was classified as fast tempo. After several revisions of the selected music through consultations with a music psychology expert, 20 songs were ultimately selected—10 songs of sedative music and 10 of stimulative music (see Table 2).

Procedure

Measurements were performed four times in total between 9:00 a.m. and 10 p.m. from May to June 2015. Music was changed every 30 min on the hour (i.e., 0 min, 30 min). For example, sedative music was played for 30 min, after which stimulative music was played for 30 min; the music playing order was randomly set. The music was changed to prevent exercise participants from realizing that they were being observed. The reason that the session-specific exercise times were not controlled for each participant was to again ensure that participants were unaware of their participation in the experiment, making it so that their situation was similar to random exposure to music and thereby reducing bias.

Therefore, the participants exercised naturally while listening to randomly set music from the warm-up to the cool-down session. At the time that participants needed to answer the questionnaire after all exercise sessions, the researchers intervened and elicited each participant's

Table 3
Normally Preferred Music by Exercise Type

	Warm-up	Workout	Cooldown
Sedative music	132(45.2%)	25(8.6%)	221(75.7%)
Stimulative music	160(54.8%)	267(91.4%)	71(24.3%)
Total	292(100%)	292(100%)	292(100%)

memory of the music he or she had listened to through self-remembrance. The questionnaire was administered to exercise participants after they had finished exercising and were exiting the fitness center. The participants gave their informed consent before taking part in the survey. All participants were provided with complimentary beverages while filling out the survey. The entire survey took approximately 5 to 10 min to complete.

The instructors and staff of the fitness center received a full explanation of the research aims, and consent was obtained from them before administering the questionnaire. All researchers completed a research ethics education course, and the entire procedures were reviewed and approved by the Institutional Research Board at the university.

Data Analysis

The data were analyzed using PASW Statistics 18.0. First, frequency analysis was conducted to classify music preferred by exercise participants during their normal exercise by exercise session. Next, we divided participants into six groups by using the “select cases” function in PASW, after which we performed recoding. For example, participants who preferred sedative music during normal warm-up sessions could be classified into a group of people who listened to sedative music during their warm-up session on the day of survey and a group of people who listened to stimulative music during that same session. Differences in the mean degree of perceived psychological helpfulness for exercise were analyzed using independent *t* tests. Statistical significance (α) was set at $p < .05$.

RESULTS

Normally Preferred Music by Exercise Session

The types of music normally preferred by participants by exercise session are summarized in Table 3. In the warm-up session, we did not observe any large differences in the percentage of participants who preferred sedative music (45.2%) and those who preferred stimulative music (54.8%). In the workout session, however, more than 90% of participants preferred stimulative music. Furthermore, about 76% preferred sedative music in the cool-down session.

Classification of Normally Preferred Music and Music Listened to on the Day of Survey and Group Differences in Music Helpfulness

To achieve the second aim of this study, the following data analysis was carried out. First, we grouped participants by the music type (sedative/stimulative) they preferred and the music that they actually listened to at the fitness center on the day of survey by exercise session. As a result, six groups were created (see Table 4). An independent *t* test was conducted to determine whether there was a statistically significant difference in helpfulness to exercise between the groups.

Table 4
Participant Groups by Normally Preferred Music and Music on Day of Survey for Psychological Helpfulness Evaluation

Exercise session	Normally preferred music	Music listened to during exercise on the day of survey	
		Sedative	Stimulative
Warm-up	Sedative	Sedative	Stimulative
	Stimulative	Sedative	Stimulative
Workout	Sedative	Sedative	Stimulative
	Stimulative	Sedative	Stimulative
Cooldown	Sedative	Sedative	Stimulative
	Stimulative	Sedative	Stimulative

Warm-Up

The results of the warm-up session are shown in Table 5. Among all exercise participants, 132 were classified as a group that normally prefers sedative music during warm-up sessions. Of these, 79 listened to sedative music during the warm-up session on the day of the survey, and 53 listened to stimulative music. Regarding differences in degree of psychological helpfulness of the music for exercise, the results showed that the sedative music group ($M = 3.41$, $SD = 1.03$) found the music more psychologically helpful than did the stimulative music group ($M = 2.51$, $SD = 1.05$; $t = 4.86$, $p < .001$).

