Impact of Auditory Listening on Emotional States in Self-paced Outdoor Running

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Abstract: Studies have shown that listening to music may evoke positive emotions when running. In recent years, the growing trend of listening to audiobooks is also inevitably influencing running. However, to date, there has been little research on the use of audiobooks in self-paced outdoor running. Therefore, our objective is to investigate whether self-paced outdoor running with auditory stimuli such as music and audiobooks may elicit different emotional states when compared to running with no-audio. Consequently, we adopted a repeated-measures design with three different counter-balanced conditions: music, audiobook, and no-audio. Thereby, thirty-two recreationally active female and male runners participated in a 10-minute running trial in each condition. We assessed the impact of auditory stimuli and emotional states with the Sports Emotion Questionnaire and the Brunel Music Rating Inventory-2. Our results of the self-report questionnaires indicate that running with music is rated with substantially greater values when compared to the audiobook condition. Interestingly, our findings uncover no meaningful difference among the self-rated emotional state dimensions anxiety, dejection, excitement, anger, and happiness across all three conditions, respectively. Hence, we conclude that running with no-audio may evoke roughly the same emotional states as when compared to running with music or audiobooks.

1 INTRODUCTION

With increasing digitization and the spread of new technologies, the way we perceive and consume media is remarkably changing. Since several years, portable devices such as MP3 players have gained widespread popularity amongst runners around the globe. Thereby, numerous recreationally active as well as professional runners across age and gender prefer listening to music when running outdoors. Running has led manufacturers of music-enabled devices to develop ever lighter and more ergonomic devices (Karageorghis, 2016; Bigliassi et al., 2015). Many runners prefer mobile listening to music by the use of headphones which may create an acoustic environment that is set apart from the outside world and dissociates themselves into a kind of cocoon (Bull, 2015). Beneficial effects of music in sports have especially been found in repetitive activities like running (Karageorghis and Priest, 2012a; Terry and Karageorghis, 2011). In general, musical effects are explored in the field of exercise and sport in four areas of research: (1) *psychological*, (2) *psychophysical*, (3) *ergogenic*, and (4) *psychophysiological* effects of music (Terry and Karageorghis, 2011; Karageorghis et al., 2012; Karageorghis and Priest, 2012a; Karageorghis, 2016).

1.1 Audiobooks

Since the advent of mobile technology traditional books can be provided as a digital audiobook which is characterized by the small portable format that creates new affordances and a multitude of possible applications (Have and Pedersen, 2015). Conceptually, audiobooks are defined as a recording of a book that is performed by a professional narrator or the author (Have and Pedersen, 2015). Affordances can be advantages such as their convenience, portability, and supplementary status to other activities, meaning audiobooks can easily be accessed whilst engaged

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with another activity. Moreover, it was found that 81% of the surveyed audiobook listeners enjoy audiobooks because they are also able to do other things in the process of listening, whereby the top three activities while listening to audiobooks are driving, relaxing before going to sleep and doing housework (Audio Publishers Association, 2018).

Consumer studies indicate that the use of smartphones for audiobooks accounted for 73% in 2018 and are expected to continue to grow (Audio Publishers Association, 2018). In recent years, audiobooks have rapidly gained popularity (Audio Publishers Association, 2019) and listening to audiobooks has become more accessible and user-friendly thanks to mobile devices and access to digital downloading and streaming services (Rubery, 2011; Have and Pedersen, 2012; Have and Pedersen, 2015). For instance, the music streaming service Spotify offers a large library of more than 50 million music tracks, including audiobooks, and podcasts. By using Spotify's free version with advertisement, users can access a huge audio catalogue without any charge, while a pay-per-month subscription allows users to synchronise playlists for offline mobile usage (Spotify USA Inc, 2020; Kreitz and Niemela, 2010). Moreover, listening to audiobooks is saving time by enabling users to simultaneously perform other tasks (Have and Pedersen, 2015). This empowerment promotes activity and at least dual-tasking which corresponds to our modern, fast-paced society. Additionally, user experience is positively influenced by the enjoyment of the flexibility of listening to audiobooks wherever the users are.

