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Perceptions of an Online Mental Cooldown: Acceptability of a Post-Exercise Psychological Skills Intervention

JUDY L. VAN RAALTE[*/**], *and* BRITTON W. BREWER[*A]

[(*)] *Department of Psychology, Springfield College, Springfield, MA 01109 USA*
[(**)] *College of Health Sciences, Wuhan Sports University, 461 Luoyu Road, Wuhan, Hubei Province 430079, China*

The myriad benefits of exercise are clear. Unfortunately, many people focus on unpleasant aspects of exercise such as pain and physical exertion and fail to exercise regularly. To help people focus on exercise enjoyment, a mental cooldown that includes aspects of imagery, relaxation, self-talk, and mindfulness was developed and the acceptability of the mental cooldown was assessed. Specifically, 54 participants (n_{female} = 42, n_{male} = 12) who were 18 to 82 years old, exercised, listened to an experimental (mental cooldown) or control audio file, and rated the audio files in terms of acceptability, relevance, likability, and interest. The mental cooldown was rated as acceptable by both older and younger exercisers and as more relevant, likable, and worth listening to after future workouts than was the control audio file. Based on these promising acceptability results, further research on the effects of the mental cooldown on exercise behavior is warranted.

KEY WORDS: Imagery, Relaxation, Self-talk, Mindfulness.

Evidence of the physical and mental health benefits of exercise has accrued to the point that exercise has been described in the medical literature as a "miracle cure" (Godlee, 2019). In addition to the physical benefits of exercise, regular exercise has been shown to be as effective as standard anti-depressant medication in alleviating mental health conditions (Rethorst & Trivedi, 2013; Rethorst et al., 2009). Although the physical and psychological benefits of exercise are clear, many people focus on barriers and unpleasant aspects of exercise such as pain and physical exertion and fail to exercise regularly (Lovell, El Ansari, & Parker, 2010; Ruby et al., 2011; U.S. Department of Health and Human Services, 2018).

Correspondence to: Judy L. Van Raalte, 263 Alden St., Springfield, MA 01109 USA. (E-mail: jvanraal@springfieldcollege.edu)
Britton W. Brewer, 263 Alden St., Springfield, MA 01109 USA. (E-mail: bbrewer@springfieldcollege.edu)

The addition of a *physical* cooldown to exercise sessions can make the end of exercise sessions more pleasant and less aversive. Brewer et al. (2000) had participants read about and rate the aversiveness of a 15-minute cycling workout of increasing intensity and also read about and rate the same workout followed immediately by a physical cooldown. Participants rated the longer workout with a physical cooldown as being less aversive than the shorter workout with no cooldown. A second group of exercisers completed the actual cycling workouts, following the 15-minute increasing intensity format both with and without physical cooldowns. The longer cycling workouts that included physical cooldowns were not seen as more aversive than the shorter cycling workouts. The authors concluded that adding physical cooldowns reduced the aversiveness of exercise. It seems possible that adding mental cooldowns to the end of exercise sessions may be another way to affect perceptions of exercise, if people find the mental cooldowns to be an acceptable addition to their workouts.

The idea of benefits accruing from a *mental* cooldown after exercise is in line with reflective interventions that have been used following performance or actions in other domains. For example, military and medical personnel use after-action reviews (AAR) to learn from past behavior and to enhance future performance (Keiser & Arthur, 2020). In sport settings, competitive athletes participate in debriefings that involve video and performance analyses to analyze and reflect on past performances and prepare for future competitions (Middlemas et al., 2018). Sport psychologists also recommend the use of structured post-event reflections to help athletes process their sport performances in a productive, improvement-focused manner (Chow & Luzzeri, 2019). If exercisers find a mental cooldown to be acceptable and something they are willing to use, then exercisers might similarly benefit from a mental cooldown that helps them process their exercise experiences in a productive manner.

