Chapter 12
Affective Responses to Exercise: Measurement Considerations for Practicing Professionals

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Chapter Overview

We provide guidance for the measurement of affective responses to exercise for practicing professionals. Affective responses include the pleasure and displeasure experienced before, during, and after acute bouts of exercise. Example vignettes at the beginning and end of the chapter provide illustrations of contrasting measurement approaches. In this chapter, we briefly describe hedonic theory applied to exercise behavior. Then we distinguish between the similar, but distinct, psychological constructs of core affect, emotion, and mood before discussing measurement considerations, including measure selection, timing and measurement frequency, individual variability, and the importance of neutral measurement technique. Next, we provide guidance for the measurement of remembered pleasure and forecasted pleasure. Finally, we present a hypothetical example using improved measurement techniques to illustrate how concepts from this chapter can be applied to a realistic scenario. Readers can apply this chapter to diverse settings, including, but not limited to, personal training, coaching, wellness programs, cardiac rehabilitation, occupational therapy, and physical therapy.

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Affective Responses to Exercise

Affective responses refer to the pleasure and displeasure that an individual experiences (Ekkekakis et al., 2008). A person may feel pleasure (good) or displeasure (bad) before exercise, more or less pleasure or displeasure during exercise, and pleasure or displeasure following exercise. An exerciser's affective responses may fluctuate frequently during exercise, and these changes are motivationally relevant. It is, therefore, critical that exercise professionals consider the pleasure experienced during exercise as an essential component of the exercise prescription, in addition to its safety and effectiveness (Ekkekakis et al., 2011; Ladwig et al., 2017). This chapter is intended to serve as a brief introduction to the measurement of affective responses to exercise so that both current and future practicing exercise professionals can improve the probability that their clients and patients have experiences during exercise that are pleasant, safe, and effective. Readers are encouraged to seek additional resources to improve their understanding of the measurement of affective responses to exercise, and a list of recommended further readings is provided at the end of this chapter.

Measuring Affective Responses in an Exercise Setting: An Example Vignette

To illustrate a new concept, it may be helpful to begin with an example of what should *not* be imitated. This example can then be revisited to illustrate how various concepts could be more appropriately applied. Here, we present a realistic scenario that should not be recreated. As you progress through this chapter, we hope that the weaknesses of this approach become clearer. Near the end of this chapter, we will present an example of another realistic scenario demonstrating better, evidence-based measurement techniques. Our goal is to allow readers to understand not only *how* to measure affective responses to exercise but *why* these measurement techniques should be chosen. *To avoid confusion, let us be clear*: The following vignette demonstrates flawed or misguided measurement practices. Though many of the decisions in the following vignette may seem reasonable at first glance (and you may have seen them employed by others in the field), careful consideration of the concepts discussed in this chapter should reveal ample room for improvement.

Poor Measurement Technique: A Vignette

Pat walked into the student fitness center, with the excitement of a new semester, and the goal to start an exercise program to improve his health. Pat is 19 years old and has never been a regular exerciser. In fact, Pat perceives the fitness center as if it were an alien planet. Pat meets with his personal trainer, Terry, a senior exercise and sport science major. Terry appears very fit, wearing a tight, sleeveless shirt that reveals his muscularity. In addition to assessing Pat's health history, cardiorespiratory fitness, and muscular fitness, Terry mentions that he is interested in measuring how Pat feels during exercise.

Terry: We're going to measure your affective responses to exercise.

Pat: Affective responses? What does that mean?

Terry: We're going to find out how exercise makes you feel. "Affect" is basically another way of saying your "emotions" or "mood". Exercise has been shown to make you feel better.

Pat: Sounds interesting... What do you need me to do?

Terry: Before we start, I want you to complete this survey, called the Physical Activity Affect Scale (PAAS; Lox et al., 2000). The PAAS measures how exercise changes your mood and emotions. Then, you will complete an exercise session at a moderate intensity for 20 minutes. After you're finished, you will complete the PAAS again, and we'll see how the exercise made you feel.

Pat: Why are we using this scale?

Terry: The PAAS (Lox et al., 2000) has been used to measure affective responses in many other exercise studies, and, just like the name suggests, it is a measure of affective responses to physical activity.

During the exercise session, a few of Pat's classmates walked into the fitness center. Some of them noticed he was completing exercise testing, and this made Pat feel uncomfortable, judged, and discouraged. Pat felt anxious about how his body and exercise performance looked to his classmates while he was exercising. After completing the exercise bout, Terry smiled and congratulated Pat for doing a good job before giving him the Physical Activity Affect Scale to complete a second time. To Terry's surprise, compared to baseline, Pat's responses indicated less positive affect, more negative affect, less tranquility, and more fatigue following exercise. Terry concluded that the exercise session must have depressed Pat's mood. Because Pat reported feeling worse after moderate-intensity exercise, Terry concluded that this intensity may not be a good component of an exercise prescription for Pat.

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Hedonic Theory

Hedonic theory posits that affective responses and memories of these responses have motivational value, such that people typically seek to repeat experiences that are pleasant and avoid those that are unpleasant. Humans likely seek to maximize pleasure and minimize displeasure because of its survival value. That is, feeling good often indicates that the action or experience will increase the odds of survival, while feeling bad may indicate increased risk of danger that could lead to injury or death (Panksepp, 2008). Cabanac (1992) theorized that the "maximization of pleasure, and the minimization of displeasure, not only leads to useful behavior, but is also the answer to motivational conflicts" (p. 174). Applied to the context of exercise, hedonic theory suggests that people are more likely to participate in exercise that leads them to experience pleasure and avoid exercise that makes them feel displeasure. Importantly, hedonic theory may help to explain why people often dropout from

exercise programs, despite the many well-known health benefits of physical activity.

Especially over the past two decades, hedonic theory has seen increasing theoretical (Brand & Ekkekakis, 2018; Ekkekakis, 2014; Ekkekakis & Dafermos, 2012) and empirical support among exercise scientists. For example, Williams and colleagues (2008) found that affective responses during exercise predicted future exercise behavior. In their study, participants completed a graded submaximal exercise test, where the exercise intensity became progressively more challenging over time. Affective valence, or, the pleasure and displeasure experienced by the exerciser, was measured at baseline (prior to the start of exercise), and every two minutes during exercise. Affective valence was also recorded when participants reached the moderate-intensity domain. Interestingly, the researchers observed "considerable variability" in affective responses. Specifically, 27.0% reported more pleasure during moderate-intensity exercise compared to baseline, 43.2% reported no change in affective valence, and 29.7% reported feeling less pleasure (p. 237). Afterwards, the researchers found that participants who experienced more pleasure during exercise also reported more exercise six- and 12-months later. A few years later, Williams and colleagues (2012) studied the relationship between affective responses to walking and subsequent physical activity. The researchers reported that the extent to which individuals experienced pleasure during walking was related to their future physical activity, whereas affective responses following the walk (i.e., during period of rest afterward) were unrelated to later physical activity behavior.

The relationship between affective responses to exercise and future physical activity behavior was further clarified in a systematic review by Rhodes and Kates (2015). The authors showed that the prevailing evidence suggested affective responses during exercise were related to future physical activity, while affective responses measured following exercise were not (this line of research is also discussed in Chapter 11 by Jones & Zenko, 2021). Taken together, the most recent evidence suggests that practitioners should be skilled in measuring affective responses during exercise so that they are better able to help their clients or patients discover exercises that are pleasant. Having these skills will also allow the exercise professional to monitor affective responses and adjust programming if a client or patient is experiencing displeasure and, consequently, at increased risk of dropping out.