Music versus Audiobook

In a direct comparison of the two conditions treadmill running with music versus treadmill running with an audiobook, both, ratings of enjoyment were significantly higher and ratings of perceived exertion were substantially lower in the music condition compared to the audiobook condition, respectively (Miller et al., 2010). They concluded that the situational context was more positively altered by music, than by the dialog condition audiobook. In a 12-min. cycling-bout, music reduced ratings of perceived exertion when compared to an audiobook and a control condition (Bigliassi et al., 2017). Furthermore, based on measurements with an electroencephalogram (EEG), in the music condition the attentional focus of the participants was reallocated toward auditory pathways, while inhibiting alpha resynchronization at the Cz electrode and reducing the spectral coherence values at Cz-C4 and Cz-Fz and a reduction of the focal awareness at light-to-moderate-intensities, which resulted in a more autonomous control of cycle movements in contrast to the two other conditions, respectively. In another self-paced walking study, it was identified that music induced more dissociative thoughts by the up-regulation of beta waves as well as arousal and perceived enjoyment in comparison with a podcast, and a control condition (Bigliassi et al., 2019). This reallocation of attention on external stimuli in ecologically valid settings elicited more positive affective responses in the music condition in contrast to podcast and control.

However, although ratings of perceived exertion were similar across music, podcast, and no-audio sprint interval training (SIT) conditions, researcher-selected motivational music enhanced affective responses and enjoyment to a greater extend than in the no-audio control condition, tentatively more than in the podcast condition (Stork et al., 2019). Moreover, a higher peak power output could be identified in the music condition when compared to the podcast and no-audio condition.

A dialogic condition such as an audibook has received scant research attention though it possesses external validity in this exercise domain (Karageorghis and Priest, 2012a).

1.2 The Present Study

To date, little is known if the increasingly popular trend of listening to an audiobook may be perceived as positive as listening to music in the externally valid context of self-paced outdoor running. Moreover, yet it is unclear, whether or not emotional states in self-paced outdoor running are affected and reported similarly for running with music, an audiobook, or no-audio. Consequently, in the present study, we investigated the following research questions (RQ) and hypotheses (H):

RQ1: Music versus Audiobook. Do runners prefer listening to music or to an audiobook in self-paced running?

H_1: We hypothesize that runners assign substantially more positive ratings to the music than to the audiobook condition in self-paced running.

RQ2: Difference between Emotional States between Running Conditions. Do runners report different emotional states when running self-paced dependent on auditory input?

$H_{2.1}$. We assume that runners assign significantly more positive ratings to the positive emotional state dimensions *excitement* and *happiness* in the music condition compared to the audiobook and the no-audio (baseline) condition in self-paced running.

Thereby, we expect no meaningful difference between the audiobook and the no-audio condition.
$H_{2.2}$. We hypothesize runners to assign noticeably lower ratings to the negative emotional state dimensions *anxiety*, *dejection*, and *anger* in the music condition compared to the audiobook and the no-audio (baseline) condition in self-paced running. At the same time, we assume no considerable difference between the audiobook and the no-audio condition.

RQ3: Associations of Emotional States and Audio Ratings. Which associations can be found between emotional states and audio ratings in self-paced running?
H_3. We assume that, in self-paced running, the self-report emotional state dimensions excitement and happiness are positively associated with audio ratings, whereas the self-report dimensions anxiety, dejection, and anger are negatively associated with audio ratings in both the music and the audiobook condition.