The use of reflective interventions across diverse settings and among a variety of groups is promising, as exercisers are a diverse group. It is not clear however, if a mental cooldown would be applicable or acceptable to exercisers across the age spectrum. Older and younger exercisers differ on a number of factors that could affect their comfort with and perceptions of the acceptability of a mental cooldown, including life experience and motives for exercising (Box et al., 2021). Before claims are made about the acceptability of a mental cooldown for exercise, it would be important to demonstrate the acceptability of a mental cooldown for exercisers of various ages.

A mental cooldown developed for the current study to help exercisers reflect on their exercise experience, provide a pleasant and relaxing transition out of exercise sessions, remind themselves of pleasant aspects of their

exercise experience, and provide an opportunity to benefit from a mindfulness activity. The exercise mental cooldown included aspects of psychological skills that have been shown to be beneficial for exercisers completing a mental warmup, including: (a) imagery; (b) relaxation; (c) self-talk; and (d) mindfulness (Van Raalte et al., 2019).

The purpose of the current study was to evaluate the acceptability of a mental cooldown for exercisers across age groups. This experiment also assessed, how relevant exercisers found the mental cooldown, how much they liked it, and how much they wanted to listen to it in the future.

Method

Participants

Participants were female (n = 42) and male (n = 12) exercisers ranging from 18 to 82 years of age, partaking in synchronous online exercise classes (n = 37), in-person exercise classes (n = 11), or other exercise (n = 5). One person did not report their type of exercise activity. Participants described themselves as non-Hispanic/Latinx and White (n = 53) or Asian (n = 1). Additional demographic information is presented in Table I. Because this is the first research study conducted on the exercise mental cooldown, it was not possible to obtain the necessary effect sizes from previous studies to conduct a sample size determination. A sensitivity analysis was conducted on the 54 participants, indicating an 80% probability of detecting an effect size of F = .39. This is considered a large effect size, which is reasonable for the variables under study (Cohen, 1988).

Table I
Demographic Characteristics of Participants.

Variable		Mental Cooldown	Control	Under Age 50	Age 50 and Older
Age					
	n	27	27	25	29
	M	40.15	50.70	22.16	66.38
	(*SD*)	(23.20)	(22.50)	(6.82)	(6.36)
Exercise frequency					
	n	27	27	25	29
	M	4.62	5.19	4.40	5.36
	(*SD*)	(2.50)	(1.59)	(1.53)	(2.42)
Gender					
	Male	8 (30%)	4 (15%)	9 (36%)	3 (10%)
	Female	19 (70%)	23 (85%)	16 (64%)	26 (90%)
Race/ethnicity					
	Asian	1 (3%)	0 (0%)	0 (0%)	1 (3%)
	Caucasian	26 (97%)	27 (100%)	25 (100%)	28 (97%)

INSTRUMENTS

The research instruments included measure of: (a) demographic characteristics (i.e., age, gender, race/ethnicity, frequency of exercise); (b) length and type of exercise session just completed; (c) perceived peak and average exercise intensity; (d) feeling/affect at the end of the exercise session; (e) enjoyment of the exercise; (f) likelihood of engaging in future exercise; (g) perceived acceptability of the audio files; (h) evaluation of the audio files; and (i) a check on the experimental manipulation.

Perceived peak and average exercise intensity. The Rating of Perceived Exertion (RPE) Scale (Borg, 1998) is a well-validated scale designed to measure participants' perceived exertion (RPE) on a scale from 6 (*no exertion at all*) to 20 (*maximal exertion*). For this study, participants' perceived peak and average exertion were measured.

Feeling/affect at the end of the exercise session. The Feeling Scale (FS; Hardy & Rejeski, 1989) is a single-item scale, "How do you feel right now, at this moment?" that was used to assess affective valence after numbers. The feeling bad/good dimension of the FS has been used to assess core affective expression (Hutchinson et al., 2020).