Core Affect, Emotion, and Mood

Although the terms affect, emotion, and mood are often used interchangeably by both researchers and the public, each represents distinct, but interrelated, psychological constructs (Ekkekakis, 2012, 2013). Practitioners should understand and appreciate the distinctions between these constructs to avoid mistakenly confusing them and choosing an inappropriate measurement approach. On a related note, achieving clarity and understanding the distinction between these constructs may "also be valuable from a therapeutic perspective" (Beedie et al., 2005, p. 848). In other words, if an exercise practitioner encounters a client with a mood disorder (e.g., depression), the practitioner will be able to recognize that measuring affective responses to acute exercise is unlikely to provide useful information about changes in the mood of this client. On the other hand, if a practitioner uses techniques to measure specific emotions (e.g., anger, pride), then some changes in core affect may not be detected due to the inability of the measurement techniques to capture them (i.e., the absence of a change in anger or another specific emotion does not imply the absence of a change in core affect).

Core Affect

Core affect is a combination of pleasure-displeasure (i.e., affective valence) and how activated, or "worked-up" one feels (Russell, 1980; Russell & Barrett, 1999). Put another way, "core affect is a neurophysiological state that underlies simply feeling good or bad" (Russell, 2009, p. 1259). Core affect is omnipresent, always accessible to consciousness, but nonreflective; this means that one does not

need to "think about it" to experience it (Russell, 2009). At any given time, a person experiences some combination of pleasure-displeasure and activation (i.e., feeling worked-up/activated or not). These core affective feelings are universal to all humans and present from birth (Barrett et al., 2007). Core affect forms the basic foundation for what we experience as moods and emotions, and, it is unlikely that humans would experience these higher-order mental processes without it.

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Emotion

In contrast to core affect, emotion requires cognitive appraisal, or, a subjective interpretation of an environmental stimulus (Lazarus, 1982). Emotions have been referred to as “cognitively elaborated affective states” (Clore & Ortony, 2008, p. 629). In contrast to core affect, emotions are *always* about ”something" the individual is experiencing, either directly or indirectly. Emotions are often complex and involve core affective responses (e.g., whether the individual feels pleasure or worked-up), the cognitive appraisal of a situation or stimulus (e.g., “is this feeling or experience good or bad for me?”), bodily changes (e.g., increased heart rate, the feeling of "butterflies in the stomach"), vocal and facial expressions, and action tendencies (i.e., a connection between emotion and behavior, such as experiencing anger and engaging in problem-solving behavior; Davidson, 2003; Ekkekakis, 2012, 2013; Ellsworth, 2009; Lauckner, 2015). Moreover, while core affect is constantly accessible to consciousness, emotions are less frequent and more transient, lasting from seconds to minutes (Ekkekakis, 2013). For example, an unexpected shove from a stranger may cause an angry emotional reaction if the individual being shoved cognitively appraises the situation as a potential risk to their social status or well-being. On the other hand, physical contact between friends may be met with a happy or amused emotional reaction if the friends cognitively appraise the contact as friendly and/or nonthreatening. Examples of emotions include anger, guilt, love, and pride (Ekkekakis, 2013).

Mood

Moods share much of the same complexity as emotions but are longer lasting and their antecedents can be more ambiguous. In contrast to emotion, individuals often cannot identify precisely what led them to their current mood state (Ekman, 1994). Sometimes, a transient emotional experience, such as an angry argument with a spouse or partner, can lead to a general irritable mood state that could last from hours to days. Other times, the antecedents for moods may be cumulative or diffuse (Morris, 1992, 1999). For instance, people may report feeling depressed because they see little hope for

the future after receiving a seemingly unending accumulation of unhappy or disheartening news (i.e., cumulative). On the other hand, others may perceive that the reasons underlying their depressed mood are the collective effects of *everything* that has happened and is currently happening in their life (i.e., diffuse). Examples of moods include irritation, joyfulness, cheerfulness, and grumpiness (Ekkekakis, 2013).

The Measurement of Affective Responses to Exercise

Up to this point, we have briefly described how hedonic theory relates to exercise behavior and we have distinguished the concepts of core affect, emotion, and mood (for a more comprehensive review, see Ekkekakis, 2013). In the following sections, we focus on several methodological considerations for practitioners seeking to measure affective responses to exercise. Specifically, we emphasize measure selection, the timing and frequency of measurement, expected individual variability in affective responses to exercise, reducing measurement bias, and considerations for decreasing measurement error.

Measure Selection

How should an exercise professional choose which measures or instruments to use? There are two general approaches to selecting measures to assess affective responses to exercise. The first is by far the easiest and involves choosing a measure that "has been used by others before." However, as is often the case, the easiest approach is not necessarily the best approach. Alternatively, Ekkekakis (2012, 2013) outlined a three-step approach to measure selection. The first step involves choosing whether one wants to measure affect, mood, or emotion. As described earlier, these are three related, but distinct, psychological constructs. In the second step, the exercise professional should choose a conceptual model that is appropriate for the construct identified in the first step. The final step involves choosing a measure based on the adopted conceptual model and psychometric considerations, such as evidence of validity and reliability among people with similar characteristics (e.g., age, sex, health status) to the client of the exercise professional. We endorse this approach, and strongly recommend further examination of readings on these topics (Ekkekakis, 2012, 2013; Ekkekakis & Zenko, 2016).

For example, let's imagine an exercise professional who is interested in measuring core affective responses to exercise. Which measure or measures should be used? There are many possibilities, and some are more appropriate than others. In this scenario, the first step is completed. The exercise professional identified *core affect* as the psychological construct to be measured. Sound understanding of the differences between core affect, emotion, and mood is necessary to complete this step. Further, if a practitioner chooses to measure a specific emotion, then a complete understanding of that specific emotion is required. If, for example, a practitioner is interested in assessing *guilt*, then they should understand how guilt is different than *shame* (Miceli & Castelfranchi, 2018).

The second step requires the exercise professional to adopt a theoretical conceptualization of the construct identified in the first step (in this example: core affect). Earlier, we completed this step by adopting the conceptualization proposed by Russell and colleagues (Russell, 1980; Russell & Barrett, 1999). Accordingly, core affect is a combination two independent (i.e., orthogonal) dimensions, namely pleasure-displeasure (sometimes called affective valence) and activation (sometimes called arousal). Further, the dimension of pleasure-displeasure is considered to be bipolar (Russell & Carroll, 1999). The justification and support for this conceptualization, known as the circumplex model of affect (Russell, 1980) has been discussed elsewhere in greater detail (e.g., Ekkekakis, 2008, 2012, 2013). We encourage students and readers to consult with this literature for a more complete understanding of the theoretical underpinnings of the circumplex model of affect.

In the third step, a practitioner should select a measure that aligns with the conceptual model

that was adopted (in this example, the circumplex model of affect; Russell, 1980). This conceptual model suggests that the exercise professional should choose one measure that corresponds with the dimension of activation, and a separate measure corresponding with pleasure-displeasure. Here, there are several candidate measures such as the Felt Arousal Scale (to measure activation; Svebak & Murgatroyd, 1985) and the Feeling Scale (ranging from "I feel… *very bad* to *very good"*; Hardy & Rejeski, 1989) or Empirical Valence Scale (ranging from *most unpleasant imaginable* to *most pleasant imaginable*; Lishner et al., 2008) to measure pleasure-displeasure. Notice how pleasure-displeasure is considered to be bipolar (Russell & Carroll, 1999) and the Feeling Scale and Empirical Valence Scale are both bipolar, indicating conceptual alignment.