2 METHOD

2.1 Participants

Thirty-two recreationally active runners (11 female, 21 male) between 19 and 51 years (M = 25.34; SD = 6.62) were recruited to participate in this study. Recreationally active was defined as regularly engaging in any strenuous physical activities such as aerobic, running, cycling or swimming at least once per week. According to their own statements, the study participants spent an average of 3.7 days per week (SD = 1.89) on strenuous exercise or training and run on average 6.48 km per unit. Subjects were volunteers and participated without compensation. In order to engage in the study, potential participants were required to meet the following inclusion criteria: regular participation in sports exercise for recreational purposes, prior experience in recreational running, and no contradictions for performing 30 minutes at self-paced running. Anyone with orthopedic limitations which may have prevented them from engaging in 30 minutes of running was excluded. Furthermore, all participants were fluent in [blanked] the language in which the questionnaires were provided, consumed no alcohol or drugs, and reported no diagnosis of a psychiatric or neurological disorder. Prior to participating, they were required to provide written informed consent. An institutional e-mail was distributed among members of the university and among the members of a sports group in [blanked]. The study information sheet was attached to this e-mail, explaining the objectives and potential risks associated with the study. The majority of the sample comprised of students and lecturers.

2.2 Design

We adopted a repeated measures design (3 x 10-minute of self-paced outdoor running) with three different conditions (independent variable): music (M), audiobook (A), and control (C). The dependent variables (DVs) were the five dimensions of the Sports Emotion Questionnaire and the single-factor of the Brunel Music Rating Inventory-2 (further described in 2.3). The study was conducted outdoors in an ecologically valid setting with an off-road and flat running course on the campus (cf. Figure 1) with no altitude difference. The distance of one lap was roughly 450 m.

Figure 1: Flat and off-road running course.

2.3 Measures and Instruments

To assess the psychological impact of auditory stimuli (M and A) on emotional states and feelings, we applied the Sports Emotion Questionnaire (SEQ) (Jones et al., 2005) in each condition (M, A, and C) and a slightly adapted version of the Brunel Music Rating Inventory-2 (BMRI-2) (Karageorghis et al., 2006) in both auditory conditions (M and A).

Sports Emotion Questionnaire
Emotional states and feelings of participants were measured after each condition using the sport-specific *Sports Emotion Questionnaire (SEQ)*. The SEQ comprises of a 5-factor structure assessing the self-report emotional state dimensions *anxiety*, *dejection*, *ex-*

citement, *anger*, and *happiness*. The questionnaire inquired participants' currently perceived emotional states and feelings by 22 items, each consisting of an adjective such as "uneasy", "exhilarated", or "cheerful". Participants responded to the items using a 5-level likert-scale anchored at 0 (not at all) and 4 (extremely).

Brunel Music Rating Inventory-2

To determine participants' perceived motivational impact of the auditory conditions M and A, the Brunel Music Rating Inventory-2 (BMRI-2) was applied after each auditory listening condition. This single-factor, six-item instrument, consists of different auditory components: *rhythm*, *style*, *melody*, *tempo*, *instrumentation*, and *beat*. The response options were limited to a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) for each item, for example, "The rhythm of the music would motivate me during exercise" (Karageorghis et al., 2006, p. 909). Hence, the summated total score ranges from 6 to 42, which is deemed as a measure for the motivational quotient of music that may stimulate or inspire physical activity which is described as high (36–42), moderate (24–35), and oudeterous (< 24) (Karageorghis, 2008). Reliability has been reported between .70 and .90, Cronbach's Alpha coefficient with .95, and references to criterion validity have been stated (Karageorghis et al., 2006).

In the present study, we wanted to compare the participants' self-ratings of the motivational quality of music with the motivational quality of audiobooks. Henceforward, we applied a slightly modified version of the BMRI-2 in the audiobook condition in order to account for these specific motivational qualities (cf. OSF link below).

Supplementary Materials: Open Science

We support the open science movement and supply the data set, the music playlist, the modified items of the BMRI-2, and a detailed description of the music and audiobook selection for our study on OSF: https://osf.io/urymp/.