A total of 160 participants normally preferred stimulative music during warm-up sessions, 88 of whom had listened to sedative music during the warm-up session on the day of survey and 72 of whom had listened to stimulative music. The results of the difference analysis showed that the participants who listened to stimulative music ($M = 3.53$, $SD = .90$) on the day of the survey reported it to be more psychologically helpful to their exercise than did those who listened to sedative music ($M = 2.51$, $SD = 1.08$; $t = -6.47$, $p < .001$).

Table 5
Differences in Perceived Psychological Helpfulness of Exercise Between Normally Preferred Music and Music Played on the Day of Survey During Warm-Up Sessions

Normally preferred music	Music listened to during exercise on the day of survey				<i>t</i>
	Sedative		Stimulative		
	<i>n</i> (%)	<i>M</i> (<i>SD</i>)	<i>n</i> (%)	<i>M</i> (<i>SD</i>)	
Sedative	79(59.85)	3.41(1.03)	53(40.15)	2.51(1.05)	4.86***
Stimulative	88(55)	2.51(1.08)	72(45)	3.53(.90)	−6.47***

*** $p < .001$.

Table 6
Differences in Perceived Psychological Helpfulness of Exercise Between Normally Preferred Music and Music Played on the Day of Survey During Workout Sessions

Normally preferred music	Music played during exercise on the day of survey				<i>t</i>
	Sedative		Stimulative		
	<i>n</i> (%)	<i>M</i> (<i>SD</i>)	<i>n</i> (%)	<i>M</i> (<i>SD</i>)	
Sedative	13(52)	3.38(1.04)	12(48)	2.67(1.16)	1.63
Stimulative	125(46.82)	2.07(.98)	142(53.18)	4.06(.77)	−18.37***

*** $p < .001$.

Workout

The results for the workout session are shown in Table 6. Twenty-five participants normally preferred to listen to sedative music during their workout session. Among these, 13 listened to sedative music during their workout on the day of survey, and 12 listened to stimulative music. The results of group comparison showed that the sedative music group ($M = 3.38$, $SD = 1.04$) reported higher psychological helpfulness scores than did the stimulative music group ($M = 2.67$, $SD = 1.16$); this difference, however, was not statistically significant ($t = 1.63$, $p > .05$).

A total of 267 participants normally preferred stimulative music during their workout session, of whom 125 listened to sedative music during the workout session on the day of survey and 142 listened to stimulative music. The results of the group comparison showed that the stimulative music group reported higher psychological helpfulness scores ($M = 4.06$, $SD = .77$) than did sedative music group ($M = 2.07$, $SD = .98$; $t = -18.37$, $p < .001$).

Cooldown

The results of the cool-down session are reported in Table 7. A total of 221 exercise participants normally preferred sedative music during the cool-down session, 116 of whom actually listened to such music during cool-down exercise on the day of survey, whereas 105 listened to stimulative music. The results of the group comparison showed that the sedative music group reported higher psychological helpfulness scores ($M = 3.48$, $SD = .94$) than did the group who listened to stimulative music ($M = 2.53$, $SD = .82$; $t = 7.97$, $p < .001$).

Table 7
Differences in Perceived Psychological Helpfulness of Exercise Between Normally Preferred Music and Music Played on the Day of Survey During Cool-Down Sessions

Normally preferred music	Music played during exercise on the day of survey				<i>t</i>
	Sedative		Stimulative		
	<i>n</i> (%)	<i>M</i> (<i>SD</i>)	<i>n</i> (%)	<i>M</i> (<i>SD</i>)	
Sedative	116(52.49)	3.48(.94)	105(47.51)	2.53(.82)	7.97***
Stimulative	37(52.11)	2.43(1.14)	34(47.89)	3.00(1.13)	−2.10*

* $p < .05$. *** $p < .001$.

Finally, 71 participants normally preferred stimulative music during cool-down sessions, of whom 37 listened to sedative music during the cool-down session on the day of the survey, whereas 34 listened to stimulative music. The results of the group comparison indicated that the stimulative music group reported higher psychological helpfulness scores ($M = 3.00$, $SD = .128$) than did the sedative music group ($M = 2.43$, $SD = 1.14$; $t = -2.10$, $p < .05$).