Enjoyment of the exercise. The Physical Activity Enjoyment Scale (PACES; Kendzierski & DeCarlo, 1991) is an 18-item scale designed to measure exercise enjoyment. Respondents indicate "How you feel at the moment about the physical activity you have been doing?" using a 7-point bipolar rating scales (11 items are reverse scored). Higher PACES scores reflect greater levels of enjoyment. The PACES-8 is an 8-item, brief version of the scale with adequate reliability and validity (Mullen et al., 2011). Items 1, 3, 4, 5, 6, and 8 were reverse scored so that higher PACES-8 scores reflect greater levels of enjoyment. The internal consistency of the scale with the present sample was adequate (Cronbach's $\alpha = .88$).

Intent to engage in future exercise. A single-item measure was used to assess participants' intentions to engage in exercise in the future (Blue et al., 2001). The item was "To what extent are you likely to exercise for at least 20 minutes, at least 3 times a week, for the next month," on a scale from 0 (*not at all likely*) to 7 (*very likely*).

Treatment acceptability. The Treatment Acceptability Questionnaire (TAQ; Hunsley, 1992) is a 6-item scale that was adapted to assess participants' perceptions of the acceptability of the mental cooldown and control group audio files. Items pertained to how acceptable, ethical, and effective the cooldown and control audio files were, how likely the mental cooldown and control group audio files were to have negative effects, how knowledgeable the creators of the audio files were, and how trustworthy the information conveyed in the audio files was. Responses are given on a 7-point Likert-type scales that are specific to the content of the items (e.g., 1 = *unethical* and 7 = *fully ethical*, 1 = *very ineffective* and 7 = *very effective*). High scores indicate greater perceived favorability of the audio files. The internal consistency of the TAQ was acceptable in the current study (Cronbach's $\alpha = .79$).

Audio file evaluation. Per the suggestion of Tenenbaum et al. (2007) that single-item scales be used in field settings to support timely completion of data collection, three single-item scales were created to assess participants' perceptions of the audio files in terms of content relevance (1 = *not at all relevant* to 7 = *very relevant*), liking for the audio files (1 = *not at all* to 7 = *very much)*, and desire to listen to the audio files after workouts in the future (1 = *not at all* to 7 = *very much)*.

Check on the experimental manipulation. The multiple-choice item, "What was the audio file you listened to about? (a) history of gyms, (b) mental cooldown and exercise enjoyment, (c) physiological changes caused by sport and exercise activities, or (d) other" was used

to assess participants' understanding of the content of their assigned audio file.

Procedure

Following approval by the Institutional Review Board, participants who exercised or attended exercise classes completed their workouts. As detailed in Figure 1, interested participants (N = 65) were directed to the online study via a link to the Qualtrics survey platform and gave informed consent. Participants (n = 11) who did not meet research criteria (who had not just completed exercise or who did not correctly identify the content of the audio file they listened to) were directed out of the study. The remaining 54 participants were randomly assigned to listen to information about gymnasiums (control group) or a mental cooldown (experimental group) audio file that was approximately 4 min in length. The experimental and control audio files were of similar format and length and read by the same person, a trained mindfulness facilitator. The exercise mental cooldown audio script is presented in Table II. After listening to their randomly assigned audio file, participants filled out questionnaires pertaining to themselves, their workouts, and the audio files.