Practitioners should consider the available psychometric evidence supporting its validity and reliability among individuals similar to their clients. Furthermore, practitioners should make practical considerations, such as the timing and frequency of measurement. For example, administering a 15-item questionnaire multiple times throughout an exercise session might be irritating and cause a large burden on participants (and could lead to them reporting feeling worse because of it). The candidate measures described in this section are all single-item scales that can be used repeatedly during an exercise session with little burden on the exerciser. This is advantageous because it provides the exercise practitioner latitude to choose to measure affective responses multiple times throughout an exercise session. We discuss this highly impactful consideration, next.

Timing and Measurement Frequency

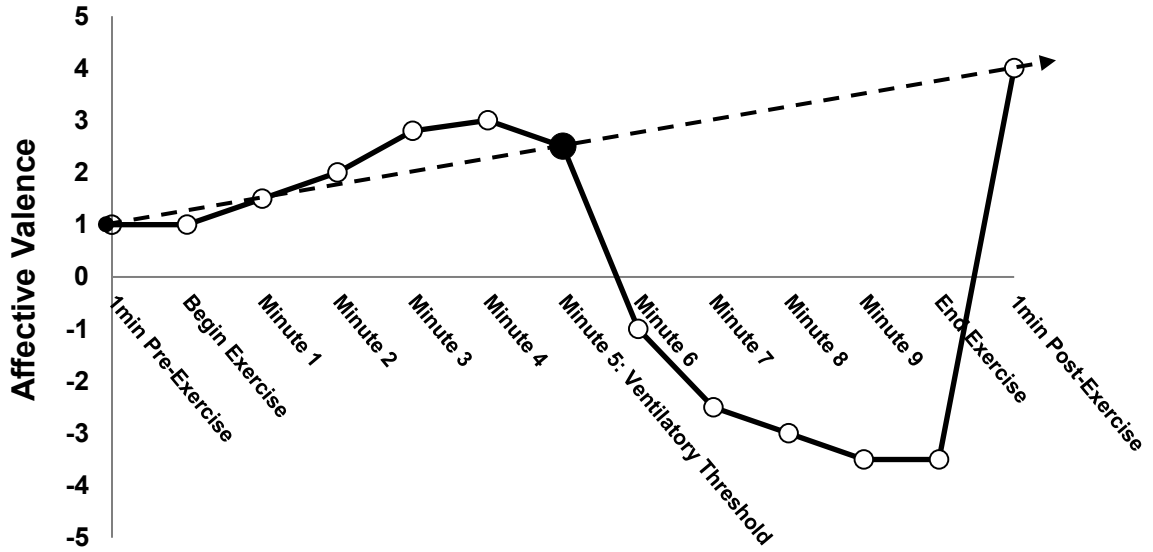
The timing and frequency at which exercisers are asked to report their affective responses during exercise can profoundly influence the interpretations of those collecting the measurements. For example, analyses of affective responses only prior to and following exercise often suggest that people "feel better" after exercise, regardless of the intensity of exercise. However, when affective responses are also collected during exercise, it becomes clear that how one feels during exercise is far from universal (Backhouse et al., 2007; Bixby et al., 2001; Hall et al., 2002; Parfitt et al., 1994). Many exercisers report increased pleasure (or less displeasure) during low- to moderate-intensity exercise. In contrast, when exercise moves beyond moderate intensity, some exercisers report feeling better, while others report feeling worse. Finally, when exercise intensity is near maximal, most exercisers report feeling worse (Ekkekakis et al., 2005, 2011). However, regardless of how the exercisers reported feeling during exercise, within a very short time after ceasing near-maximal-intensity exercise (i.e., seconds to minutes), many people exhibit an "affective rebound", where they report feeling better (Box et al., 2020; Ekkekakis et al., 2005, 2011). As it turns out, one of the most common maxims of exercise science, that "exercise makes people feel better", may be partly attributable to suboptimal measurement timing and frequency. Importantly, practitioners who assume that affective responses to exercise are universal may create situations where their clients experience increasing displeasure during exercise but report feeling better afterwards simply because the unpleasant exercise experience has finished. If these and similar instances of displeasure during exercise are experienced repeatedly, it may reduce the probability that the exerciser continues to adhere.

Therefore, to achieve a clearer understanding of the affective responses to exercise of a client, we recommend that measurement of affective responses occurs frequently before, during, and after exercise (see Ekkekakis et al., 2020) When measuring pleasure or displeasure during exercise, a practitioner assesses how the exerciser feels *right now*, at the moment, to measure the moment-to-moment changes in the *experienced pleasure* or displeasure of the exerciser. For example, in addition to reading appropriate instructions to familiarize the client or patient, a practitioner using the Feeling Scale (Hardy & Rejeski, 1989) might ask the exerciser “How do you feel *right now*?” at regular intervals. A practitioner should aim to achieve a good balance of limiting burden (i.e., not asking too many questions) but also achieving an accurate representation of how the client feels during exercise. To

balance burden with measurement accuracy, the time between measurement instances can and should be increased or decreased based on the mode, duration, and intensity of the exercise. For example, to most faithfully measure how one feels during a one-hour, steady-state bicycle ergometer test, it may make the most sense to measure the affective responses of a client at five-minute intervals (i.e., when affective responses are expected to be relatively stable). On the other hand, during a graded-exercise test to exhaustion, a practitioner should consider measuring affective responses just prior to the end of each stage to adequately capture the more rapid changes in affective responses that are to be expected with short stages of exercise. Depending on the graded-exercise test protocol, this might require measurements every one, two, or three minutes. Further illustration of the importance of measurement timing and frequency during a graded-exercise test is presented in Figure 12.1.

Figure 12.1

A Hypothetical Measurement Scenario During a Graded-Exercise Test



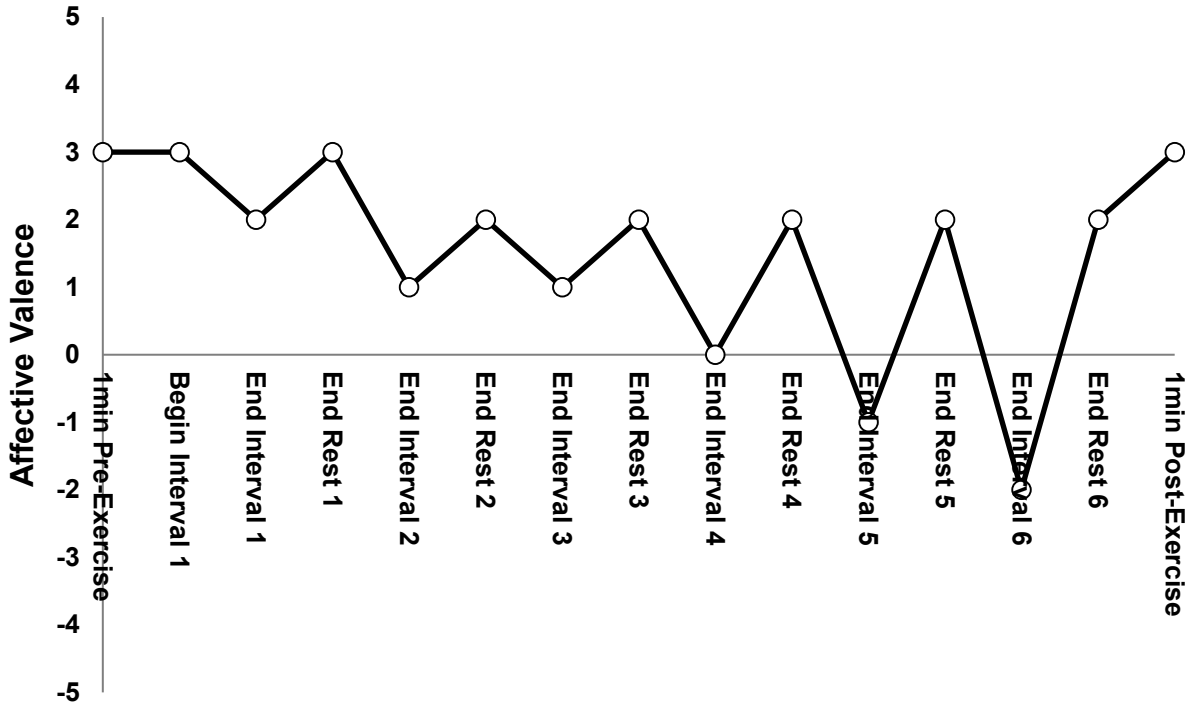
Note. A practitioner who measures affective valence only before and after exercise may conclude that the graded-exercise test to exhaustion made the exerciser feel more positive (i.e., a post-exercise value of "4", compared to a pre-exercise value of "1"). This is illustrated by the dashed arrow. However, the reality is that the affective responses of the client were much more complex. The hypothetical client felt more positive at the beginning of the session, but affective responses rapidly became less pleasant and more unpleasant (indicated by negative values) after five minutes of exercise (around the gas-exchange ventilatory threshold), before rebounding and becoming more pleasant after the exercise had ended (possibly because the client was relieved to stop exercising). This figure is adapted from an illustration and discussion presented by Backhouse and colleagues (2007).