DISCUSSION

The present study was conducted to identify, by exercise session (warm-up/workout/cooldown), the level of psychological helpfulness of the music played during exercise. To sum up the research findings on the relationship between music and exercise so far, music appears to capture attention, trigger a range of emotions, alter or regulate mood, evoke memories, increase work output, heighten arousal, induce states of higher functioning, reduce inhibitions, and encourage rhythmic movement (for reviews, see Karageorghis, 2008; Lucaccini & Kreit, 1972; Terry & Karageorghis, 2011). Of course, listening to music does not directly enhance muscular strength; however, it does help to suppress excessive anxiety and excitement and control arousal before or during exercise, which helps to optimize preparation for exercise performance (Karageorghis & Priest, 2012).

The main limitation of existing studies on music and human behavior lies in the fact that it is difficult to clearly identify the music preferences for each exercise session of large numbers of exercise participants. This is primarily because previous studies focused on verifying the effect of one type of music (i.e., fast music/slow music) on exercise performance or on the healing effect of music for a single type of exercise (e.g., long distance running, grip strength test); such a narrow focus was primarily due to the difficulties in conducting experiments with large numbers of participants. Thus, we sought to overcome these limitations in order to identify exercise participants' preferred choice of music during their normal exercise by exercise session and analyzed the effects of randomly set music at the fitness center on the day of survey during each exercise session.

Regarding normally preferred music during exercise, similar percentages were observed for sedative and stimulative music in the warm-up session (45.2% vs. 54.8%). In contrast, more participants listened to stimulative and sedative music in the workout (91.4%) and cool-down (75.7%) sessions, respectively. As mentioned in the introduction, most studies have examined listening to music before exercise (Crust & Clough, 2006; Hall & Erickson, 1995; Yamamoto et al., 2003) or during the actual workout session (Crust & Clough, 2006; Hall & Erickson, 1995; Hutchinson et al., 2011; Karageorghis et al., 1996; Karageorghis & Terry, 1997); few studies have been carried out on the effects of music on the recovery session after exercise (Desai, Thaker, Patel, & Rarmar, 2015; Savitha, Reddy, & Rao, 2010). Participants who are exercising individually may choose their favorite music for each exercise session, but those who use a fitness center or public facility are unable to personally control the music choice. Therefore, this study extends our knowledge of the music preferences that participants have for different exercise sessions beyond the limited scope of previous studies. Most health-related facilities use stimulative tempo music (fast music) to motivate participants' exercise, and our results suggest that there are similar trends in music preference for the warm-up and cool-down sessions. These results will both directly and indirectly benefit follow-up research.

Next, we grouped exercise participants by type of music normally preferred and the randomly played music at the fitness center, and then we compared how helpful participants found the random music for their exercise. With regard to perceived psychological helpfulness, the results showed that the group that normally preferred sedative music during the warm-up

session benefitted most from the sedative music, whereas the group with a preference for stimulative music benefitted from stimulative music. According to Hall and Erickson (1995), listening to music before a workout session is effective for stimulating athletic ability. Crust and Clough (2006) also reported that listening to music before exercise helps enhance one's stamina. Similarly, Karageorghis and Priest (2012) stated that exercise participants who prefer sedative music for their warm-up exercise feel more relaxed because the music reduces arousal levels; in contrast, stimulative music improves exercise performance in the workout session through heightened arousal. Taken together, the results suggest that exercise participants can best prepare for their own workout through warm-up sessions by listening to their preferred music, regardless of what type of music it is.

Most participants preferred stimulative music during the workout session, and listening to such music improved the perceived psychological helpfulness of such music for their exercise. This result agrees with previous findings. For instance, a study of the relationship between music tempo and exercise intensity showed that exercise participants prefer faster tempo music as exercise intensity increases (Karageorghis et al., 2011). Similarly, listening to stimulative music during the workout session has been reported to benefit many areas, such as motivation to keep exercising (Karageorghis, Jones, & Stuart, 2008; Karageorghis & Priest, 2012), athletic ability (Crust & Clough, 2006; Edworthy & Waring, 2006; Hutchinson et al., 2011; Karageorghis et al., 1996).

