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1 **Abstract**

2 This study investigated the causal influence that game situations-dependent spectator emotions
3 exert on psychological vigor. Four distinctive game situations that evoked four types of
4 spectators' emotional states—happiness, sadness, anger, and fear—were identified. Virtual
5 reality technology was utilized to replicate sport spectators' emotional experiences. The results
6 of the laboratory experiments revealed that states of vigor generally corresponded to the winner-
7 loser effect, wherein victories (or losses) are associated with positive (or negative) emotions.
8 Notably, the close victories condition exerted emotional ambivalence, resulting in mixed
9 outcomes on vigor. Moreover, anger evoked through close losses had a positive impact on vigor.
10 This study advances current understandings of sport fans' emotional ambivalence and negative
11 affect valuation tendencies. The findings provide significant implications for strategies through
12 which marketers, stakeholders, and health managers can facilitate consumer well-being via sport
13 spectatorship.
14 *Keywords:* emotional ambivalence, negative emotions, public health, spectator sports, well-being

Spectator Emotions in Predicting Psychological Vigor:

Emotional Meta Experience and Affect Valuation Perspectives

1. Introduction

Individuals inherently desire to feel energetic, strong, active, and dynamic (Shirom, 2011). This state of psychological vigor plays an invaluable role in a person's lifespan and can produce favorable psychological and behavioral outcomes in an array of contexts (Isoard-Gauthier et al., 2018). For example, psychological vigor has been shown to facilitate mental resilience and emotional stability (di Luzio et al., 2019). Individuals with high levels of vigor are not easily exhausted and tend to remain persistent in the face of major societal challenges or aversive life events (Shirom et al., 2013). Over the past decade, numerous scholars have attempted to identify and explore specific drivers that cause individuals to feel invigorated (e.g., Pulido-Martos et al., 2019; Shirom, 2011; Shraga & Shirom, 2009).

The findings of recent emotion studies suggest that psychological vigor may become either enhanced or weakened according to social and psychological connections individuals forge with a particular group (i.e., group-based emotional states, di Luzio et al., 2019; Shirom, 2011). These findings are relevant in the context of spectator sports, where fans' psychological vigor may be determined by a variety of discrete emotions they experience in response to the successes and failures of the group (i.e., a sports team) they support (Wann & James, 2019). In the current study, therefore, we focus on spectator emotions as well as the impact of emotions on psychological vigor in the context of spectator sports. This focus directly engages and aligns with the increasing calls for research that centers on the health-related consequences of spectator emotions (Cornil & Chandon, 2013; Teal et al., 2020) and the role of sport spectatorship in making an individual's life worth living (Inoue et al., 2017, 2020; Kim et al., 2017).

1 One general conclusion regarding the health impact of emotions is that negative affect
2 states (e.g., nervousness, anger, and sadness) are completely undesirable for all individuals
3 (Lench et al., 2011). This conclusion is rooted in the notion that negative emotions are likely to
4 produce diminished psychosocial functioning and health outcomes, such as depressive symptoms
5 and decreased life satisfaction (Gruber et al., 2011). However, Galderis et al.'s (2015) new
6 definitions of mental health posit that emotional ambivalence—or the simultaneous experience
7 of both positive and negative emotions—may help facilitate dynamic emotional states that can
8 improve mental resilience, emotional stability, and overall quality of life (Coifman & Summers,
9 2019). In addition, an increasing body of evidence suggests that feelings and expressions
10 associated with the same negative affect (e.g., anger) could be differently appraised according to
11 the specificities of a given situation or stimulus (Bartsch et al., 2010; Kim et al., 2015; Luong et
12 al., 2016).

13 In the context of spectator sports, the end result of a game (i.e., victories vs. losses) is
14 arguably one of the most influential elements that affect spectators' emotions. The correlational
15 account of the winner-loser effect, wherein victories (or losses) are associated with positive (or
16 negative) emotions (Booth et al., 1989), provides a clear and straightforward understanding of
17 the game outcome effects on spectator emotions as precursors of vigor. However, such
18 dichotomic accounts may overly simplify the complexities of the various scenarios that emerge
19 throughout the course of a game (Chang, 2019). Hence, scholars have increasingly highlighted
20 the significance of considering in-game dynamics and suspense (Wann & James, 2019) and
21 perceived closeness and the surprise factor (Mehta et al., 2015) as additional elements that may
22 confound the dichotomic outcomes of victories vs. losses. Specifically, the game outcomes of
23 victories and losses may be classified into (a) decisive (certain, clear, not suspenseful, and not

1 surprising) victories and losses, and (b) close (uncertain, unclear, suspenseful and surprising)
2 victories and losses (Burk et al., 2019; Mehta et al., 2015; Vermeer et al., 2020). These expanded
3 classifications may then diverge from the general conclusions based on the conventional notions
4 associated with the winner-loser effect (e.g., Booth et al., 1989; Cornil & Chandon, 2013). For
5 example, in line with the aforementioned new definitions of mental health (Galderis et al., 2015)
6 and recent research on emotion (e.g., Chang et al., 2018; Coifman & Summers, 2019), the
7 negative emotions fans experience may not all have equally detrimental consequences; rather,
8 confrontational, competitive, and rivalrous situations such as sport spectatorship may engender
9 certain types of negative emotions that are considered functional, useful, appropriate, and
10 meaningful, leading to positive health outcomes.

11 To date, however, only a handful of scholars (e.g., Jang et al., 2018; Mehta et al., 2015)
12 have explored the dynamic consequences that these different classifications of victories and
13 losses exert on sport fans' emotions and health-related outcomes. Given this void in the
14 literature, the purpose of this study is to explore game situations-dependent spectator emotions as
15 well as their impact on vigor. The current study aims to extend the existing understanding of the
16 mere correlational winner-loser effect by illuminating fans' state of emotional ambivalence that
17 may be exerted by close victories as well as the dynamic consequences that ambivalent feelings
18 have on vigor. In addition, this study investigates whether a particular form of negative emotions
19 (i.e., anger) evoked through close losses has a counterintuitive effect on vigor (i.e., a positive
20 influence rather than a negative one). The findings from this study may offer a novel insight
21 given that the experience of negative emotions and emotional ambivalence has traditionally been
22 viewed as consistently producing poor mental and physical health outcomes (Bartsch et al.,
23 2010; Gray et al., 2011). Practically, the new knowledge produced by this study provides

1 implications for developing strategies through which managers, policy makers, and health
2 professionals can help maintain and enhance spectators' well-being.

3 **2. Theoretical Background and Hypotheses Development**

4 **2.1. Theoretical framework**

5 This research synthesizes three interrelated theoretical frameworks centered on focal
6 study constructs as well as causal relationships among these constructs: conservation resources
7 (COR) theory (Hobfoll, 1989), emotional meta experience (Bartsch et al., 2010), and the affect
8 valuation model (AVM; Reifen et al., 2010). First, the COR theory asserts that people inherently
9 desire to augment their current mental resources because a decrease or loss of these resources
10 would be harmful, painful, and stressful (Hobfoll, 1989; Shirom, 2011). From this perspective,
11 psychological vigor comprises an approach-oriented mental system that guides human organisms
12 toward rewarding experiences as a way to acquire mental resources (Isoard-Gauthier et al.,
13 2018). Accordingly, in relation to emotions, the COR theory is aligned with the basic principle
14 behind the winner-loser effect (e.g., Booth et al., 1989): Victories elicit happiness, which in turn,
15 positively influences vigor; whereas losses evoke sadness, which in turn, negatively influences
16 vigor. We thus conceptualize psychological vigor as a positive affect representing the perceived
17 availability of different types of mental resources that may be either retained or lost by
18 experiencing specific game situations (victories vs. losses) in sport spectatorship.

19 Second, the concept of emotional meta experience posits that positive and negative
20 emotions can be coactivated in emotionally complex situations (Bartsch et al., 2010; Berrios et
21 al., 2015; Larsen et al., 2001). That is, the underlying neural routes of the two emotion categories
22 (i.e., positive and negative feelings) are only partially distinct, enabling individuals to
23 simultaneously experience both feelings (Russell, 2017). Among numerous types of ambivalent

1 feelings, experiencing suspense and uncertainty may engender a state of emotional ambivalence
2 characterized by a mixture of happiness and fear (Madrigal & Bee, 2005). Specifically,
3 individuals often experience a state of fear when they find themselves in situations that are
4 unclear, tentative, and conceivably intimidating (Dunn & Hoegg, 2014). In addition, those who
5 obtain tentative forms of success (or achieve a temporary high social position) tend to feel fear,
6 which in turn, causes them to act with caution given their unstable and insecure social status
7 (Steckler & Tracy, 2014). By applying this notion to the context of spectator sports, we predict
8 that close victories may activate both positive (i.e., happiness) and negative (i.e., fear) emotions.