Another increasingly popular form of exercise, namely high-intensity interval exercise, comes with its own unique challenges for exercise professionals interested in understanding the affective responses of their clients. Because interval exercise is typically characterized by short bursts of vigorous- to supramaximal-intensity exercise interspersed with periods of low-intensity recovery, even small changes in measurement timing and frequency can obscure how well the affective responses of a client are understood. Unpleasant affective responses typically rebound following cessation of vigorous-to maximal-intensity intervals (Box et al., 2020). Therefore, to best capture the range of affective responses

experienced during the frequent ups-and-downs of interval exercise, exercise professionals should ensure that their measurement timing and frequency also faithfully represents the anticipated patterns of affective responses to interval exercise. Specifically, each measurement of affect during interval exercise should be completed as close to the end of each interval as possible, as opposed to the beginning, middle, or afterward (Decker & Ekkekakis, 2017). Measurements only at the beginning or middle of intervals may not capture the anticipated peaks and valleys of affective responses during each interval. Furthermore, if measurements of affective responses about the exercise interval are solicited during the subsequent rest interval, the rapid affective rebound effect of resting may bias the interpretation of the affective experience of the client. This would also render the measure as one of *remembered pleasure*, or how pleasant or unpleasant one felt previously, rather than experienced pleasure (i.e., pleasure experienced *at that moment).* Examples of appropriate and problematic timing and frequency of measurement of affective responses during interval exercise are illustrated in Figures 12.2 and 12.3, respectively (also see Box & Petruzzello, 2021).

Figure 12.2

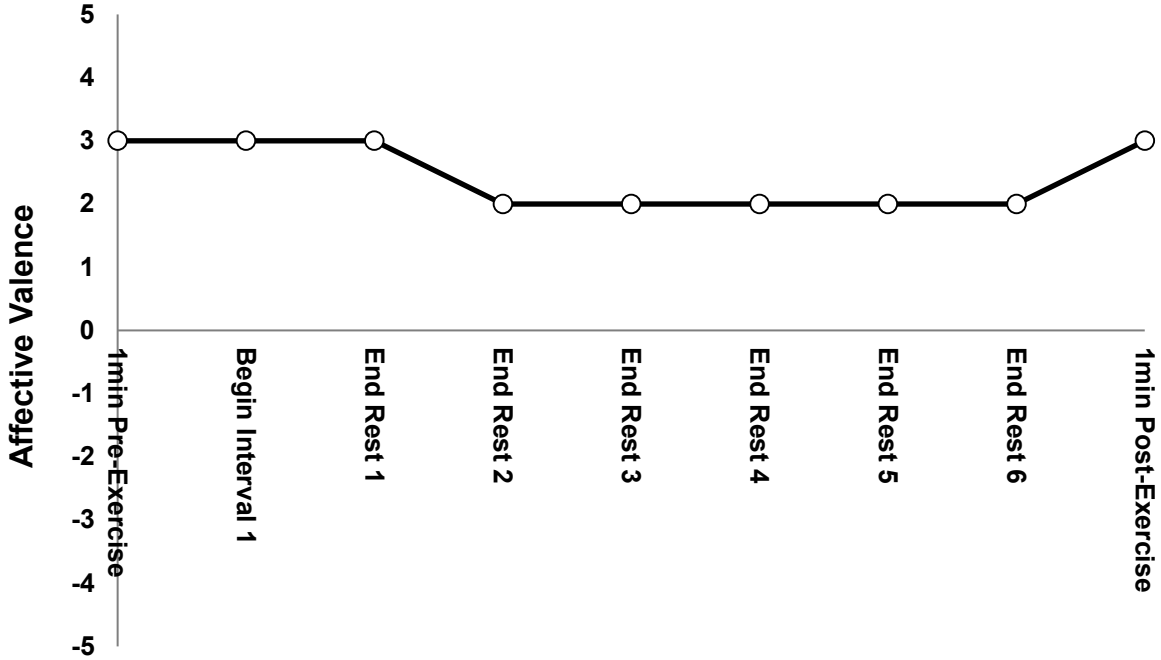
Appropriate Measurement Timing and Frequency During an Interval Exercise Session



Note. It is likely impossible to collect data at the precise end of each interval. However, to capture accurate data, practitioners should aim to measure as close to the end of each interval as possible. For example, 10-seconds before the end of each interval will help to improve the accuracy of the representation of the exercise affective experience. Using this approach, the exerciser appears to have highly variable affective responses to exercise (i.e., many affective rebounds during rest periods, and affective declines during intervals) and appears to experience negative affective valence toward the end of the exercise session (measured during Interval 5 and Interval 6). In this example, the practitioner measured affective responses consistently during both rest and interval periods.

Figure 12.3

Problematic Measurement Timing During the Same Interval Exercise Session



Note. In this case, measurements were collected at the beginning of exercise and during each rest interval of the same exercise session illustrated in Figure 12.2, obfuscating the true variability of affective responses throughout the interval exercise by missing the peaks and valleys of affective responses. Using this approach, the exerciser appears to have much more stable affective responses to exercise and appears to never experience negative affective valence.

Individual Variability

As reviewed earlier, individual variability in affective responses is to be expected, especially around the transition from moderate-to vigorous-intensity (i.e., near the ventilatory threshold; Ekkekakis, 2009; Ekkekakis et al., 2005, 2011). This dose-dependent variability is also discussed further in Chapter 11 by Jones and Zenko (2021). For example, in a seminal study by Van Landuyt and colleagues (2000), participants exercised for 30 minutes at 60% of their estimated VO_2 max, or maximal oxygen consumption. According to the American College of Sports Medicine (Garber et al., 2011), this corresponds to a "moderate" exercise intensity. Core affect was assessed during exercise using the Feeling Scale (Hardy & Rejeski, 1989) and the Felt Arousal Scale (Svebak & Murgatroyd, 1985). On average, there was no change in pleasure or displeasure during exercise, while activation increased. However, when the researchers examined individual differences in affective responses, they noted that 44.4% of participants felt increasing levels of pleasure during exercise, 14.3% exhibited essentially no change, and 41.3% felt less pleasant. Practically, these results suggest that it is prudent to analyze changes in affective responses during exercise on both the individual and group level, as opposed to just at the group level. If, for example, Van Landuyt and colleagues (2000) only assessed affective responses at the group level, they would have incorrectly concluded that exercise elicited essentially no change in the pleasure or displeasure experienced by the participants. However, because the researchers analyzed affective responses within each individual, we now know that some people will feel more pleasure during moderate-intensity exercise, while others will report feeling less.