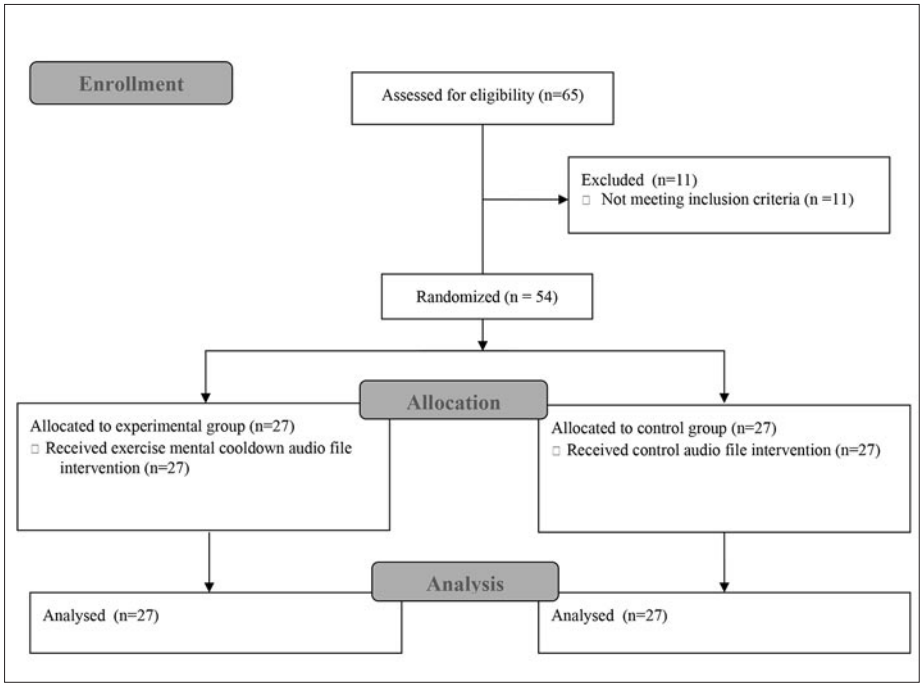

Fig. 1. - Intervention Flow Chart.

TABLE II
Exercise Mental Cooldown Audio Script.

Now it's time for a mental cooldown. Take a slow, deep breath and as you exhale, let your shoulders relax. Now close your eyes and take another slow, deep breath in through your nose, and exhale slowly through your mouth. Now, breathe in-2-3-4 and out-2-3-4. Resume breathing normally.

With your eyes still closed, think about your workout today. What are your thoughts and feelings about today's workout?

As you think about your workout, get a clear picture in your mind of what you enjoyed. It could be your ability to "just do it," your effort, something you said to yourself, the people you worked out with, or even something about the place you were exercising. Now, notice what that enjoyment feels like. Where in your body do feel this enjoyment? You might notice your heart, your abdomen, or pleasant sensations in your hands or feet. With each breath you take, you are building the capacity to feel enjoyment in future workouts.

As the feeling of what you enjoyed starts to fade, can you add a spark of energy deep inside? Feel the energy spread throughout your body, from your core, down into your legs, and then up through your core and into your arms and then up into your head. Allow this energy to grow throughout your body. Notice how this energy feels. Energy can help power your efforts to achieve your exercise and other goals.

When you hear the bell ring, open your eyes and proceed with your day, feeling energized, alert, and calm. [end with bell sound]

Results

RANDOMIZATION

Participants in the experimental and control groups who gave informed consent, reported having completed exercising within the past 15 minutes, completed relevant questionnaires, and correctly identified the content of their audio file on the manipulation check item were compared via a 2 (condition: experimental, control) X 2 (age group: under age 50, over age 50) MANOVA to determine if randomization had been successful in creating equivalent groups in terms of the number of times they exercised per week, length of workouts, how hard they worked out, perceived exertion (RPE), enjoyment of the exercise, current feelings, and likelihood of engaging in future exercise. Results revealed that the condition X age group multivariate interaction was not statistically significant, Wilks' lambda = .87, F (9, 41) = 0.66, p = .74, η_p^2 = .13, and that the main effects for condition, Wilks' lambda = .88, F (9, 41) = 0.64, p = .76, η_p^2 = .12, and age group, Wilks' lambda = .72, F (9, 41) = 1.82, p = .10, η_p^2 = .29, also were not statistically significant. Because the groups did not differ significantly from each other on key variables, all 54 participants were included in subsequent analyses. Means and standard deviations are presented in Table III.

MAIN ANALYSIS

A 2 (condition: experimental, control) X 2 (age group: under age 50, age 50 and over) MANOVA was performed on participant ratings on: (a) the

TABLE III
Means and Standard Deviations by Condition and Age Group.