9 Finally, the AVM suggests that the ways in which individuals appraise negative emotions
10 vary across different contexts (Reifen et al., 2010). In addition, people seldom merely appraise
11 negative emotions as aversive states. Rather, in certain contexts, they may consider experiences
12 and active expressions of negative emotions to be functional, appropriate, and meaningful
13 (Bartsch et al., 2010; Oliver & Raney, 2011). In the current research, these tenets of the AVM
14 are applied to develop the hypothesis that certain types of negative emotions (i.e., anger) caused
15 by close losses may increase psychological vigor.

16 **2.2. The concept of psychological vigor in spectator sports**

17 Psychological vigor broadly refers to a positive affect denoting a combination of
18 contentment and a positive energy balance, and is viewed as mood-like feelings that last longer
19 than (short-lived) emotions (Shirom, 2011; Shraga & Shirom, 2009). In addition, as “a unique
20 type of positive affect” (Shirom, 2011, p. 51), psychological vigor can be differentiated from
21 other types of positive affect that only represent either calm energy (e.g., pleasantness) or high-
22 intensive affect (e.g., joy) (Shraga & Shirom, 2009). More specifically, based on the COR theory
23 (Hobfoll, 1989), Shirom (2011) has defined psychological vigor as an individual’s feelings that

1 they experience the following three types—or *facets*—of mental resources: physical strength,
2 cognitive liveliness, and emotional energy. Physical strength refers to feelings associated with
3 physical capabilities and competence. Cognitive liveliness is defined as feelings related to mental
4 strength and agility. Emotional energy entails feelings of sympathy and empathy for others
5 (Shirom, 2011; Shirom et al., 2013). According to the COR theory, these three facets constitute
6 “the three most salient domains [i.e., physical, emotional, and cognitive domains] of energy that
7 humans possess” (Shraga & Shirom, 2009, p. 272), thus serving as preconditions for the
8 development and attainment of other personal resources.

9 Multiple studies have provided empirical evidence supporting the above
10 conceptualization of psychological vigor (e.g., Pulido-Martos et al., 2019; Shraga & Shirom,
11 2009). For example, Shraga and Shirom (2009) conducted interviews with individuals of public
12 and private organizations, and found that the respondents identified all three facets of vigor when
13 describing their experience of feeling invigorated (Shraga & Shirom, 2009). The vast majority
14 (77%) of the respondents also reported that they experienced these three facets simultaneously,
15 rather than separately, supporting the coexistence of the three types of mental resources (Shraga
16 & Shirom, 2009). Pulido-Martos et al. (2019) established the construct validity of the Shirom-
17 Melamed Vigor Measures (SMVM; Shirom, 2004), a 12-item scale designed to measure the
18 three facets of psychological vigor. In particular, Pulido-Martos et al.’s confirmatory factor
19 analysis demonstrated the overall model fit of the three-facet structure of psychological vigor,
20 with each of the three facets providing evidence of adequate reliability and validity. In addition,
21 the correlations between the facets ranged from .55 to .76, suggesting that these facets are closely
22 interconnected, yet capture a distinct aspect of vigor. Furthermore, according to the results of
23 model comparisons, the three-facet structure (with correlational paths between the facets) yielded

1 a better model fit compared to (a) a uni-factor model specifying all items as indicators of the
2 overall vigor construct, or (b) a second-order factor model with three first-order factors (i.e.,
3 facets) and one overarching second-order factor (Pulido-Martos et al., 2019). Altogether, the
4 collective evidence from the prior studies supported Shirom's (2011) conceptualization of
5 psychological vigor as a positive affect consisting of the three interrelated facets of physical
6 strength, cognitive liveliness, and emotional energy.

7 In recent management and organizational behavior literature, researchers have found that
8 high feelings of vigor are strengthened through work-related experiences, such as task
9 achievements and peer support (Shirom et al., 2013). Similarly, in the context of spectator sports,
10 fans' psychological vigor may become either enhanced or weakened as a result of their
11 spectating experiences. For example, fans' affective judgment of their physical capabilities and
12 mental agility often corresponds to the performance of the team they support. That is, fans may
13 consider the success of the teams they support as their own (Wann & James, 2019), and
14 therefore, a team's victories may lead them to feel physically and mentally active, agile, and
15 energetic (Booth et al., 1989; Chervonsky & Hunt, 2017; Decrop & Derbaix, 2010; Mehta et al.,
16 2015). Such pleasurable rewards function as natural incentives that contribute to fans' intrinsic
17 and long-lasting pleasure as well as their overall life satisfaction, thus encouraging them to
18 spectate subsequent games (Wann & James, 2019). In addition, compared to decisive games (i.e.,
19 predictable and/or certain), close (i.e., unpredictable and/or uncertain) games are likely to lead
20 fans to become more cognitively alive and physically peppy (Burk et al., 2019; Mehta et al.,
21 2015). Moreover, spectators tend to express sympathy and empathy for other fans who root for
22 the same team (Decrop & Derbaix, 2010).

23 **2.3. Spectator emotions as precursors of vigor**

1 Emotions have conventionally been understood as individual-specific phenomena
2 resulting from goal achievements and cognitive appraisals of risks and benefits (Smith &
3 Mackie, 2015). However, recent studies have increasingly recognized that experiencing emotions
4 is not restricted to the individual context, but could largely be influenced by group-level
5 dynamics (Campo et al., 2019) including spectatorship sports (e.g., Paek et al., 2020). Hence,
6 social psychologists have continued to highlight the significance of group-based emotions—
7 emotions that occur when an individual socially or mentally interacts with a particular group
8 (e.g., professional teams) (Smith & Mackie, 2015). Furthermore, even without direct associations
9 with a group, individuals for whom an indirect social affiliation is present tend to experience a
10 variety of specific and discrete emotions in reaction to changes in a group-based environment
11 (Angit et al., 2011; Lench et al., 2011). Accordingly, vigor functions as individuals' adaptive
12 responses, shaped in the form of semantic knowledge of their emotional states (Scherer &
13 Moors, 2019), to the successes and failures of their ingroup (di Luzio et al., 2019; Shirom, 2011).
14 In the following sections, we discuss specific game situations that potentially evoke spectators'
15 emotional states as precursors of their psychological vigor.

16 **2.3.1. Decisive victories and decisive losses: The winner-loser effect**

17 As discussed in the Introduction, we classify the game outcomes of victories and losses
18 into (a) *decisive* victories and losses, and (b) *close* victories and losses (Burk et al., 2019; Mehta
19 et al., 2015; Vermeer et al., 2020). Given these expanded classifications, we predict that fans'
20 state of vigor corresponds to the two decisive conditions (decisive victories and decisive losses,
21 respectively) by following the general notion of the winner-loser effect (Booth et al., 1989;
22 Vongas & Al Hajj, 2015). More specifically, among numerous types of discrete emotions,

1 happiness¹ is generally considered to arise from a victory (Tanzer & Weyandt, 2019), while the
2 emotion of sadness is commonly triggered by loss, failure, defeat, or a lack of hope in realizing
3 an objective (Gray et al., 2011). Individuals who experience feelings of happiness are likely to
4 experience physiological arousal, expanded attention, and increased optimism (Chervonsky &
5 Hunt, 2017; Tanzer & Weyandt, 2019). On the contrary, sadness has been found to be strongly
6 associated with feelings of boredom and fatigue, hopelessness, depression, and
7 psychophysiological distress (Gray et al., 2011; Tiedens, 2001). Thus, as an adaptive response to
8 particular events (i.e., the victories and losses of fans' favored teams), spectators' psychological
9 state of vigor—as indicated by each of its three facets—may become either strengthened or
10 weakened.

11 ***H1:*** Decisive victories will exert happiness.

12 ***H2:*** Happiness (evoked through decisive victories) will *increase* physical strength (***H2a***),
13 cognitive liveliness (***H2b***), and emotional energy (***H2c***).

14 ***H3:*** Decisive losses will exert sadness.

15 ***H4:*** Sadness (evoked through decisive losses) will *decrease* physical strength (***H4a***), cognitive
16 liveliness (***H4b***), and emotional energy (***H4c***).

17 **2.3.2. Close victories: Emotional meta experience**

18 According to the concept of emotional meta experience (Bartsch et al., 2010; Berrios et
19 al., 2015; Larsen et al., 2001), individuals often experience a state of fear when they find
20 themselves in situations that are unclear, tentative, and conceivably intimidating (Dunn &
21 Hoegg, 2014). In addition, those who obtain tentative forms of success (or achieve a temporary

¹ The term “happiness” has been conceptualized as either pleasure, engagement, or meaning (Tanzer & Weyandt, 2019). In this study, we employ the first perspective (i.e., happiness as pleasure), defining happiness as a positive emotional state arising from the experience of hedonic enjoyment (e.g., Jang et al., 2017, 2018).

1 high social position) tend to feel not only happiness (resulting from the success) but also fear and
2 anxiety, which, in turn, causes them to behave cautiously given their unstable and insecure social
3 status (Steckler & Tracy, 2014). Building on this prior understanding, we expect close victories
4 to result in the experience of ambivalent feelings that have dual effects on spectator emotions.