2.4 Procedure

After a friendly welcome, each participant received an introduction to the background and the main goal of the study with all necessary information. Additionally, everyone got a written summary about the study. Then the information sheet on informed consent was handed out, which all of them signed. Thereby, everyone was explicitly informed, that the participation in this self-paced outdoor running study is voluntary. In addition, everyone was instructed about the possibility to stop at any time prior to the official end of the study without receiving any consequences. However, all of them completed the whole study without facing any difficulties. After this introductory part, all participants started with the initial 10-minute self-paced running condition (C) with no-audio, which was completed only with the SEQ. In the next phase, the allocation of all participants was randomly counterbalanced on either of the auditory listening conditions (M and A). For example, the first participant started the first 10-minute self-paced running condition with music. After running, this auditory condition (M) was rated with the BMRI-2 and the emotional states and feelings were assessed with the SEQ. Then the participant continued with 10-minute self-paced running with the audiobook. After finishing (A), the BMRI-2 and the SEQ were completed. In contrast, the second participant first received the A condition, followed by the M condition, and so on.

Auditory Conditions

We prepared several different devices (MP3, iPod, Smartphone) for the M (a compilation of tracks from the most popular Spotify running playlist with a pace ranging from 150 to 165 beat per minute (BPM)) and A condition to reduce organizational effort and ease the participation of the runners. Every participant could adjust the volume when running. Each auditory stimuli was played throughout the respective exercise trial via the participants' headphones. After 10 minutes in operation, the audio automatically stopped, signaling each participant to come back to the starting point. There the subsequent assessments with the questionnaires awaited them with a duration of about 5 minutes.

Upon completion of all three conditions, a sheet with a take-home-message about the study was handed out, accompanied with the contact and affiliation details of the examiner, in case any questions may arise later on. All data for this study were collected anonymously. The entire participation duration lasted from approximately 45 to 60 minutes. The study was carried out over a period of two days under good weather conditions.

2.5 Statistical Analyses

The significance level has been set to $\alpha = .05$, if not stated otherwise (e.g., in case of Bonferroni correction). Hence, all results with $p < \alpha$ are reported as statistically significant. Since no negatively coded items were included in the questionnaire, the total scores could be directly calculated for all five dimensions of the SEQ and the single-factor of the BMRI-2. All data were analyzed using IBM® SPSS® Statistics, Version 25 (IBM Corp., 2017).

RQ1. Because of the rating scale response format of the BMRI-2, we focused on the single-factor composite total score for which we could assume at least *pseudo-metric* level data. Additionally, Shapiro Wilk's test revealed that the assumption of normality of the BMRI-2 (DV) has been met for both conditions M and A. Therefore, we applied a two samples dependent *t*-test.

RQ2. Since the five emotional state dimensions of the SEQ (DVs) are assessed with a Likert scale response format yielding ordinal data, we applied the nonparametric Friedman test for repeated measures with the three conditions (i.e., M, A, and C) as within-subjects-factor (IV). Moreover, normal distribution has not been met for the negative emotional state dimensions anxiety, dejection, and anger in either of the three conditions.

RQ3. Given the ordinal data of the SEQ we applied the nonparametric Spearman rank correlation.

Supplementary Analysis. In a supplementary and exploratory statistical analysis, we performed a multiple linear regression analysis with the stepwise selection method for the M and the A condition, respectively.

3 RESULTS

We investigated the following three research questions (RQ1 to RQ3) with the accompanying two-sided alternative hypotheses of interest (H_1, $H_{2.1}$, $H_{2.2}$, and H_3). In addition, we performed supplementary statistical analysis to identify any emotional states as predictors for music ratings.

RQ1: Music versus Audiobook.