Variable	Mental Cooldown (n = 27)		Control (n = 27)		Under Age 50 (n = 25)		Age 50 and Older (n = 29)	
	M	(*SD*)	*M*	(*SD*)	*M*	(*SD*)	*M*	(*SD*)
Age	40.15	(23.20)	50.70	(22.50)	22.16	(6.82)	66.38	(6.36)
Workout length (min)	72.46	(34.70)	61.74	(30.83)	78.64	(43.61)	58.21	(15.07)
Workout difficulty	4.15	(1.05)	4.11	(1.19)	4.04	(1.06)	4.21	(1.17)
Feeling scale	3.37	(2.04)	3.15	(2.05)	2.84	(2.50)	3.62	(1.47)
RPE average	14.19	(2.89)	13.44	(2.01)	13.96	(2.81)	13.69	(2.24)
RPE max	15.56	(2.42)	14.78	(2.28)	15.28	(2.69)	15.07	(2.09)
PACES	5.99	(1.00)	5.80	(1.08)	6.14	(0.81)	5.69	(1.77)
Likely to exercise	6.11	(1.45)	6.63	(0.74)	6.00	(1.47)	6.69	(0.71)

TAQ (the acceptability of the audio files participants listened to); (b) relevance of the audio files; (c) liking of the audio files; and (d) interest in listening to the audio files after workouts in the future. The condition X age group multivariate interaction was not statistically significant, Wilks' lambda =.95, F (4, 47) = 0.65, p = .63, η_p^2 = .05, but the multivariate main effects for audio file condition, Wilks' lambda = .70, F (4, 47) = 5.01, p = .002, η_p^2 = .30, and age group, Wilks' lambda = .78, F (4, 47) = 3.41, p = .02, η_p^2 = .23, were both statistically significant. Univariate tests were conducted for the statistically significant main effects. With regard to the main effect for condition, participants rated the mental cooldown audio file as being significantly more relevant, F (1,50) = 10.16, p = .002, η_p^2 = .17, likable, F (1,50) = 5.77, p = .02, η_p^2 = .10, and something they wanted to listen to after workouts in the future, F (1,50) = 14.87, p = .000, η_p^2 = .23, than the audio file about gymnasia. There were no other statistically significant univariate effects for condition. Means, standard deviations, and results of univariate tests are presented in Table IV.

TABLE IV
Means, Standard Deviations, and Univariate Tests by Condition.

Variable	Mental Cooldown (n = 27)		Control (n = 27)			
	M	(*SD*)	*M*	(*SD*)	*F*	*p*
TAQ	5.38	(0.97)	5.22	(0. 92)	0.14	.710
Relevance audio	3.96	(1.91)	2.15	(1.54)	10.16	.002
Like audio	4.30	(1.75)	3.15	(1.41)	5.77	.019
Want to listen again	3.19	(1.77)	1.56	(0.97)	14.87	.000

Univariate tests were also conducted for age group. Younger exercisers rated the audio files as being more relevant than the older exercisers, F (1,50) = 5.85, p = .019, η_p^2 = .11. There were no other statistically significant univariate effects for age group. The mental cooldown and the control audio files were rated as acceptable by participants. Means, standard deviations, and results of univariate tests are presented in Table V.

Discussion

Post-performance reflections and interventions have been advocated and used across a number of domains ranging from military operations to sport competitions (Chow & Luzzeri, 2019; Keiser & Arthur, 2020; Middlemas et al., 2018). The purpose of this research was to explore the acceptability of a specific type of post-performance reflection, an exercise mental cooldown. Because exercisers vary in age and motivation for exercise (Box et al., 2021; Moschny et al., 2011), perceptions of exercisers of diverse ages were assessed.