5 Sport spectators may perceive close victories of the team they support as a situation in
6 which the winner's position is unstable, illegitimate, vulnerable, susceptible, and tentative given
7 that these victories were barely achieved (Burk et al., 2019; Mehta et al., 2015; Vermeer et al.,
8 2020). As a consequence, in addition to happiness resulting from a team's win, spectators'
9 concerns over the possible loss of their preferred team's winning status in subsequent
10 competitions may engender the negative feeling of fear. Supporting this assumption, scholars
11 have demonstrated that individuals often display states of fear (e.g., risk aversion, avoidance, and
12 danger signaling when interacting with significant others), alongside states of happiness, when
13 tentatively achieving a victory that leads them to occupy a dominant, yet vulnerable, position
14 (Burk et al., 2019; Geniole et al., 2017; Vermeer et al., 2020). This facet of the emotional meta
15 experience, characterized by a co-occurrence of happiness and fear, arises as a means for
16 individuals to barely maintain their higher social standing, given that such higher status remains
17 susceptible and could be easily seized by their opponents (Mehta et al., 2015).

18 The emotion of fear represents the opposite end of happiness in the spectrum of emotions
19 (Hobfoll, 1989). That is, happiness facilitates the proactive acquisition of mental resources,
20 whereas fear promotes avoidance and preventive maintenance of current resources (di Luzio et
21 al., 2019). People who experience the state of fear tend to be highly aware of loss and failure,
22 and therefore, become passivistic when it comes to procuring further resources (Dunn & Hoegg,
23 2014). The fewer resources they intend to invest in resource gain, the less likely they are to

1 retrieve the marginal investment asset, which, in turn, leads to a resource loss sequence (Hobfoll,
2 1989). Thus, the feeling of fear (specifically, fear evoked from experiencing close victories)
3 fosters a negative cycle of psychological resources conservation, which produces negative effects
4 on each facet of vigor.

5 **H5:** Close victories will exert happiness.

6 **H6:** Happiness (evoked through close victories) will *increase* physical strength (**H6a**), cognitive
7 liveliness (**H6b**), and emotional energy (**H6c**).

8 **H7:** Close victories will exert fear.

9 **H8:** Fear (evoked through close victories) will *decrease* physical strength (**H8a**), cognitive
10 liveliness (**H8b**), and emotional energy (**H8c**).

11 **2.3.3. Close losses: Negative affect valuation**

12 Close losses can be understood as unstable, illegitimate, vulnerable, susceptible, and
13 tentative failures given that such disappointing outcomes are barely attained and thus represent
14 an opposite mirror of close victories (Burk et al., 2019; Mehta et al., 2015; Vermeer et al., 2020).
15 Accordingly, in addition to sadness caused from watching a team lose, feelings of anger may
16 emerge among spectators due to two major characteristics of the negative emotion of anger.
17 First, anger is induced as a result of an unfavorable situation that hinders the pursuit of a goal
18 when the suggested status quo (or the outcome of negative events) is not acceptable (Calanchini
19 et al., 2016). Second, as a byproduct of unexpected and surprising defeats, individuals may
20 desire to express anger to place the blame on their opponents and promptly prepare for
21 subsequent competitions (Harmeling et al., 2015; Kim et al., 2015). Given the prediction that the
22 two aforementioned negative emotions (i.e., sadness and anger) will emerge simultaneously, the
23 winner-loser effect only partially accounts for the impact of close losses on vigor. Thus, to fully

1 understand this impact, it is imperative to incorporate the AVM.

2 The major tenet of the AVM is concerned with the relative tendencies of emotion
3 evaluations (Luong et al., 2016; Markovitch et al., 2017). That is, individuals tend to appraise
4 negative emotions differently across situations and consumption contexts (Reifen et al., 2010).
5 Thus, certain types of negative emotions (e.g., anger) are paradoxically perceived and appraised
6 to be useful, suitable, and meaningful (Bartsch et al., 2010; Oliver & Raney, 2011). For example,
7 feeling angry as a result of witnessing a close loss is presumably acceptable and even predictable
8 for spectators. Therefore, anger is expected to promote psychological vigor, including physical
9 strength (e.g., feeling physically energetic), emotional energy (e.g., empathy toward the team
10 they support and the fans who are rooting for the same team), and cognitive liveliness (e.g.,
11 mental alertness). As such, in line with the recent suggestion of the negative affect valuation
12 account (Luong et al., 2016), we argue that the typical outcomes of the emotional states of anger
13 produce a paradoxical consequence of increasing vigor in the context of spectator sports.

14 In support of this argument, social psychologists often characterize the semantic
15 representations of anger as an individual's relative strength and power (Tiedens, 2001). As a
16 result, anger is likely to correlate with enthusiastic optimism toward accomplishments and
17 victories (Reifen et al., 2010). These characteristics may lead to approach-oriented behaviors
18 such as (a) confronting an anger-evoking target (e.g., opponent teams in spectator sports; Kim et
19 al., 2015), and (b) facilitating and reconciling the attention and support of surrounding others
20 (e.g., support from the fans rooting for the same team; Harmeling et al., 2015). As such, anger, as
21 a type of agonistic emotions (Reifen et al., 2010), could guide and catalyze the coping processes
22 associated with retaliatory behavior (Tamir et al., 2008). Similarly, anger is frequently associated
23 with deeper and closer relationships as well as proactive attempts to improve relationships

1 (Overall et al., 2015; Tiedens, 2001). As a result, people tend to perceive angry individuals as
2 dominant, convincing, capable, invigorated, and even smart (Tamir et al., 2008). All of these
3 characteristics of anger may ultimately help an individual prepare for future competitions and
4 confrontations. These emotional outcomes suggest that for fans who feel angry by experiencing
5 close losses, the emotion of anger is not just a necessary evil, but rather an effective catalyst of
6 strong fandom and team commitment that promote the three facets of psychological vigor.

7 **H9:** Close losses will exert sadness.

8 **H10:** Sadness (evoked through close losses) will *decrease* physical strength (**H10a**), cognitive
9 liveliness (**H10b**), and emotional energy (**H10c**).

10 **H11:** Close losses will exert anger.

11 **H12:** Anger (evoked through close losses) will *increase* physical strength (**H12a**), cognitive
12 liveliness (**H12b**), and emotional energy (**H12c**).

13 **3. Method**

14 **3.1. Experimental design and stimuli development**

15 A variety of game factors may determine the in-game dynamics (e.g., Madrigal & Bee,
16 2005; Wann & James, 2019) in the context of spectator sports. However, among many factors,
17 scoring differential in sporting events is one of the most visible and straightforward elements
18 representing the extent to which the end results of a game are uncertain, unclear, suspenseful,
19 and surprising. Based on this reasoning, we identified four NBA games, including two decisive
20 games (Los Angeles Lakers [winner, 111 pts.] vs. Memphis Grizzlies [loser, 88 pts.]; Golden
21 State Warriors [winner, 125 pts.] vs. Portland Trail Blazers [loser, 97 pts.]) and two close games
22 (Milwaukee Bucks [winner, 116 pts.] vs. Chicago Bulls [loser, 113 pts.]; Denver Nuggets
23 [winner, 100 pts.] vs. Golden State Warriors [loser, 98 pts.]).

1 A pretest was conducted to ensure the experimental validity of the selected stimuli. We
2 recruited 25 undergraduate students and randomly assigned them to one of the four games.
3 Participants were asked to watch a summary of the randomly selected game for 15-20 minutes.
4 To aid their spectating experiences (Uhm et al., 2020), we utilized Oculus Go, a virtual reality
5 (VR) headset. The VR headset was a standalone equipment with all the elements necessary to
6 provide a virtual reality spectatorship experience built into the headset; it used a single 5.5-
7 inch LCD display with a resolution of 1280 x 1440 pixels per eye and a refresh rate of 72 Hz.

8 After the viewing task, participants responded to the measure of in-game dynamics
9 adapted and modified from the existing studies (Burk et al., 2019; Madrigal & Bee, 2005): “The
10 in-game dynamics were compelling” (1 = *strongly disagree*, 7 = *strongly agree*), “It was a
11 [decisive/close game]” (1 = *decisive game*, 7 = *close game*), and “Considering the in-game
12 dynamics, the end result of the game was [surprising/not surprising]” (1 = *not surprising*, 7 =
13 *surprising*). The ANOVA results revealed significant differences between the two conditions. In
14 brief, the two close games were evaluated to be more dynamic ($F(1, 23) = 10.24, p = .004$.
15 $M_{\text{Decisive}} = 3.75, M_{\text{Close}} = 4.77$), close ($F(1, 23) = 7.13, p = .01$. $M_{\text{Decisive}} = 4.08, M_{\text{Close}} = 5.01$) and
16 surprising ($F(1, 23) = 6.78, p = .02$. $M_{\text{Decisive}} = 3.50, M_{\text{Close}} = 4.23$), compared to the two decisive
17 games.