In the beginning, we tested our first hypothesis H_1, that recreationally active runners assign substantially greater positive ratings to the M than to the A condition on various musical components (rhythm, style, melody, tempo, instrumentation, and beat) in self-paced running. Thereby, we identified a large effect ($t(30) = 4.44; p = .000$; Cohen's $d = .80$; Power $=$ 99%) in favor for the M condition ($M = 27.84; SD = 7.01$) compared to the A condition ($M = 20.81; SD = 8.59$). Therefore, we could assume that the M condition is substantially higher rated than the A condition, what yielded to an acceptance of H_1.

RQ2: Difference between Emotional States between the Running Conditions.

To investigate our second RQ, we thematically subdivided our five self-report emotional state dimensions into positive (i.e., excitement and happiness; cf. $\mathrm{H}_{2.1}$) and negative (i.e., anxiety, dejection, and anger; cf. $\mathrm{H}_{2.2}$) emotional state assessments. For each of the five emotional state dimensions a separate statistical analysis with the Friedman test was performed to compare all three running conditions M, A, and C. Because of multiple testing, we applied the Bonferroni procedure to avoid alpha inflation and adjusted the nominal alpha level to $\alpha_{Bonf.corr.} = .01$ for each condition to maintain the overall alpha level of $\alpha = .05$.

Positive Emotional States. We tested our second hypothesis $\mathrm{H}_{2.1}$ if runners assign significantly more positive ratings to the positive self-report emotional state dimensions excitement and happiness in the M condition compared to the A and the C condition, while we assumed no difference between A and C. Our results indicate no difference between all three conditions for excitement ($\chi^2(2, N = 32) = 1.63, p = .443$) and for happiness ($\chi^2(2, N = 32) = 4.5, p = .105$), respectively. Hence, we could not confirm our hypothesis $\mathrm{H}_{2.1}$.

Negative Emotional States. Henceforward, we tested our third hypothesis $\mathrm{H}_{2.2}$ if runners assign significantly more positive ratings to the negative self-report emotional state dimensions anxiety, dejection, and anger in the M condition compared to the A and the C condition, whereby we expect no difference between A and C. Based on the necessary Bonferroni correction to control for the family-wise error rate, we found no difference between all three conditions for either of the emotional state dimensions anxiety ($\chi^2(2, N = 32) = 4.67, p = .097$), dejection ($\chi^2(2, N = 32) = 6.07, p = .048$), and anger ($\chi^2(2, N = 32) = 3.89, p = .143$). This finding did not yield an assumption of our hypothesis $\mathrm{H}_{2.2}$.

RQ3: Associations of Emotional States and Audio Ratings. Additionally, we analysed whether the dimensions excitement and happiness are positively associated with audio ratings of the BMRI-2, and if the dimensions anxiety, dejection, and anger are negatively associated with audio ratings in both auditory condition M and A (H_3). We found particularly strong and positive correlations for the positive dimensions excitement and happiness in both conditions M and A (cf. Table 1). Moreover, we uncovered consistently negative but weak correlations for the dimensions anxiety, dejection, and anger for the M and A condition, respectively. Thereby, only the dimension anger in the M condition revealed a sufficiently large effect, whereas the others showed no significant relationship (cf. Table 1). Therefore, the hypothesis H_3 can only be partly confirmed, but especially for the positive dimensions excitement and happiness.

Table 1: Spearman Correlations of Emotional State Dimensions (SEQ) and Audio Ratings (BMRI-2).

		Emotional State Dimensions				
Audio Ratings		Anxiety	Dejection	Excitement	Anger	Happiness
Music Condition	*r*	-.21	-.31	**.55***	**-.45***	**.51***
	p	.250	.082	**.001**	**.009**	**.003**
Audiobook Condition	*r*	-.22	-.27	**.64***	-.28	**.70**
	p	.233	.149	**.000**	.132	**.000**

Note. N = 32. *Significant at the Bonferroni-corrected level α = .01 (two-sided) for each condition.