Neutral Measurement by the Exercise Professional

The measurement fidelity of exercise affective responses can also be influenced by the person doing the measurement. When an exercise professional solicits affective responses from a client, their demeanor can subtly (or sometimes, clearly) bias the affective responses of the client. For example, simply smiling, nodding, thanking, or telling a client "good job" after receiving ratings on a measure may be interpreted by clients that the response is the one the exercise professional prefers them to make. In this situation, the exercisers may continue to rate their affective responses in this manner because they think it will make their trainer happy (i.e., provide the "socially desirable" response versus their true feelings). Exercise professionals who wish to collect accurate measures of affective responses to exercise among their clients should do their best to ask questions in a non-leading manner with neutral facial expressions and tone of voice. Whichever tone of voice and facial expression the professional adopts should be used consistently throughout exercise so that subtle changes in demeanor do not unduly influence the affective responses of the client.

Photo by Cliff Booth from Pexels

Environmental and Situational Considerations for Reducing Measurement Error

The effects that the exercise environment and individual situations can have on affective responses should be considered by exercise professionals. For example, the concept of affect can be, as with many psychological constructs, difficult to comprehend. If the person being asked about affect does not understand what is being asked, it is unlikely that they will provide data with any value. Therefore, using standardized instructions for measures, as well as asking whether the concept makes sense to the individual, can help to reduce instances of measurement error. One way that exercise practitioners can check for comprehension is to ask exercisers to explain what it is they are being asked to report. If there is a lack of understanding, the practitioner can try to clarify the concept further.

The presence of music and video can also influence how individuals perceive exercise (Lind et al., 2009; Jones et al., 2014). It has been demonstrated that when exercise is at the light- to moderate-intensity range, music and/or video can help the individual to dissociate, or distract, from the bodily

sensations associated with exercise (e.g., increased breathing rate, lactate accumulation). Put another way, having a distraction, such as music and video, can help to attenuate unpleasant feelings during exercise. For some, if the same exercise intensity is performed without music and video, their exercise affective responses may not be the same as if they were in the presence of the distracting audiovisual stimuli. Therefore, exercise professionals should consider these effects and use distractors carefully and not as a means to mask displeasure during exercise.

Some people may find exercising in front of mirrors or others unpleasant and/or embarrassing, as they perceive (whether real or imagined) that their bodies are on display and are being evaluated by others (i.e., social-physique anxiety; Sabiston et al., 2014; also see Chapter 7 by Vani et al., 2021). Exercisers who are beginners or those with low motor skillfulness may also experience displeasure if they feel they are being evaluated critically by others. Exercise professionals should probe for and be cognizant of these potential effects among their clients, ideally prior to beginning exercise. For some individuals, exercising alone, away from mirrors and the prying eyes of others, may improve their affective responses. Similarly, leadership style (e.g.., focusing on health vs. focusing on appearance) of exercise leaders in group fitness settings may influence affective responses to exercise (Raedeke et al., 2007).

Last, but not least, exercise environments that are too hot or cold may also impact how the exerciser feels and should be considered. A hot room may raise body temperature to the point where exercise becomes increasingly uncomfortable. At the same time, heat typically leads to more sweating (Harrison, 1986) and could exacerbate the influence of social-physique anxiety, as exercisers may perceive that they appear to others to be struggling with exercise due to their excessive sweating. In short, there are many potential environmental and situational influences on affective responses to exercise; practitioners should be mindful of these influences and aim to assess affective responses in a standardized setting.

The Measurement of Remembered Pleasure and Forecasted Pleasure

It is important to note that *remembered pleasure* (sometimes called recalled or remembered affect) and *forecasted pleasure* (sometimes called predicted pleasure) are distinct psychological constructs and use different measurement strategies from those discussed so far. Until now, we have discussed approaches appropriate for the measurement of moment-to-moment *experienced* core affective responses to exercise (i.e., how one feels at a given moment, assessed before, during, or after exercise). The measurement of remembered pleasure and forecasted pleasure is also occasionally included in research studies and may be useful to practitioners, but this requires a different approach. These constructs are further discussed in Chapter 11 by Jones and Zenko (2021).

Remembered pleasure is a retrospective evaluation about a previous affective experience. For example, several minutes, hours, or days after exercising in a laboratory or fitness center setting, you may consider asking your participant to evaluate their exercise session by responding to the question “How did the exercise session in the laboratory make you feel?” (Zenko et al., 2016). Likewise, forecasted pleasure might be assessed using the question “If you repeated the exercise session again, how do you think it would make you feel?” (Zenko et al., 2016). In both instances, the exerciser is required to cognitively appraise the exercise session and evaluate a past experience or make predictions about a future experience. This is different than moment-to-moment core affective assessments about how an exerciser feels *right now*. Since memories and predictions are susceptible to biases, it is expected that remembered pleasure of a previous exercise session will not be fully explained by moment-to-moment core affective responses measured during the actual exercise session. Likewise, it is expected that predictions and affective forecasts about future exercise sessions will also be biased and not fully explained by experienced pleasure or remembered pleasure.

For example, a pessimistic or apprehensive new exerciser may have felt pleasant during their first exercise session in their new program, but, based on a lifetime of unpleasant experiences, may predict feelings of displeasure even if they repeat the same exercise protocol in the future. On the other hand, experienced exercisers may feel quite unpleasant during their regular training session, but they may choose to adhere to their programming and repeat the exercise session the next day and may even predict that it will feel more pleasant. Put differently, perfect relationships between experienced pleasure, remembered pleasure, and forecasted pleasure are unlikely, even if the exerciser is evaluating the same exercise protocol. Indeed, Zenko et al. (2016) found that salient aspects of an exercise session (slope of pleasure, or the rate and direction of affective responses experienced during exercise) explained about 46% of the variance in remembered pleasure assessed about 15 minutes after the exercise session ended. Remembered pleasure, in turn, explained about 70% of the variance in forecasted pleasure, indicating that about 30% was explained by other factors.

Measuring Affective Responses in an Exercise Setting: An Example Vignette Revisited

Now it is time to return to the vignette featuring our friends, Pat and Terry, from the start of the chapter. In contrast to the previous vignette, the following example highlights evidence-based principles and techniques of the measurement of affective responses to exercise that should be emulated. It is important to acknowledge that these are not the *only* ways to measure affective responses to exercise. Instead, our goal is to demonstrate how to carefully consider measurement choices based on the best evidence currently available.

Better Measurement Technique

Pat walked into the student fitness center, with the excitement of a new semester, and the goal to start an exercise program to improve his health. Pat is 19 years old and has never been a regular exerciser. In fact, Pat perceives the fitness center as if it were an alien planet. Pat meets with his personal trainer, Terry, a senior exercise and sport science major. Terry wears comfortable exercise attire that does not overly accentuate his figure. In addition to assessing Pat's health history, cardiorespiratory fitness, and muscular fitness, Terry mentions that he is interested in measuring how Pat feels during exercise.

Terry: We're going to measure your affective responses to exercise.

Pat: Affective responses? What does that mean?

Terry: We're going to find out how exercise makes you feel. Specifically, I am interested in core affect, and I will be assessing how the pleasure and displeasure that you experience during exercise changes from moment-to-moment. At some moments, you may feel better, and at other times, you may feel worse.

Pat: This sounds interesting. What do you need me to do?