18 **3.2. Procedure and measures**

19 We recruited students from a large U.S. university as potential study participants. Given
20 the protocol approved by the institutional review board, we utilized intercept samples in a public
21 setting at different buildings within the university. The research team approached students who
22 passed by or entered the data collection sites and asked them to participate in the experiment by
23 distributing a recruitment flyer. We recruited individuals who (a) indicated that they were

1 interested in NBA games to at least some degree, (b) were either undergraduate or graduate
2 students, and (c) were willing to participate in the current study. Potential participants were also
3 notified of the foreseeable risks involved with the experiment (i.e., the experience of dizziness by
4 using the VR device). Individuals who met the aforementioned criteria for study inclusion and
5 agreed to participate were guided to the experimental laboratory.

6 Upon arrival at the laboratory, an electronic consent was obtained from each individual as
7 a requirement to participate in the experiment. The participants were then randomly allocated to
8 one of the four games. They were asked to watch a summary of the randomly allocated game for
9 15-20 minutes through the Oculus Go VR headset. Participants were told that they were taking
10 part in an “Entertainment Technology and Xerophthalmia Symptoms (Dry Eye Syndrome)
11 Study,” and should be fully engaged, immersed, concentrated, and attentive while viewing the
12 game via the headset.

13 Upon completing the viewing task, participants were prompted to answer a survey
14 instrument measuring the study variables. First, they responded to the measures of the degree to
15 which they experienced affective states (Coleman & Williams, 2013; Richins, 1997), including
16 anger (“*frustrated*,” “*angry*,” and “*irritated*”), fear (“*scared*,” “*afraid*,” and “*panicky*”), sadness
17 (“*depressed*,” “*sad*,” and “*miserable*”), and happiness (“*happy*,” “*pleased*,” and “*joyful*”). The
18 format of this measurement was a seven-point scale (1 = *not at all*, 7 = *extremely*; Coleman &
19 Williams, 2013; Richins, 1997). Participants then responded to the measures of vigor and in-
20 game dynamics. Vigor was measured with SMVM (Shirom, 2004) consisting of 12 items (1 =
21 *strongly disagree*, 7 = *strongly agree*): five items for physical strength (“felt full of pep,” “felt I
22 had physical strength,” “felt vigorous,” “felt energetic,” and “experienced feelings of vitality”),
23 three items for cognitive liveliness (“felt I could think rapidly,” “felt I was capable of

1 contributing new ideas,” and “felt able to be creative”), and four items for emotional energy
2 (“felt able to show warmth to others,” “felt able to be sensitive to the needs of others,” “felt
3 capable of emotionally investing in others,” and “felt capable of being sympathetic to others”).
4 The measures of in-game dynamics were in the same format as in the pretest.

5 Participants were also asked to respond to questions about the two covariate measures of
6 NBA involvement (Kunkel et al., 2014) and fan identification (Trail & James, 2001). Lastly,
7 participants wrote a short description of the game they viewed (i.e., the names of the team they
8 supported and the opponent team as well as the final score of the game); this open-ended
9 response was utilized to categorize participants into the conditions of victories vs. losses. At the
10 end of the survey, they were debriefed and received a \$10 prepaid debit card for compensation.

11 **4. Results**

12 A total of 180² responses were included in the data analysis of which 124 were male
13 (69%). The average age of the participants was 22.81 years ($SD = 2.43$), and the majority of the
14 participants were Caucasian ($n = 151, 84\%$). The multiple items measuring happiness ($\alpha = .94$),
15 sadness ($\alpha = .81$), fear ($\alpha = .83$), anger ($\alpha = .91$), physical strength ($\alpha = .78$), cognitive liveliness
16 ($\alpha = .82$), NBA involvement ($\alpha = .87$), and fan identification ($\alpha = .95$) were all averaged to
17 designate a composite measure, respectively. Due to an internal consistency reliability problem
18 ($\alpha = .48$), one of the four items of emotional energy was dropped (“felt able to be sensitive to the
19 needs of others”), which resulted in acceptable consistency reliability of the measure ($\alpha = .74$).

20 In-game dynamics manipulations were checked through the three survey items. After
21 controlling for the two covariates, the ANCOVA results revealed significant differences between

²The results of a priori power analysis revealed that a total sample of 161 was required to achieve a power of .90 for multivariate analysis (i.e., two-tailed and medium effect size of $d = .50$). Also, the sample size of 180 is sufficient for the four-group path analysis based on the existing recommendations (e.g., Hair et al., 2009).

1 the two conditions: the two close games were perceived to be more dynamic ($F(1, 174) = 18.25$,
2 $p < .001$; $M_{\text{Decisive}} = 3.61$, $M_{\text{Close}} = 4.18$), close ($F(1, 174) = 21.07$, $p < .001$; $M_{\text{Decisive}} = 3.35$,
3 $M_{\text{Close}} = 4.01$), and surprising ($F(1, 174) = 37.76$, $p < .001$; $M_{\text{Decisive}} = 3.29$, $M_{\text{Close}} = 4.14$),
4 compared to the counterparts. Similar results were found when the two game categories (i.e.,
5 close vs. decisive) were broken down into four specific game situations. For example, close
6 victories were perceived as more significantly dynamic than decisive victories ($\beta = .72$, $SE = .19$,
7 $t = 3.79$, $p = .001$; $M_{\text{Close victories}} = 4.24$ vs. $M_{\text{Decisive victories}} = 3.52$). With respect to covariate
8 effects, the omnibus MANCOVA results revealed significant effects of NBA involvement and
9 fan identification, as displayed in Table 1; the two covariates were entered as control variables to
10 reduce the error term in the models, thereby increasing the precision of the designed estimates.

11 **4.1. Four game situations on emotions**

12 MANCOVA, as well as a series of 2 (game results: victories vs. losses) \times 2 (in-game
13 dynamics: decisive vs. close) between-subjects ANCOVA, were conducted to control for the
14 composite variables of NBA involvement and fan identification. We also employed Tukey's
15 multiple comparison test (i.e., Tukey's HSD) to compare covariate-adjusted means (i.e., least-
16 squares adjusted means: LSM) across the four different game situations.

17 After controlling for the two covariates, the MANCOVA results revealed significant
18 main and interaction effects. An inspection of the LSMs for each dependent variable indicated
19 significant main effects of game results on happiness, sadness, and anger, but not on fear.
20 Compared to losses, victories evoked significantly greater happiness ($M_{\text{victories}} = 3.96$ and $M_{\text{losses}} =$
21 2.73 , $p < .001$), but lower levels of sadness ($M_{\text{victories}} = 2.50$ and $M_{\text{losses}} = 2.83$, $p = .02$) and anger
22 ($M_{\text{victories}} = 2.36$ and $M_{\text{losses}} = 3.33$, $p < .001$); fear was not significantly different between the two
23 conditions ($M_{\text{victories}} = 2.54$ and $M_{\text{losses}} = 2.64$, $p = .45$). Also, the main effects of in-game

1 dynamics on sadness and anger were significant. Compared to the close conditions, decisive
2 game situations elicited significantly greater sadness ($M_{\text{decisive}} = 2.83$ and $M_{\text{close}} = 2.52$, $p = .02$).
3 On the other hand, close game situations evoked significantly greater anger ($M_{\text{decisive}} = 2.52$ and
4 $M_{\text{close}} = 3.10$, $p < .001$), compared to the decisive conditions. Happiness ($M_{\text{decisive}} = 3.56$ and
5 $M_{\text{close}} = 3.50$, $p = .75$) and fear ($M_{\text{decisive}} = 2.58$ and $M_{\text{close}} = 2.59$, $p = .87$) did not significantly
6 differ between the two conditions.

7 With respect to the interaction effects of game results \times in-game dynamics, the results
8 were significant on happiness and sadness. However, the interaction effects were not significant
9 on anger and fear. Specifically, in the decisive victories condition, the feeling of happiness was
10 the most prominent emotion category. Also, along with close victories, decisive victories exerted
11 the happiest state ($M_{\text{decisive victories}} = 4.28$ vs. $M_{\text{close victories}} = 3.95$, $p = .19$) compared to the other
12 game situations, including close losses ($M = 3.16$, $p < .001$) and decisive losses ($M = 2.46$, p
13 $< .001$). These results support *H1*. Inversely, decisive losses ($M = 3.49$) exerted the saddest state
14 compared to all other game situations, including close victories ($M = 2.62$, $p < .001$), close losses
15 ($M = 2.43$, $p < .001$), and decisive victories ($M = 2.39$, $p < .001$); thus, *H3* is supported.