Meanwhile, the group that normally preferred sedative music during workout sessions benefited more from such music when they listened to it during exercise on the day of the survey. However, despite the clearly observed mean difference (3.38 vs. 2.67) between these participants and those who listened to stimulative music, there was no statistically significant difference in psychological helpfulness scores. This might be because there were only 25 participants (8.6% of the whole sample) who preferred sedative music during the workout session. Hepler and Kapke (1996) showed that participants listening to sedative music exhibited lower heart rates while running on a treadmill, which indicates that sedative music eases the heart tensions and thus induces a far more stable psychological state. Ghaderi, Rahimi, and Azarbayjani (2009) also found that the group members who listened to relaxing music while exercising had an increased exercise time as compared to those who did not; notably, sedative music appeared to lead to a reduction in both the RPE and cortisol level after exercise. In the present study, only a few participants preferred sedative music during the workout session. However, sedative music has ultimately shown to be effective for individuals' own exercise, which indicates that it can also benefit the workout session.

Finally, in the cool-down session, stimulative and sedative music proved more effective for the groups preferring such music. Recently, there have been various studies on the effects of music during the recovery session after the workout, some of which has shown that slow music is a more effective method of relaxation than are fast or no music (Desai, Thaker, Patel, & Rarmar, 2015; Manjunatha, Revathi, SharanAchar, Chandrakumar, & Sapna, 2014; Savitha et al., 2010). It was reported that recovery time can also be shortened using sedative music (Lee & Kimmerly, 2016). Although this study did not directly measure recovery ability or the quality of actual recovery, we found that the majority of participants preferred sedative music during cool-down sessions and confirmed that sedative music was psychologically more helpful for their exercise during this period than was stimulative music. As such, the previous findings demonstrating that the effects of sedative music during cool-down sessions were indirectly supported in this study. However, stimulative music was more helpful to the group that preferred such music during the cool-down session, which indicates that slow, sedative music is not the only effective music for cool-down sessions. Therefore, we can conclude that one's preferred music affords greater perceived benefits during the cool-down session.

This provides insights for future research on recovery sessions, which have recently received increasing attention.

Based on the results, we might assume that listening to music while exercising can indirectly help motivate one to exert one's athletic ability, which supports the findings of previous studies. Furthermore, this study supported the theoretical assumptions of earlier researchers in that, during normal exercise (from warm-up to workout and cool-down sessions), exercise participants benefit from their preferred music, whether stimulative or sedative. The implications of this study can be summarized as follows: The fact that individuals display preferences for different kinds of music for different exercise sessions indicates that one's preferred music can improve the level of perceived psychological helpfulness during any session of exercise. This expands on previous findings by allowing researchers to generalize music preferences to various conditions rather than a single one (e.g., a certain type of music is effective for a certain exercise session). In this respect, the present findings can be useful for health management centers such that these centers might designate a separate space for warm-up and cool-down exercise that plays different music, so that exercise participants can customize music to their own exercise session. In addition, our research results can easily apply to those who exercise individually.

Nevertheless, our study has several limitations and shortcomings. First, this study was performed only with adults in their 20s and 30s. Therefore, follow-up studies with a more diversified range of ages must be carried out because the types of preferred music might vary according to age group. Second, as this study targeted a large number of participants, we were unable to control participants' exercise ability or the length of each exercise carried out in each session. Based on the results of our study, future studies should focus on whether music directly influences individuals' exercise in each exercise session. Moreover, as the length of the exercise carried out in each session can provide important information on the psychological utility of music for exercise, it should be investigated in follow-up studies. Finally, further studies should investigate the relationship between exercise and preferred music by participants' personality type, as the types of preferred music may depend on personality traits (Crust, 2008; McCown, Keiser, Mulhearn, & Williamson, 1997; Priest & Karageorghis, 2008). By doing so, our understanding of the relationship between music and human behavior will be improved, thereby providing further guidance to future studies.

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APPENDIX

Preferred Music Under Normal Exercise Circumstances

Q-1. Please indicate the type of music you normally prefer for each exercise session by recalling your normal exercise routine.

Exercise session	Music type	
Warm-up	① sedative	② stimulative
Workout	① sedative	② stimulative
Cooldown	① sedative	② stimulative

Randomly Assigned Music on the Day of Survey and the Degree of Psychological Helpfulness

Q-2. Please indicate the type of music played at the fitness center today and the extent to which this music influenced you in a positive manner by recalling your exercise today.

Exercise session	Music type played at fitness center		Degree of psychological helpfulness (the degree of psychological comfort and stability during workout)				
			Not helpful at all			Very helpful	
Warm-up	① sedative	② stimulative	①	②	③	④	⑤
Workout	① sedative	② stimulative	①	②	③	④	⑤
Cooldown	① sedative	② stimulative	①	②	③	④	⑤

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