Terry: I will be administering the Feeling Scale (Hardy & Rejeski, 1989) multiple times, before, during, and after you exercise. This will allow me to have a more comprehensive understanding of your affective experience.

Pat: Why are we using the Feeling Scale (Hardy & Rejeski, 1989)?

Terry: That is a great question. Although there are many potential measures available, I am adopting the conceptualization of core affect proposed by Russell and colleagues (Russell, 1980, Russell & Barrett, 1999). This suggests that core affect is comprised of two distinct dimensions, namely affective valence, which is a bipolar dimension ranging from displeasure to pleasure (Russell & Carroll, 1999), and activation or arousal. Since I am most interested in the pleasure and displeasure that you experience, I will be using a measure that corresponds to this

dimension. The measure ranges from *very bad* to *very good* and appears to have acceptable psychometric properties in people your age. It also has practical strengths that make it acceptable for our purposes. If I was interested in measuring a distinct mood state, such as your level of *depression*, I would take an entirely different approach.

Before Pat begins exercising, Terry reads the standardized instructions of the Feeling Scale to Pat and checks for comprehension. During the exercise session, a few classmates came to the fitness center and this made Pat feel uncomfortable, judged, and discouraged. Pat felt social-physique anxiety, embarrassment, shame, and guilt when others were present (for further reading about these concepts, see Chapter 7; Vani et al., 2021). Terry made note of this observation, and when analyzing Pat's affective responses, Terry discovered that Pat reported pleasure during exercise until the classmates joined. Thankfully, the multiple assessments of affective valence allowed Terry to identify this pattern. In the presence of classmates, Pat's showed increasingly unpleasant affective responses. In addition to considering how the exercise stimulus itself made Pat feel, Terry considered the environmental and social context of the exercise session (i.e., exercising in the presence of others). Terry made another appointment with Pat so that his affective responses to exercise could be assessed in a private setting. Terry was careful not to assume that every one of his clients would have a similar pattern of affective responses to exercise. Terry recognized that, unlike Pat, others may thrive and relish the opportunity to "show off" while exercising in front of others.

Conclusion and Recommendations for Professional Practice

As exercise and sport professionals, we understand that exercise is a many-splendored thing (Ekkekakis & Dafermos, 2012). Therefore, our overarching purpose is to guide as many individuals to experience these splendors as possible. At the same time, until, as a field, we discover and implement methods to meaningfully increase physical activity among the general population, we will not have achieved our purpose. If we continue to fail to achieve this goal, there may be fewer opportunities for those pursuing careers as exercise professionals and the growth of our field may stagnate, or worse, deteriorate. Based on the evidence-base outlined in this chapter, it is becoming increasingly apparent that affective responses to exercise are a critical, but often overlooked, influence on exercise adherence. Given the ease with which measures of affective responses to exercise may be administered to clients, we suggest that, in addition to focusing on safety and effectiveness, practitioners should consider whether their clients experience pleasure during the prescribed exercise (Ekkekakis et al., 2011; Ladwig et al., 2017). Using this "affect-based" exercise prescription methodology may help new and returning (i.e., those who were once active but have been chronically sedentary) exercisers experience moment-to-moment pleasure as they begin an exercise regimen. Maximizing pleasure during exercise may increase the odds that clients remember the experience as pleasant, which, in turn, could improve their affective forecast of how they will feel repeating the exercise behavior. Careful consideration of all of these factors may increase the odds of exercise adherence.

In the preceding sections, we attempted to provide a framework to disseminate affect-based exercise prescription into regular practice among exercise professionals. Although affective responses are a complicated psychological construct to comprehend, we believe that considering the following steps will help current and future practicing professionals to rapidly incorporate this approach into their day-to-day interactions with clients:

1. First, remember that affective responses are highly variable between individuals. Therefore, it is unlikely that your clients (especially those who are chronically sedentary, unfit, or have obesity) will feel the same pleasure during exercise as students immersed in the study of exercise or sport science.

2. Always be cognizant that both (a) the way you present yourself to your clients and (b) the exercise environment can influence how your clients feel. There is a reasonable likelihood that you, an exercise professional, will be more physically fit than your clients. These discrepancies in fitness may be intimidating to some clients, so try not to draw attention to it (e.g., wearing sleeveless or revealing attire, demonstrating movements that are far beyond the skill or fitness level of your clients). In addition, some clients may prefer to exercise alone versus in the presence of others. Assessing client preferences and then subsequently acting appropriately based on those preferences may help to improve the affective experiences of your clients.
3. Frequently measure the affective responses of your clients and consider modifications based on these data. If you discover a client experiences displeasure during a certain exercise intensity, duration, and/or modality, changes to make the experience more pleasant may be necessary. These may prove to be simple, (e.g., such as reducing intensity or duration) or more complicated, such as when the modality itself is causing displeasure (e.g., non-weight bearing exercise may be more pleasurable than weight-bearing exercise for clients with excessive body mass or other biomechanical limitations). In other cases where exercise intensity is light-to-moderate, audiovisual stimuli may provide a distraction that could render mildly unpleasant exercise as more pleasant. Some modifications will require creativity from the exercise professional to ensure that the client experiences exercise as pleasantly as possible. At the same time, the extra effort committed to help a client discover what exercises maximize their pleasure could pay off for the exercise professional in the form of improved adherence, and, therefore, a more successful and consistent client base.

Learning Exercises

1. What are the differences between affect, mood, and emotion?

2. Describe the three-step process of measure selection proposed by Ekkekakis (2012, 2013).

3. Imagine that you're measuring affective responses to exercise. The exerciser is using a treadmill for 30 minutes. When, and how frequently do you measure affective responses? Which measure(s) do you use? Justify your responses.

4. It is a common belief that "exercise makes people feel better", and this is one of the many benefits of exercise. How would you respond to someone who tells you that "exercise makes people feel better"? Justify your response.

5. What are some methods you could use to help make your client feel better during exercise (also see Jones & Zenko, Chapter 11)?

Further Reading

Brand, R., & Ekkekakis, P. (2018). Affective-reflective theory of physical inactivity and exercise: Foundations and preliminary evidence. *German Journal of Exercise and Sport Research, 48*(1), 48–58. https://doi.org/10.1007/s12662-017-0477-9

Ekkekakis, P. (2008). Affect circumplex redux: The discussion on its utility as a measurement framework in exercise psychology continues. *International Review of Sport and Exercise Psychology, 1*(2), 139–159. https://doi.org/10.1080/17509840802287200

Ekkekakis, P. (2012). The measurement of affect, mood, and emotion in exercise psychology. In G. Tenenbaum, R. C. Eklund, & A. Kamata (Eds.), *Measurement in sport and exercise psychology (*pp. 321–332). Human Kinetics.

Ekkekakis, P. (2013). *The measurement of affect, mood, and emotion: A guide for health-behavioral research.* Cambridge University Press. https://doi.org/10.1017/CBO9780511820724

Ekkekakis, P., & Brand, R. (2019). Affective responses to and automatic affective valuations of physical activity: Fifty years of progress on the seminal question in exercise psychology. *Psychology of Sport & Exercise, 42,* 130–137. https://doi.org/10.1016/j.psychsport.2018.12.018

Ekkekakis, P., Hall, E. E., & Petruzzello, S. J. (2005). Variation and homogeneity in affective responses to physical activity of varying intensities: An alternative perspective on dose-response based on evolutionary considerations. *Journal of Sport Sciences, 23*(5), 477–500. https://doi.org/10.1080/02640410400021492

Ekkekakis, P., Zenko, Z., Ladwig, M. A., & Hartman, M. E. (2018). Affect as a potential determinant of physical activity and exercise: Critical appraisal of an emerging research field. In D. M. Williams, R. E. Rhodes, & M. T. Conner (Eds.), *Affective determinants of health behavior.* Oxford University Press.