16 Similar to decisive victories, in the close victories condition, happiness ($M = 3.95$) was
17 the most evident emotion category: along with decisive victories, close victories exerted the
18 happiest state compared to the other game situations, including close losses ($M = 3.16$, $p < .001$)
19 and decisive losses ($M = 2.46$, $p < .001$). This result supports *H5*. Close victories ($M = 2.67$) did
20 not exert significantly different states of fear, compared to all other game conditions, including
21 decisive loss ($M = 2.79$, $p = .93$), close loss ($M = 2.55$, $p = .88$), and decisive victories ($M = 2.44$,
22 $p = .54$). Thus, *H7* is not supported. In close losses, the least prominent emotion profile was
23 sadness, while the most evident emotion category was anger. That is, except for decisive losses,

1 sadness had non-significant differences among the three conditions of close victories ($M = 2.62$),
2 close losses ($M = 2.43$), and decisive victories ($M = 2.39$), rejecting $H9$. However, along with the
3 decisive losses condition, close losses ($M_{\text{decisive losses}} = 3.09$ vs. $M_{\text{close losses}} = 3.47$, $p = .17$) revealed
4 the highest level of anger compared to all other game situations, including close victories ($M =$
5 2.62 , $p < .001$) and decisive victories ($M = 2.14$, $p < .001$). These results provide empirical
6 evidence for $H11$. In sum, the results supported $H1$, $H3$, $H5$, and $H11$, but rejected $H7$ and $H9$.

7 **4.2. Emotions on vigor**

8 By following the existing guidelines (Kellar & Kelvin, 2013; Rosseel, 2013)³, we
9 employed path analysis to examine the effects of four discrete emotions on the three facets of
10 psychological vigor; the four game situations were included as a categorical moderator variable.
11 Given the saturated model tested, the model fit was perfect. In decisive victories, happiness was
12 the sole significantly positive predictor of all facets of vigor, including physical strength ($\beta = .47$,
13 $p < .001$), cognitive liveliness ($\beta = .35$, $p = .007$), and emotional energy ($\beta = .45$, $p < .001$).
14 These results support $H2a$, $H2b$, and $H2c$. On the other hand, decisive losses had significant
15 negative effects of sadness solely on emotional energy ($\beta = -.29$, $p = .06$); the paths from sadness
16 to physical strength and cognitive liveliness were both not significant. Thus, $H4a$ and $H4b$ were
17 unsupported, but $H4c$ was supported. Additionally, the game situation of decisive losses had
18 significant positive effects of happiness on emotional energy ($\beta = .48$, $p = .001$). The paths from
19 the other three emotions to the three components of psychological vigor were all non-significant.

20 With respect to the close victories condition, happiness had a positive influence on

³Based on the existing recommendations, we tested the assumptions of multiple regression analysis and path analysis. The results indicated no apparent violations of the underlying assumptions. For example, with respect to multicollinearity, the highest correlation among independent variables was .45 (i.e., Fear & Anger in Close Victories), well below the threshold for violation; also, in all regression models examined, none of the variables exceeded the tolerance of < 0.01 , and variance inflation factor scores were all close to 1, indicating the absence of multicollinearity (Kellar & Kelvin, 2013; Rosseel, 2013).

1 physical strength ($\beta = .63, p < .001$) and cognitive liveliness ($\beta = .49, p = .001$), while its
2 influence on emotional energy was not significant ($\beta = .12, p = .48$). These results supported *H6a*
3 and *H6b*, but rejected *H6c*. Also, close victories had a negatively significant influence of fear on
4 physical strength ($\beta = -.33, p = .002$). All other paths from fear were non-significant. These
5 results supported *H8a*, but did not support *H8b* and *H8c*. In the meantime, the path from anger to
6 physical strength was positively significant ($\beta = .27, p = .01$) in this condition. In the close losses
7 condition, sadness had a negatively significant influence solely on physical strength ($\beta = -.45, p$
8 $< .001$). However, anger had a significantly positive influence on the two facets of psychological
9 vigor, including physical strength ($\beta = .28, p = .02$) and cognitive liveliness ($\beta = .45, p < .001$).
10 All other paths from sadness and anger were non-significant. These results provide empirical
11 support for *H10a*, *H12a*, and *H12b*, while rejecting *H10b*, *H10c*, and *H12c*. In this condition, the
12 following two paths were also significant: positive influences of happiness on physical strength
13 ($\beta = .23, p = .04$) and emotional energy ($\beta = .71, p < .001$). In brief, the results supported *H2a*,
14 *H2b*, *H2c*, *H4c*, *H6a*, *H6b*, *H8a*, *H10a*, *H12a*, and *H12b*. However, the empirical evidence did
15 not confirm the following hypotheses: *H4a*, *H4b*, *H6c*, *H8b*, *H8c*, *H10b*, *H10c*, and *H12c*.

16 5. Discussion

17 This study explored game situations-specific spectator emotions and their impact on
18 psychological vigor, providing the following contributions. First, this study confirmed the
19 theoretical proposition that individuals experience a variety of discrete emotions corresponding
20 to their appraisals of the successes and failures of their ingroup (Campo et al., 2019; Coleman &
21 Williams, 2013). Second, beyond the predominant account of the winner-loser effect (Booth et
22 al., 1989; Geniole et al., 2017; Vongas & Al Hajj, 2015), this study elucidates sport fans'
23 emotional meta experience (i.e., close victories) and negative affect valuation (i.e., close losses).

1 Third, this study demonstrates how spectating experience, especially through its effects on
2 emotions, affects individuals' health and well-being (Inoue et al., 2020; Kim et al., 2017). That
3 is, the current study advances prior research by applying new models of mental health (Galderis
4 et al., 2015) to simultaneously test two different perspectives in which negative emotions have
5 been hypothesized to either enhance or decrease health (Bartsch et al., 2010; Oliver & Raney,
6 2011; Tiedens, 2001).

7 Fourth, methodologically, the current research validates that emotions are sufficiently
8 evoked in an experimental lab setting, and that such emotions are systematically associated with
9 the four different game situations and psychological vigor. An important contribution is,
10 therefore, a fresh methodological approach to intervene with spectator emotions. In general, it is
11 challenging to explore fan behavior associated with affective states in laboratory settings. Most
12 research attempting to manipulate emotions asks fans to recall and articulate spectating situations
13 in which they experienced a particular affect (i.e., retrospective spectating experiences).

14 Although this type of experience sampling method has proven effective (e.g., Chang et al.,
15 2018), we developed an emotion manipulation strategy that more accurately reflects spectators'
16 actual viewing experiences by utilizing virtual reality and entertainment technology. In the
17 following sections, we discuss further implications associated with specific game situations in
18 the given context.

19 **5.1. Theoretical implications**

20 **5.1.1. Confirmation and extension of the winner-loser effect**

21 The results confirmed the general notion of the winner-loser effect: Regardless of
22 whether they were decisive or close, all victories evoked happiness. Also, happiness evoked from
23 experiencing both decisive *and* close victories positively influenced the three facets of vigor.

1 Overall, the current study provides rigorous support for the winner-loser effect. In brief, the
2 positive emotion of happiness has been found to arise in response to victories (Booth et al., 1989;
3 Tiedens, 2001; Vongas & Al Hajj, 2015). Happiness helps accelerate the spreading activation of
4 the neural network in one's brain, which in turn, allows for enlarged associative linkage, flexible
5 attention, and improved mental well-being (Geniole et al., 2017; Tanzer & Weyandt, 2019).

6 Notably, in game situations that resulted in decisive and close losses, happiness positively
7 influenced two of the three facets of vigor: physical strength and emotional energy. While these
8 results diverge from our prediction, they can be explained by research on the functionality of
9 emotions. For example, according to studies on adaptive functions of positive affect (Gruber et
10 al., 2011), even in aversive life events such as the experience of seeing the loss of a favorite
11 team, those who desire to feel happy tend to show an enthusiastic and active mindset toward
12 their life in general, so that they often exhibit a strong psychophysiological resilience⁴ (Coifman
13 & Summers, 2019). The positive emotion of happiness also helps accrue personal and social
14 resources; that is, happiness-seeking individuals are often considered to be skillful and
15 experienced at constructing favorable atmosphere in their social relationships through humor,
16 creative exploration, relaxation, and optimistic thinking (Tanzer & Weyandt, 2019).

17 The results also revealed that sadness was evoked only from experiencing decisive—but
18 not close—losses. According to the conventional notion of the winner-loser effect, the negative
19 emotion of sadness is elicited from experiencing any kind of loss (Booth et al., 1989; Vongas &
20 Al Hajj, 2015). Emotion researchers, however, suggest that certain types of losses pose the
21 potential of future successes and, therefore, may not evoke sadness because humans have
22 evolved not to seek enjoyment or to avoid experiencing sadness as their ultimate goal; instead,

⁴ Psychophysiological resilience refers to individuals' capability to maintain calm during crisis/threat mentally, emotionally, and physically, or to return to pre-crisis/pre-threat status promptly (Coifman & Summers, 2019).