Supplementary Statistical Analysis: Prediction of BMRI-2. Based on the previous correlational findings, we were interested whether any of the five emotional state dimensions may positively or negatively predict the auditory rating of the BMRI-2 (criterion variable). We performed multiple linear regression analyses with stepwise selection. We identified the emotional state dimension happiness as a stable predictor for positive BMRI-2 ratings for the M (explained variation $R^2 = .31$) and the A condition (explained variation $R^2 = .48$; cf. Table 2).

4 DISCUSSION

The primary purpose of this study was to investigate whether self-paced running with music or an audiobook is perceived and rated more positive than the other condition (**RQ1**.) In line with prior findings in the literature (Miller et al., 2010; Bigliassi et al., 2017; Bigliassi et al., 2019; Stork et al., 2019) we could confirm, that in the M condition substantially more positive audio ratings were assigned when compared to the A condition. However, none of the previous studies focused on self-paced running with a researcher-selected audiobook with an overwhelmingly rating as *funny*. As we expected, the potential additional humorous induction of the funny audiobook did not affect auditory ratings in terms of perceived inspiration for self-paced running. In contrast, the overall total score of the BMRI-2 of all runners can be categorized as oudeterous (< 24, neither motivating nor demotivating; cf. Karageorghis, 2008) for the A condition (M = 20.81), and moderately inspiring (range 24 to 35) for the M condition (M = 27.84).

Our secondary purpose of the present study was to examine if different self-paced running conditions M, A, and C may evolve more positive or more negative emotional states (**RQ2**.) Several studies have found smaller or larger effects of music of enhancing the reallocation of attentional focus to distract and dissociate from the sensation of boredom, pain, and fatigue (Morgan and Pollock, 1977; Atkinson et al., 2004; Edworthy and Waring, 2006; Karageorghis and Priest, 2012b; Bigliassi et al., 2015; Bigliassi et al., 2017; Bigliassi et al., 2019). However, our investigation focused only on a potential perceived and self-reported emotional state difference among the three conditions M, A, and C, and not on the possible reallocation of attentional focus. Nevertheless, our findings indicated no difference in self-reported emotional state dimension in any of the three conditions. Hence, we could not identify any substantial benefits in favor for any auditory condition, neither M, nor A, and we have to acknowledge that running with no-audio may elicit roughly the same emotional states in self-paced outdoor running.

Our third purpose was to assess any potential associations among self-reported emotional states such as anxiety, dejection, excitement, anger, and happiness in the M and A condition and the self ratings for the preferences of the auditory conditions (**RQ3**). Of course, we did not focus on any associations in the C (baseline) condition with no-audio, because of no auditory ratings in this condition. As expected, more positive auditory ratings were associated with more positive ratings of the positive emotional state dimensions excitement and happiness. This finding is very plausible, also because of the negative, though weak and not significant correlations of the auditory ratings (except anger in the M condition, cf. Table 1) and the negatively deemed emotional state dimensions anxiety, dejection, and anger (the later only for the A condition). Hence, we may conclude that negative emotions may have a slight but potential impact on negative auditory ratings.

Based on the correlational findings (cf. RQ3), we conducted additional **supplementary statistical analysis** to possible identify any emotional state(s) as predictor(s) for auditory ratings. Henceforward, we performed a multiple linear regression analysis with stepwise selection of any variable as potential predictor of the criterion variable (BMRI-2). In both auditory conditions M and A, the perceived and self-reported emotional state *happiness* was identified as solid predictor (also in terms of explained variations, cf. $R^2 = .31$ for the M and $R^2 = .48$ for the A condition; cf. Table 2). Interestingly, though the emotional state dimension excitement revealed substantial positive associations with the auditory rat-

Table 2: Multiple Linear Regression with Stepwise Selection: Prediction of Audio Ratings (BMRI-2).