Miron-Shatz, T., Stone, A., & Kahneman, D. (2009). Memories of yesterday's emotions: Does the valence of experience affect the memory-experience gap? *Emotion, 9*(6), 885–891. https://doi.org/10.1037/a0017823

Razon, S., Basevitch, I., Filho, E., Land, W., Thompson, B., Biermann, M., & Tenenbaum, G. (2010). Associative and dissociative imagery effects on perceived exertion and task duration. *Journal of Imagery Research in Sport and Physical Activity, 5*(1). https://doi.org/10.2202/1932-0191.1044

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References

Backhouse, S. H., Ekkekakis, P., Biddle, S. J. H., Foskett, A., & Williams, C. (2007). Exercise makes people feel better but people are inactive: Paradox or artifact? *Journal of Sport and Exercise Psychology, 29*(4). 498–517. https://doi.org/10.1123/jsep.29.4.498

Barrett, L. F., Mesquita, B., Ochsner, K. N., & Gross, J. J. (2007). The experience of emotion. *Annual Review of Psychology, 58,* 373–403. https://doi.org/10.1146/annurev.psych.58.110405.085709

Beedie, C. J., Terry, P. C., & Lane, A. M. (2005). Distinctions between emotion and mood. *Cognition and Emotion, 19*(6), 847–878. https://doi.org/10.1080/02699930541000057

Bixby, W. R., Spalding, T. W., & Hatfield, B. A. (2001). Temporal dynamics and dimensional specificity of the affective response to exercise of varying intensity: Differing pathways to a common outcome. *Journal of Sport & Exercise Psychology, 23*(3), 171–190. https://doi.org/10.1123/jsep.23.3.171

Box, A. G., Feito, Y., Zenko, Z., & Petruzzello, S. J. (2020). The affective interval: An investigation of the peaks and valleys during high- and moderate-intensity interval exercise in regular exercisers. *Psychology of Sport and Exercise, 49,* 101686. https://doi.org/10.1016/j.psychsport.2020.101686

Box, A. G., & Petruzzello, S. J. (2021). High-intensity interval exercise: Methodological considerations for behavior promotion from an affective perspective. *Frontiers in Psychology, 12,* 563785. https://doi.org/10.3389/fpsyg.2021.563785

Brand, R., & Ekkekakis, P. (2018). Affective-reflective theory of physical inactivity and exercise: Foundations and preliminary evidence. *German Journal of Exercise and Sport Research, 48*(1), 48–58. https://doi.org/10.1007/s12662-017-0477-9

Cabanac, M. (1992). Pleasure: The common currency. *Journal of Theoretical Biology, 155,* 173–200. https://doi.org/10.1016/s0022-5193(05)80594-6

Clore, G. L., & Ortony, A. (2008). Appraisal theories: How cognition shapes affect into emotion. In M. Lewis, J. M. Haviland-Jones, & L. F. Barrett (Eds.), *Handbook of emotions* (p. 628–642). The Guilford Press.

Davidson, R. J. (2003). Seven sins in the study of emotion: Correctives from affective neuroscience. *Brain and Cognition, 52*, 129–132. https://doi.org/10.1016/S0278-2626(03)00015-0

Decker, E. S., & Ekkekakis, P. (2017). More efficient, perhaps, but at what price? Pleasure and enjoyment responses to high-intensity interval exercise in low-active women with obesity. *Psychology of Sport and Exercise, 28*, 1–10. https://doi.org/10.1016/j.psychsport.2016.09.005

Ekkekakis, P. (2008). Affect circumplex redux: The discussion on its utility as a measurement framework in exercise psychology continues. *International Review of Sport and Exercise Psychology, 1*(2), 139–159. https://doi.org/10.1080/17509840802287200

Ekkkekakis, P. (2009). The dual-mode theory of affective responses to exercise in metatheoretical context: I. Initial impetus, basic postulates, and philosophical framework. *International Review of Sport and Exercise Psychology, 2*(1), 73–94. http://dx.doi.org/10.1080/17509840802705920

Ekkekakis, P. (2012). The measurement of affect, mood, and emotion in exercise psychology. In G. Tenenbaum, R. C. Eklund, & A. Kamata (Eds.), *Measurement in sport and exercise psychology* (pp. 321–332). Human Kinetics.

Ekkekakis, P. (2013). *The measurement of affect, mood, and emotion: A guide for health-behavioral research.* Cambridge University Press. https://doi.org/10.1017/CBO9780511820724

Ekkekakis, P. (2014). Hedonic theory. In R. C. Eklund & G. Tenenbaum (Eds.), *Encyclopedia of sport and exercise psychology* (pp. 335–337). Sage.

Ekkekakis, P., & Dafermos, M. (2012). Exercise is a many-splendored thing, but for some it does not feel so splendid: Staging a resurgence of hedonistic ideas in the quest to understand exercise behavior. In E. O. Acevedo (Ed.), *Oxford library of psychology*: *The Oxford handbook of exercise psychology* (pp. 295–333). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780195394313.013.0016

Ekkekakis, P., Hall, E. E., & Petruzzello, S. J. (2005). Variation and homogeneity in affective responses to physical activity of varying intensities: An alternative perspective on dose-response based on evolutionary considerations. *Journal of Sport Sciences, 23*(5), 477–500. https://doi.org/10.1080/02640410400021492

Ekkekakis, P., Hall, E. E., & Petruzzello, S. J. (2008). The relationship between exercise intensity and affective responses demystified: To crack the 40-year-old nut, replace the 40-year old nutcracker! *Annals of Behavioral Medicine, 35,* 136–149. https://doi.org/10.1007/s12160-008-9025-z

Ekkekakis, P., Hartman, M. E., & Ladwig, M. A. (2020). Affective responses to exercise. In G. Tenenbaum & R. C. Eklund (Eds.), *Handbook of sport psychology* (4th ed., pp. 233–253). Wiley. https://doi.org/10.1002/9781119568124.ch12

Ekkekakis, P., Parfitt, G., & Petruzzello, S. J. (2011). The pleasure and displeasure people feel when they exercise at different intensities: Decennial update and progress towards a tripartite rationale for exercise intensity prescription. *Sports Medicine, 41*(8), 641–671. https://doi.org/10.2165/11590680-000000000-00000

Ekkekakis, P., & Zenko, Z. (2016). Measurement of affective responses to exercise: From "affectless arousal" to "the most well-characterized" relationship between the body and affect. In H.L. Meiselman (Ed.), *Emotion measurement* (pp. 299–321). Woodhead.

Ekman, P. (1994). Moods, emotions, and traits. In P. Ekman & R.J. Davidson (Eds.), *The nature of emotion: Fundamental questions* (pp. 56–58). Oxford University Press.

Ellsworth, P.C. (2009). Functionalist theories of emotion. In D. Sander & K. R. Scherer (Eds.), *The Oxford companion to emotion and the affective sciences* (pp. 188–189). Oxford University Press.