1 emotions are often experienced as a by-product of important factors within certain contexts or
2 situations (Angit et al., 2011). From this perspective, compared to decisive losses (i.e., complete
3 failure in achieving a desired and valued goal), close losses may suggest tentative frustrations,
4 implying the potential of future victories. Close losses may then evoke feelings (such as anger)
5 that potentially function as a motivational force (Angit et al., 2011); these feelings help
6 spectators prepare for future competitions and confrontations. As such, the results of this study
7 imply that experiencing feelings of either reduced sadness or enhanced happiness may not be
8 sought as a goal among spectators; instead, the meaningfulness (e.g., eudemonic consideration;
9 Oliver et al., 2011) of spectators' viewership activity may have important implications for
10 understanding spectators' affective experiences.

11 The current results did not support our predictions of sadness based on the conventional
12 winner-loser account (e.g., Booth et al., 1989). That is, sadness evoked through decisive losses
13 negatively influenced solely the emotional energy facet of vigor; in contrast, sadness evoked
14 through close losses negatively influenced only the physical strength facet of vigor. Accordingly,
15 it is speculated that the ways spectators feel sadness and its effects on health outcomes may not
16 be so linear or straightforward, but may be contextual, dynamic, and selective according to the
17 specificities of the conditions of a game. That is, the results imply that in addition to the types of
18 emotions, it would be important to consider the depth and magnitude of emotions. In this regard,
19 the concept of pulse contributes to a more nuanced understanding of the results (as well as
20 extending the winner-loser account). According to emotion dynamics research, pulse is a type of
21 intra-individual indicator of emotion dynamics, and generally refers to variability of affect
22 intensity (i.e., more or less intensive emotions); thus, a particular type of emotions could exist in

1 a continuum with a variety of emotional pulses (Krone et al., 2018). For example, as the results
2 of the current study displayed, decisive losses exert significantly sadder states than close losses.

3 By applying the emotion dynamics account, the findings of emotion research demonstrate
4 that individuals often display bodily reactions first in response to emotions-evoking stimuli;
5 however, they are likely to return to their original status instantly given exposure toward low
6 pulse emotions-evoking stimuli (Coifman & Summers, 2019). Evidence indicates that the
7 discrete emotion of sadness is negatively associated with short-term outcomes of
8 psychophysiological health, such as slow cardiovascular recovery and reduced heart rate, all
9 implying weakened perceptions of physical strength (Overall et al., 2015; Tiedens, 2001). On the
10 other hand, individuals who feel more intense level of sadness (due to experiencing the complete
11 failures of their societal goals) tend to perceive a low and insecure social status (Mehta et al.,
12 2015). As a result, they often strongly desire to recover their harmed feelings by engaging in a
13 more extensive deliberation and devotion of their social relationships (Overall et al., 2015).
14 Ironically, however, sadness often drives away surrounding others who might otherwise offer
15 support because of sad individuals' tendency for seeking excessive reassurance in their
16 interpersonal relationships (Tiedens, 2001), which in turn, creates a downward spiral of more
17 negative social interactions (e.g., social anxiety, rejection, and phobia) (Gray et al., 2011).
18 Although the emotion dynamics account of sadness is explanatory, further investigations are
19 imperative to empirically validate the pulse effects (e.g., multiple-wave, time-lagged design to
20 test the variability of sadness intensity).

21 **5.1.2. Emotional meta experiences of fearful happiness**

22 With respect to close victories, the results revealed that in addition to the positive
23 influences of happiness on physical strength and cognitive liveliness, fear negatively influenced

1 the physical strength facet of vigor. The emotional ambivalence principle supports the results.
2 For example, Berrios et al. (2015) suggest that two contrasting emotions of favorable (e.g.,
3 happiness) and unfavorable (e.g., fear) affect can have simultaneous influences on
4 psychophysiological outcomes such as vigor. One major source of emotional ambivalence has
5 been suggested to involve certain types of organizational events (Chervonsky & Hunt, 2017;
6 Smith & Mackie, 2015). In particular, ambivalence is experienced when the following two
7 conditions are met: (1) events produced favorable outcomes; but (2a) the outcomes are
8 unsatisfactory because they fall below expectancy, or (2b) crises or threats that would potentially
9 harm the favorable outcomes are still present (Berrios et al., 2015; Larsen et al., 2001; Russell,
10 2017). In the current context, close victories lead spectators to feel happiness because they won
11 the competition. Nonetheless, fear damages their perceived physical strength because the
12 winners' higher status position is unstable and was narrowly attained (Burk et al., 2019; Mehta et
13 al., 2015). In other words, further competitions in such a situation may lead spectators' favored
14 team to lose, thus harming their higher yet potentially insecure social standing (Vermeer et al.,
15 2020). Accordingly, a fresh insight derived from our results is the dynamic influences of positive
16 and negative emotions on the improvement and deterioration of psychological vigor.

17 However, it should be noted that the LSMs of fear were not statistically different across
18 the four game situations in the current study, and thus the game situation of close victories was
19 insufficient to evoke fans' fear. Also, fear had a non-significant influence on the two facets of
20 vigor: cognitive liveliness and emotional energy. The characteristics of fear suggested in existing
21 studies are in line with the current results. In social contexts (including sport spectatorship),
22 individuals rarely experience fear because fear usually represents a severe and extreme version
23 of anxiety (Dunn & Hoegg, 2014). Therefore, when their social rank and standing are perceived

1 to be susceptible and provisional, individuals tend to display alleviated states of fear (such as
2 anxiety, tension, worry, and nervousness), rather than extreme states of fear (Mehta et al., 2015).
3 Fear is, however, still an adaptive reaction experienced in the presence of a threat or anticipated
4 risk to important goals (Dunn & Hoegg, 2014). Thus, by experiencing and expressing fear as a
5 result of encountering dominant and competitive opponents, individuals implicitly express their
6 lack of intention to seek dominance and motivation as a means to avoid further competitions
7 (Steckler & Tracy, 2014). Furthermore, emotion studies suggest that the most immediate and
8 adaptive response of the states of fear entails bodily perceptions (e.g., the physical strength facet
9 of vigor) and physiological functioning (e.g., startle reflex and facial mimicry), followed by
10 impaired psychological (e.g., pessimistic judgments) and social performance (e.g., protective and
11 avoidance behavior) (Dunn & Hoegg, 2014; Overall et al., 2015). As such, future researchers
12 may utilize a hierarchically ordered emotion category or multiple dimensions of fear to advance
13 the findings of the current study.

14 In spite of its limited conclusions on the emotional meta experiences of fearful happiness,
15 the current study confirms the importance of integrating and recognizing the reality and
16 complexities of human life, wherein people often encounter situations that evoke a variety of
17 both positive and negative emotions at the same time (Galderis et al., 2015). Specifically, despite
18 the large volumes of studies on spectator emotions and the role of affect (e.g., Campo et al.,
19 2019; Decrop & Derbaix, 2010; Madrigal & Bee, 2005; Wann & James, 2019), less attention has
20 been paid to the unique prospective consequences that emotional ambivalence produces.
21 Meanwhile, it has been increasingly suggested that simultaneous experiences of positive and
22 negative affect in the face of challenging situations (e.g., happiness and fear in close victories)
23 largely facilitate the enhancement of mental resilience and overall psychological health (Coifman

1 & Summers, 2019). As such, this study opens up a novel line of future research inquiries to
2 further explore multiple pairs of opposing emotions evoked and communicated in the given
3 context as well as their directional impact on a variety of health outcomes.

4 **5.1.3. The paradox of anger**

5 As hypothesized, close losses evoked the feeling of anger, which in turn, positively
6 influenced the two facets of vigor (i.e., physical strength and cognitive liveliness). The functional
7 characteristics of anger evidenced in existing emotion studies strongly support the results. Anger
8 has been characterized as a combative and agonistic affect rather than harmonic, coordinating,
9 and social (Harmeling et al., 2015; Tamir et al., 2008). That is, anger often functions to facilitate
10 the coping processes associated with retaliatory, competitive, aggressive, and penalizing actions,
11 so that it is more likely to be associated with feelings of physical competence and mental
12 strength (i.e., physical strength and cognitive liveliness), while being less likely to be associated
13 with feelings of sympathy and empathy for others (i.e., emotional energy). As such, our findings
14 provide empirical support for the following arguments suggested in social psychology studies: (i)
15 the adaptive function of anger helps strengthen angry individuals' self-perceptions of relative
16 strength and power (Kim et al., 2015), and (ii) this psychological state enhances individuals'
17 self-confidence in regards to their mental and physical capability to handle such anger evoking
18 objects and situations (Tamir et al., 2008; Tiedens, 2001).