Condition	Variable[a]	*B*	*SE*	*t*	*p*	95% CI	R^2
Music	**Happiness**	4.84	1.33	3.64	**.001***	[2.13, 7.56]	**.31**
	Anxiety	(excluded as predictor by stepwise selection)					
	Dejection	(excluded as predictor by stepwise selection)					
	Excitement	(excluded as predictor by stepwise selection)					
	Anger	(excluded as predictor by stepwise selection)					
Audiobook	**Happiness**	5.49	1.06	5.17	**.000***	[3.32, 7.66]	**.48**
	Anxiety	(excluded as predictor by stepwise selection)					
	Dejection	(excluded as predictor by stepwise selection)					
	Excitement	(excluded as predictor by stepwise selection)					
	Anger	(excluded as predictor by stepwise selection)					

Note. N = 32. Unstandardized regression coefficient B and standard error (SE);
CI = confidence interval; [a]Emotional state dimensions of SEQ.
*$p < .05$.

ings (cf. Table 1), in both linear regression analyses it was excluded as predictor as well as the emotional state dimensions anxiety, dejection, and anger.

Although several studies have been conducted with researcher-selected (also referred to as experimenter-selected) music-playlists (Atkinson et al., 2004; Edworthy and Waring, 2006; Miller et al., 2010; Stork et al., 2019), we cannot exclude that personally selected songs may have elicited more positive affective reactions. However, it was found that in a direct comparison of experimenter-selected versus self-selected music in sports, participants assigned roughly the same ratings (Moss et al., 2018). Conversely, this might prove difficult if the sample size would be increased, and it would be critical to create a seriously standardized M condition what could negatively influence potential positive findings. In this case, it should be ensured to select only music with the same BPM of the same genre with the same loudness (db).

Another potential limitation is that the audiobook excerpt chosen for the experiment was no classic novel narrative, but a live recording of a reading by the author, including background noises and audience laughter. Some test persons stated that they experienced this laughter as irritating or odd for the context of running. This aligns with qualitative responses from participants who stated that the narrator's voice appeared monotonous, as they missed the usual driving forces of rhythm and melody. Research has identified that responsiveness to music in exercise stems from musical qualities such as rhythm, melody and harmony (Karageorghis, 2016). Nevertheless, the majority of participants post-activity stated that the audiobook was quite pleasant and humorous. Some participants have expressed that the story was so capitivating that they forgot about the time when running. What should be noted in this regard is that the majority of the participants reported no previous use of audiobooks during running. Listening to an audiobook may therefore have elicited a novelty effect that would subsequently have been reduced with repeated exposure.

Apart from this, in future studies, a single-item liking scale, ranging from 1 (I do not like it at all) to 10 (I like it very much), could be considered to identify the degree to which participants preferred the condition (Bigliassi et al., 2017).

5 CONCLUSION

For the last decades, running has made the use of portable technologies such as listening to music for individual training very popular. However, the newly emerging trend of listening to audiobooks while running has only been scantly researched. So far there has been no study focusing on emotional states and listening to humorous audiobooks in recreational self-paced outdoor running. Primarily, our results revealed a clear preference in favor for auditory self-ratings of self-paced outdoor running with music when compared to audiobooks. Interestingly, we identified no self-reported affective differences in the emotional state dimensions such as anxiety, dejection, excitement, anger, and happiness across all three conditions when running with music, audiobooks, and no-audio (baseline), respectively. Hence, we assume that self-paced outdoor running with no auditory listening may elicit the same emotional states as evoked by self-paced outdoor running music or audiobooks.

In future research, it would be interesting to study the music-emotion and the audiobook-emotion link also under high physical exertion. Additionally, in contrast to many studies, it would be important to investigate whether outdoor running with an audiobook may have a positive effect in running sessions with a longer duration than 10 to 15 minutes. Furthermore, different genres of audiobooks such as novels from mystery, to thriller, and biographies should also be considered.

Finally, we conclude that even simple self-paced running in the nature with no-audio may elicit the same emotional states as when compared to running with portable auditory technologies such as music and audiobooks.

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