Primary results of this experiment indicated that exercisers found the mental cooldown to be acceptable. These results are noteworthy because: (a) the exercise mental cooldown was rated positively even though it was unfamiliar to participants, and many people dislike unfamiliar activities and resist change (Labrecque et al., 2017); (b) completing the mental cooldown was seen as acceptable even though it made exercise sessions longer (Arzu et al., 2006); and (c) the exercise mental cooldown was found to be acceptable to people of diverse ages. It seems possible that the mental cooldown provided just enough novelty to make the exercise more interesting. This contention is supported by the fact that the control group also rated their audio file as acceptable. The particular value of the mental cooldown relative to the control condition was demonstrated by mental cooldown participants' addi-

TABLE V
Means, Standard Deviations, and Univariate Tests by Age Group.

Variable	Under Age 50 (n = 25)		Age 50 and Older (n = 29)			
	M	(*SD*)	*M*	(*SD*)	*F*	*p*
TAQ	5.39	(1.12)	5.23	(0.77)	0.26	.61
Relevance audio	3.88	(2.11)	2.34	(1.50)	5.85	.02
Like audio	3.96	(1.81)	3.52	(1.55)	0.12	.73
Want to listen again	2.64	(1.85)	2.14	(1.43)	0.05	.82

tional ratings suggesting that they liked their audio file significantly more, found the content to be significantly more relevant, and would be more likely to listen to their audio file after workouts in the future.

Because previous research has shown that exercise perceptions and motivations vary by age group (Box et al., 2021), older and younger exercisers were compared in terms of their perceptions of the mental cooldown. The younger exercisers rated the content of the audio files as being more relevant than the older exercisers did. It seems possible that information about gymnasia and the mental cooldown was tied more closely to the exercise motivation and goals of the younger exercisers than to those of the older exercisers. Future researchers may want to consider allowing exercisers to choose or modify components of their mental cooldowns (e.g., content, focus, length) to increase relevance. Adding choice has been shown to enhance physical activity performance (Wulf et al., 2018). It is also possible that younger exercisers rated the audio files as being more relevant because they have greater interest in information about gymnasia and the mental cooldown components of imagery, relaxation, self-talk, and mindfulness than do older exercisers. Additional research that focuses on the content of the audio files, including the psychological skills embedded in the mental cooldown (i.e., imagery, relaxation, self-talk, and mindfulness), can help determine the extent to which individual components are acceptable to exercisers. Now that the acceptability of the mental cooldown for exercisers has been demonstrated across age groups, it will be important to identify the specific groups or types exercisers who benefit from the mental cooldown and the effects of the mental cooldown on exercise factors including exercise habits, exercise motivation, and exercise behavior.

Although promising, the results of this research have limitations. First, participants in this study were experienced exercisers, among the 20% of Americans who report meeting the recommended exercise standard of 75 to 150 minutes per week of moderate- and vigorous-intensity aerobic to accrue health benefits (U.S. Department of Health and Human Services, 2018). Research with less experienced exercisers would help determine if less active populations also find the mental cooldown to be acceptable. Second, the exercise classes studied were held during a pandemic, with many of the participants exercising via online exercise classes. Although it is possible that the acceptability of the exercise mental cooldown was affected by the delivery format, it should be noted that an in-person mental warmup for exercisers showed promising results suggesting that these sorts of mental interventions are applicable and acceptable for exercisers regardless of delivery format (Van Raalte et al., 2019).

Conclusion

This experiment evaluated the acceptability of an exercise mental cooldown relative to a control condition across age groups. Results showed that the mental cooldown was an acceptable intervention that participants rated as relevant, likable, and something that they would want to listen to after workouts in the future. Additionally, the mental cooldown is a tool that can be easily administered and widely accessed by exercisers. Interventions found to be effective in the laboratory often fail to generalize to other settings because people discontinue involvement when they no longer have access to laboratory equipment or other amenities when a study ends (Dishman, 1988). In contrast, the mental cooldown is something that exercisers can access and continue to use even upon completion of the study. Given these promising preliminary results, future research exploring the effects of the mental cooldown on willingness to exercise and exercise behavior seems warranted.

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