19 Beyond our predictions, the results revealed that anger had a positive influence on the
20 physical strength facet of vigor in the close victory condition. In addition to the aforementioned
21 theoretical accounts of anger, recent studies on context-dependent health (Kim et al., 2015;
22 Luong et al., 2016), negative affect valuation (Bartsch et al., 2010; Oliver & Raney, 2011), and
23 emotion dynamics (Chang, 2019) further elucidate this unanticipated result. That is, existing

1 studies suggest that healthier individuals often desire to feel angry in confrontational situations
2 (e.g., rivalry and close games and conflict-related contests) because such anger may be
3 potentially useful, meaningful, valuable, and appropriate (Luong et al., 2016; Markovitch et al.,
4 2017). In such contexts, anger has been shown to have similar effects as happiness with respect
5 to biological (e.g., high cardiac contractility, physical arousal, and brain stimulation) and
6 psychological health outcomes (e.g., estimating a higher probability of positive events and self-
7 confidence) (Calanchini et al., 2016; Reifen et al., 2010). Similarly, Reifen et al. (2010) suggest
8 that anger is one of the most significant emotions in the context of group-based emotions
9 because of its powerful functional roles for uplifted optimism regarding individuals' relative
10 power, strength, and performance compared to outgroups.

11 The current study makes a notable contribution to the literature on the counterintuitive
12 appraisal tendency of negative emotions (Kim et al., 2015; Luong et al., 2016). From the
13 conventional approach on health, psychophysiological health is attained through pleasurable and
14 positive emotional experiences; therefore, the traditional belief is that healthier people solely
15 desire pleasurable and positive emotional experiences (rather than unpleasurable and negative
16 emotional ones) (Luong et al., 2016). Similarly, a large volume of emotion studies have argued
17 that anger only leads to unfavorable health outcomes (e.g., low self-esteem, aggressive
18 behaviors, and interpersonal conflict) (Harmeling et al., 2015). However, it has been increasingly
19 suggested that the causal effects of emotions on health are not so linear but could be more
20 dynamic, non-linear, and deviating when considering the reality of human life (Chang, 2019;
21 Reifen et al., 2010). For example, according to the fresh insight on health equipped with
22 evolutionary psychology (Markovitch et al., 2017), negative emotions are a necessary evil
23 because such unpleasant emotional experiences have helped humanity for survival and may even

1 maximize the pleasantness of positive emotions (e.g., the opponent-process theory of emotions in
2 spectatorship sports; Chang, 2019), ultimately contributing to a variety of positive health
3 outcomes (e.g., mental resilience and well-being). In sum, by exploring spectators' game
4 situations-specific affective responses, we attempted to theoretically reconcile the contrasting
5 likelihoods of anger to psychological vigor in the given context.

6 **5.2. Practical implications**

7 The current study provides a number of important practical implications. First, given the
8 positive role of anger in enhancing spectators' psychological vigor, managers may not
9 necessarily worry as much about fans' expressions of anger (in line with the existing
10 suggestions; Calanchini et al., 2016; Chang et al., 2018; Reifen et al., 2010). Nevertheless, this
11 recommendation should be applied with caution. In particular, when the affective states of
12 negative emotions are excessively intensive (e.g., continued expressions of anger even after
13 anger-evoking stimuli or situations are vanished), such unfavorable states may overwhelm
14 individuals (e.g., resulting in dysfunctional anger; Harmeling et al., 2015). As such, managers
15 should implement interventions aimed at alleviating negative emotions (such as sadness and fear
16 as well as dysfunctional anger) for the development of vigor in their market segment. However,
17 spectators' affective states often stem from their subjective appraisals of each game episode so
18 that it is challenging for managers to exert control when it comes to provoking fans' particular
19 affective responses.

20 Nonetheless, with the goal of developing positive communication patterns among
21 spectators, managers may attempt to explicitly alter fans' beliefs and viewpoints toward such
22 unfavorable emotions-eliciting situations through metacognitive therapy (i.e., a type of
23 psychotherapy; Coifman & Summers, 2019). For example, negative metacognitions of sadness

1 and fear are concerned with the uncontrollability and danger of thoughts (Bartsch et al., 2010),
2 and thus positive metacognitions (e.g., “It is better to expect the worst than to be anxious”; “We
3 just barely lost the game”; “It was not a huge fail, so there is no need to get depressed”) could be
4 delivered through a variety of message formats (e.g., advertising messages and announcers’
5 comments). Future studies should initiate experimental testing by manipulating the
6 aforementioned elements to examine their impact on fans’ emotional desensitization as well as
7 vigor in the given context.

8 Second, a major premise underlying constructive sport spectatorship environment could
9 be that developing a fan community necessitates a better understanding of spectator emotions. It
10 is worth highlighting that managers should be aware that more than just sadness and fear are
11 critical to better understand the expressions of spectators’ emotions. In other words, it is
12 imperative for managers to track spectator emotions surrounding the sporting games, which will
13 ultimately be redirected towards consumption satisfaction and future attendance (Chang, 2019).
14 With this respect, it is recommended that managers assess spectator emotions in their market
15 research on a regular basis. Such emotion tracking practices could involve local and national
16 news reports along with fans’ commentary as well as social media communication (e.g., postings
17 before, during, and after an event as well as postings from stadium attendants and local
18 community). Managers can employ a variety of analytics tools (e.g., customer service metrics
19 calculator and sentiment analyzer) to explore spectator emotions as well as the degree to which
20 specific events’ elements (e.g., types of in-game entertainment) influence fan emotions, health
21 outcomes, and the consumption of their brands, such as team merchandise sales and the number
22 of stadium attendants.

23 Third, the results represent remedial and therapeutic implications given that the four

1 manipulated game situations induced affective responding among sport spectators. For example,
2 recent research on clinical psychology suggests that individuals who frequently come across
3 situations inducing emotional ambivalences tend to be more emotionally flexible and adaptable,
4 so as to efficiently recover from stressful and unfavorable life events; lack of affective flexibility
5 has been found to result in mental illness such as delusional disorder (Coifman & Summers,
6 2019). In the current study, all of the four distinctive game situations led to some degree of
7 emotional ambivalence among spectators. In particular, the two conditions of close victories and
8 close losses produced considerable dynamics of both positive and negative emotions.
9 Accordingly, health professionals may utilize sport viewing activities in their emotion therapy
10 procedures; repetitive exposure to such game situations may help develop emotional and
11 behavioral flexibility, which may in turn, lead to a more balanced consideration of different
12 perspectives as well as emotional resilience and mental health.

13 **6. Caveats and Further Considerations**

14 There are several limitations and suggestions for future studies. First, the results should
15 be generalized with caution given our exclusive focus on the four discrete emotions and a single
16 type of sporting events for the stimuli, as well as the sole utilizations of self-reports rating scales
17 of emotions. Future scholarship may extend the current study by: (a) utilizing other affect
18 categories (e.g., pride and shame), (b) using stimuli from a variety of sporting events and leagues
19 (e.g., collegiate and mega sporting events), or (c) employing other types of emotion measures
20 (e.g., implicit association test and time intensity measure of emotions) and conceptualizations
21 (e.g., happiness as either engagement or meaning; Tanzer & Weyandt, 2019). Second, it is likely
22 that internal and individual factors largely determine the associations between actual feelings and
23 perceived emotions. In particular, fans' affect valuation could differ based on their subjective

1 appraisal tendency (Scherer & Moors, 2019), implicit team identification (Chang et al., 2018),
2 and pre-existing team emotions (Lee et al., 2018), so that emotional experiences could be
3 evaluated differently across individuals. Future studies may further explore how fans value each
4 discrete emotion by measuring their affect valuation tendencies.

5 Third, the adoption of convenience sampling for laboratory experiments is appropriate for
6 theory testing and development, as results from such investigations serve as a quality platform to
7 begin to test grounds for experimental social science; however, this type of research is often
8 limited to generalize the results especially because of relatively small and homogeneous
9 convenience samples (Calder et al., 1981). Although we attempted to facilitate intensive
10 emotional experiences by utilizing decent VR technology that mimics real life game situations,
11 concerns associated with external validity may remain. Accordingly, it is warranted to consider
12 to replicate this study by utilizing larger probability and population-based samples (e.g., actual
13 NBA game attendants) as well as by incorporating detailed contextual factors (e.g., individual
14 spectating vs. spectating with others; spectating in a silent home environment vs. at a noisy bar
15 or stadium). Fourth, although we have adapted measurement items whose psychometric
16 properties have been well established in prior studies, the use of a path analysis does not allow us
17 to control the potential impacts of measurement errors inherent in the dataset on the current
18 results. Future scholarship may employ more rigorous statistical tools with a greater sample size
19 (e.g., multiple group SEM) to advance the current findings.

20 In conclusion, the current study postulates the causal effects of game situations-specific
21 spectator emotions on their psychological vigor. This study constitutes the first research that
22 links emotions and vigor in the given context, and thus more research into this topic is aptly
23 required in order to generalize these findings over a variety of sport consumption contexts.