Garber, C. E., Blissmer, B., Deschenes, M. R., Franklin, B. A., Lamonte, M. J., Lee, I. M., Nieman, D. C., Swain, D. P., & American College of Sports Medicine (2011). American College of Sports Medicine position stand. Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. *Medicine and Science in Sports and Exercise, 43*(7), 1334–1359. https://doi.org/10.1249/MSS.0b013e318213fefb

Hall, E. E., Ekkekakis, P., & Petruzzello, S. J. (2002). The affective beneficence of vigorous exercise revisited. *British Journal of Health Psychology, 7*, 47–66. https://doi.org/10.1348/135910702169358

Hardy, C. J., & Rejeski, W. J. (1989). Not what, but how one feels: The measurement of affect during exercise. *Journal of Sport & Exercise Psychology, 11*(3), 304–317. https://doi.org/10.1123/jsep.11.3.304

Harrison, M. H. (1986). Heat and exercise: Effects on blood volume. *Sports Medicine, 3*, 214–223

Jones, L., Karageorghis, C. I., & Ekkekakis, P. (2014). Can high-intensity exercise be more pleasant? Attentional dissociation using music and video. *Journal of Sport and Exercise Psychology, 36(*5), 528–541. https://doi.org/10.1123/jsep.2013-0251

Jones, L., & Zenko, Z. (2021). Strategies to facilitate more pleasant exercise experiences. In Z. Zenko & L. Jones (Eds.), *Essentials of exercise and sport psychology: An open access textbook* (pp. 242–270). Society for Transparency, Openness, and Replication in Kinesiology. https://doi.org/10.51224/B1011

Ladwig, M. A., Hartman, M. E., & Ekkekakis, P. (2017). Affect-based exercise prescription: An idea whose time has come? ACSM's *Health & Fitness Journal, 21*(5), 10–15. https://doi.org/10.1249/FIT.0000000000000332

Laukner, C. (2015). The emotions and action tendencies associated with viewing online cancer information among patients' loved ones. *Journal of Health Psychology, 21*(11), 2525–2537. https://doi.org/10.1177/1359105315581063

Lazarus, R. S. (1982). Thoughts on the relations between emotion and cognition. *American Psychologist, 37*, 1019–1024. https://doi.org/10.1037/0003-066X.37.9.1019

Lind, E., Welch, A. S., & Ekkekakis, P. (2009). Do 'mind over muscle' strategies work? Examining the effects of attentional association and dissociation on exertional, affective and physiological responses to exercise. *Sports Medicine, 39*(9), 743–764. https://doi.org/10.2165/11315120-000000000-00000

Lishner, D. A., Cooter, A. B., & Zald, D. H. (2008). Addressing measurement limitations in affective rating scales: Development of an empirical valence scale. *Cognition and Emotion, 22*(1), 180–192. https://doi.org/10.1080/02699930701319139

Lox, C. L., Jackson, S., Tuholski, S. W., Wasley, D., & Treasure, D. C. (2000). Revising the measurement of exercise-induced feeling states: The Physical Activity Affect Scale (PAAS). *Measurement in Physical Education and Exercise Science, 4*(2), 79–95. https://doi.org/10.1207/S15327841Mpee0402_4

Miceli, M., & Castelfranchi, C. (2018). Reconsidering the differences between shame and guilt. *Europe's Journal of Psychology*, *14*(3), 710–733. https://doi.org/10.5964/ejop.v14i3.1564

Morris, W.N. (1992). A functional analysis of the role of mood in affective systems. In M. S. Clark (Ed.), *Review of personality and social psychology* (Vol. 13, pp. 256–293). Sage.

Morris, W. N. (1999). The mood system. In D. Kahneman, E. Diener, & N. Schwarz (Eds.), *Well-being: The foundations of hedonic psychology* (pp. 169–189). Russell Sage Foundation.

Panksepp, J. (2008). The affective brain and core consciousness: How does neural activity generate emotional feelings? In M. Lewis, J. M. Haviland-Jones, & L. F. Barrett (Eds.), *Handbook of emotions* (pp. 47–67). The Guilford Press.

Parfitt, G., & Eston, R. (1995). Changes in ratings of perceived exertion and psychological affect in the early stages of exercise. *Perceptual and Motor Skills, 80*(1), 259–266. https://doi.org/10.2466/pms.1995.80.1.259

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879

Raedeke, T. D., Focht, B. C., & Scales, D. (2007). Social environmental factors and psychological responses to acute exercise for socially physique anxious females. *Psychology of Sport and Exercise, 8*(4), 463–476. https://doi.org/10.1016/j.psychsport.2006.10.005

Rhodes, R. E., & Kates, A. (2015). Can the affective response to exercise predict future motives and physical activity behavior? A systematic review of published evidence. *Annals of Behavioral Medicine, 49*(5), 715–731. https://doi.org/10.1007/s12160-015-9704-5

Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology, 39*(6), 1161–1178. https://psycnet.apa.org/doi/10.1037/h0077714

Russell, J. A. (2009). Emotion, core affect, and psychological construction. *Cognition and Emotion, 23*(7), 1259–1283. https://doi.org/10.1080/02699930902809375

Russell, J. A., & Barrett, L. F. (1999). Core affect, prototypical emotional episodes, and other things called emotion: Dissecting the elephant. *Journal of Personality and Social Psychology, 76*(5), 805–819. https://doi.org/10.1037//0022-3514.76.5.805

Russell, J. A., & Carroll, J. M. (1999). On the bipolarity of positive and negative affect. *Psychological Bulletin, 125*(1), 3–30. https://doi.org/10.1037/0033-2909.125.1.3

Sabiston, C. M., Pila, R., Pinsonnault-Bilodeau, G., & Cox, A. E. (2014). Social physique anxiety experiences in physical activity: A comprehensive synthesis of research studies focused on measurement, theory, and predictors and outcomes. *International Review of Sport and Exercise Psychology, 7*(1), 158–163. https://doi.org/10.1080/1750984X.2014.904392

Schneider, M., Dunn, A. L., & Cooper, D. (2009). Affect, exercise, and physical activity among healthy adolescents. *Journal of Sport & Exercise Psychology, 31*(6), 706–723. https://doi.org/10.1123/jsep.31.6.706

Svebak, S., & Murgatroyd, S. (1985). Metamotivational dominance: A multimethod validation of reversal theory constructs. *Journal of Personality and Social Psychology, 48*(1), 107–116. https://doi.org/10.1037/0022-3514.48.1.107

Vani, M. F., Murray, R. M., & Sabiston, C. M. (2021). Body image and physical activity. In Z. Zenko & L. Jones (Eds.), *Essentials of exercise and sport psychology: An open access textbook* (pp. 150–175). Society for Transparency, Openness, and Replication in Kinesiology. https://doi.org/10.51224/B1006

Williams, D. M., Dunsiger, S., Ciccolo, J. T., Lewis, B. A., Albrecht, A. E., & Marcus, B. H. (2008). Acute affective response to a moderate-intensity exercise stimulus predicts physical activity 6 and 12 months later. *Psychology of Sport and Exercise, 9*(3), 231–245. https://doi.org/10.1016/j.psychsport.2007.04.002

Williams, D. M., Dunsiger, S., Jennings, E. G., & Marcus, B. H. (2012). Does affective valence during and immediately following a 10-min walking predict concurrent and future physical activity? *Annals of Behavioral Medicine, 44*(1), 43–51. https://doi.org/10.1007/s12160-012-9362-9

Van Landuyt, L. M., Ekkekakis, P., Hall, E. E., & Petruzzello, S. J. (2000). Throwing the mountains into the lakes: On the perils of nomothetic conceptions of the exercise-affect relationship. *Journal of Sport and Exercise Psychology, 22*(3), 208–234. https://doi.org/10.1123/jsep.22.3.208

Zenko, Z., Ekkekakis, P., & Ariely, D. (2016). Can you have your vigorous exercise and enjoy it too? Ramping intensity down increases postexercise, remembered, and forecasted pleasure. *Journal of Sport & Exercise Psychology, 38,* 149–159. http://dx.doi.org/10.1123/jsep.2015-0286

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