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Table 1
A Summary of the MANCOVA and ANCOVA Results

	Wilks' λ	<i>F</i>	<i>Sig.</i>
Game Results	.49	44.05	<.001
In-game Dynamics	.85	7.39	<.001
Game Results × In-game Dynamics	.80	10.77	<.001
NBA Involvement	.78	11.75	<.001
Fan Identification	.69	19.15	<.001

		<i>F-Statistics (Sig.)</i>
Happiness	Game Results	115.59*** (<.001)
	In-game Dynamics	.18 (.67)
	Game Results × In-game Dynamics	19.39*** (<.001)
	NBA Involvement	39.18*** (<.001)
	Fan Identification	53.79*** (<.001)
Sadness	Game Results	10.15** (.002)
	In-game Dynamics	6.67* (.01)
	Game Results × In-game Dynamics	26.04*** (<.001)
	NBA Involvement	.85 (.36)
	Fan Identification	24.56*** (<.001)
Anger	Game Results	53.28*** (<.001)
	In-game Dynamics	23.15*** (<.001)
	Game Results × In-game Dynamics	.15 (.69)
	NBA Involvement	5.16* (.02)
	Fan Identification	6.91** (.009)
Fear	Game Results	.56 (.45)
	In-game Dynamics	.03 (.87)
	Game Results × In-game Dynamics	3.59 (.06)
	NBA Involvement	.02 (.91)
	Fan Identification	.24 (.63)

	Happiness <i>LSM (SE)</i>	Sadness <i>LSM (SE)</i>	Anger <i>LSM (SE)</i>	Fear <i>LSM (SE)</i>
Decisive Victory	4.28 ^a (.11)	2.39 (.13)	2.14 (.14)	2.44 (.12)
Decisive Loss	2.46 (.14)	3.49 ^b (.16)	3.09 (.17)	2.79 (.15)
Close Victory	3.95 ^a (.12)	2.62 (.14)	2.62 (.15)	2.67 (.13)
Close Loss	3.16 (.11)	2.43 (.13)	3.47 ^c (.13)	2.55 (.11)

Note. * $p < .05$. ** $p < .01$. *** $p < .001$. Least square adjusted means (*LSM*) and standard errors (*SE*); ^asignificantly greater than the two conditions of Decisive Loss and Close Loss, supporting *H1* and *H5*; ^bsignificantly greater than the three conditions of Decisive Victory, Close Victory, and Close Loss, supporting *H3*; ^csignificantly greater than the two conditions of Decisive Victory and Close Victory, supporting *H11*.

Table 2

Standardized Path Coefficients (β), Standard Errors (SE), and Factor Correlations

IV	DV	Decisive Victory			Decisive Loss			Close Victory			Close Loss		
		β	SE	Sig.	β	SE	Sig.	β	SE	Sig.	β	SE	Sig.
Happiness	Physical strength	.47***	.22	< .001	.07	.27	.69	.63***	.17	< .001	.23*	.20	.04
	Cognitive liveliness	.35**	.19	.007	-.16	.23	.33	.49**	.13	.001	-.13	.17	.27
	Emotional energy	.45***	.22	< .001	.48***	.16	.001	.12	.14	.48	.71***	.18	< .001
Sadness	Physical strength	-.02	.22	.89	-.09	.26	.63	-.19	.13	.06	-.45***	.21	< .001
	Cognitive liveliness	.04	.17	.77	.001	.21	.99	-.05	.23	.72	.06	.15	.61
	Emotional energy	.16	.15	.21	-.29	.18	.06	-.11	.17	.49	-.04	.12	.66
Anger	Physical strength	.21	.21	.07	.15	.12	.41	.27**	.18	.01	.28*	.13	.02
	Cognitive liveliness	-.02	.16	.87	-.06	.20	.74	-.05	.19	.73	.45***	.15	< .001
	Emotional energy	.01	.15	.95	.05	.30	.75	-.12	.15	.49	-.15	.13	.10
Fear	Physical strength	.03	.16	.78	.13	.26	.48	-.33**	.11	.002	-.01	.11	.94
	Cognitive liveliness	.17	.18	.20	-.26	.18	.15	.08	.12	.59	.07	.11	.57
	Emotional energy	-.03	.15	.80	.04	.29	.74	-.26	.11	.11	.01	.14	.88

	1	2	3	4	5	6
Happiness	—					
Sadness	-.07/-.06/-.34/-.10	—				
Anger	-.03/.03/.31/-.15	.03/-.33/-.27/.16	—			
Fear	.12/.09/.27/.17	.12/.34/-.11/-.19	-.07/-.20/.45/-.17	—		
Physical Strength	.47/.09/.69/.23	-.04/-.10/-.44/-.43	.23/.15/.37/.17	.07/.08/-.02/.07	—	
Cognitive Liveliness	.37/-.19/.52/-.19	.03/-.06/-.21/.13	-.04/-.01/.15/.47	.22/-.26/.19/-.04	.59/.11/.47/.30	—
Emotional Energy	.44/.51/.05/.74	.12/-.33/-.09/-.14	.002/.16/-.17/-.26	.04/-.03/-.27/.17	.63/.27/.12/.38	.78/.28/.18/-.15

Note. **p* < .05. ***p* < .01. ****p* < .001. Decisive victory/decisive loss/close victory/close loss in the correlations matrix.

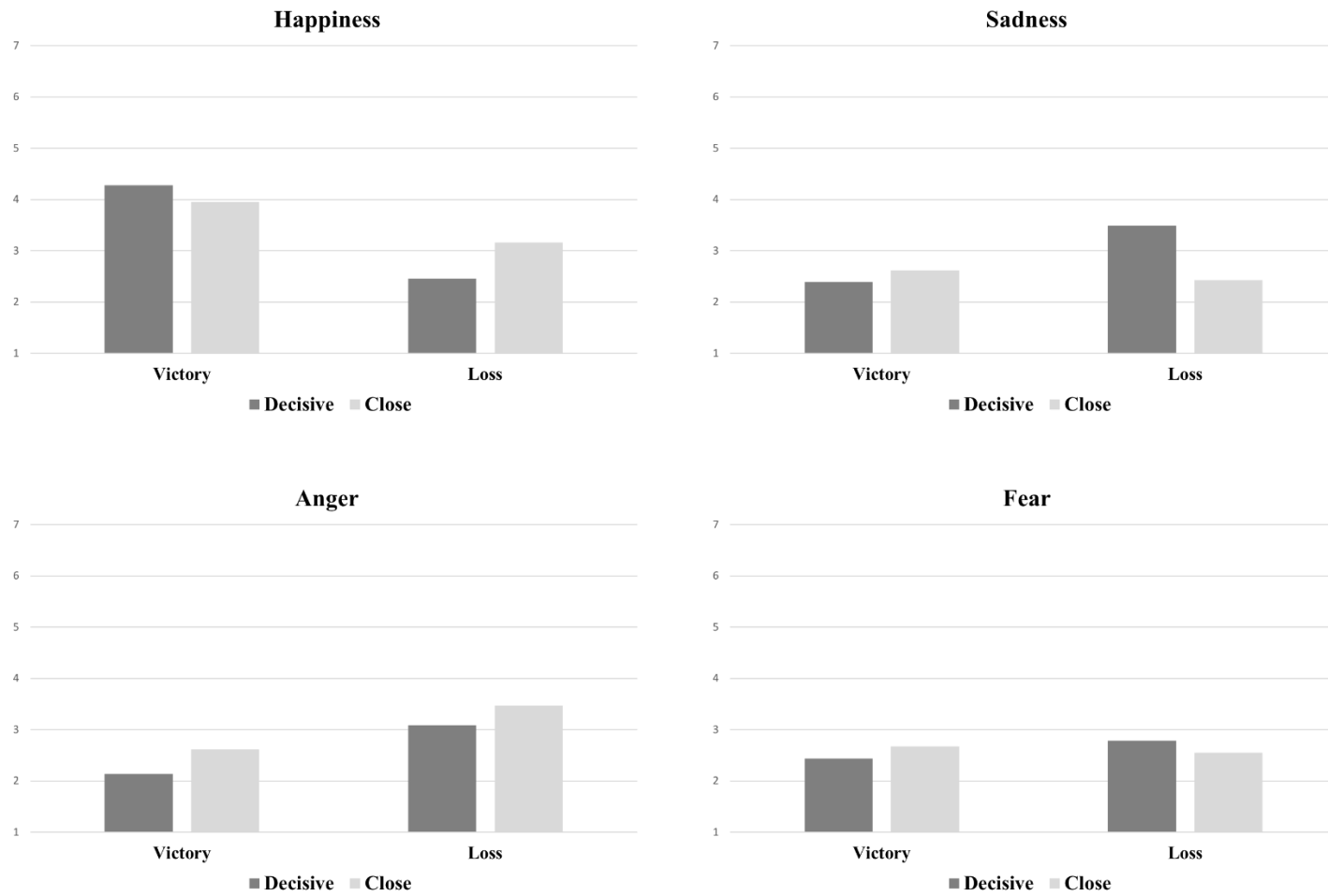
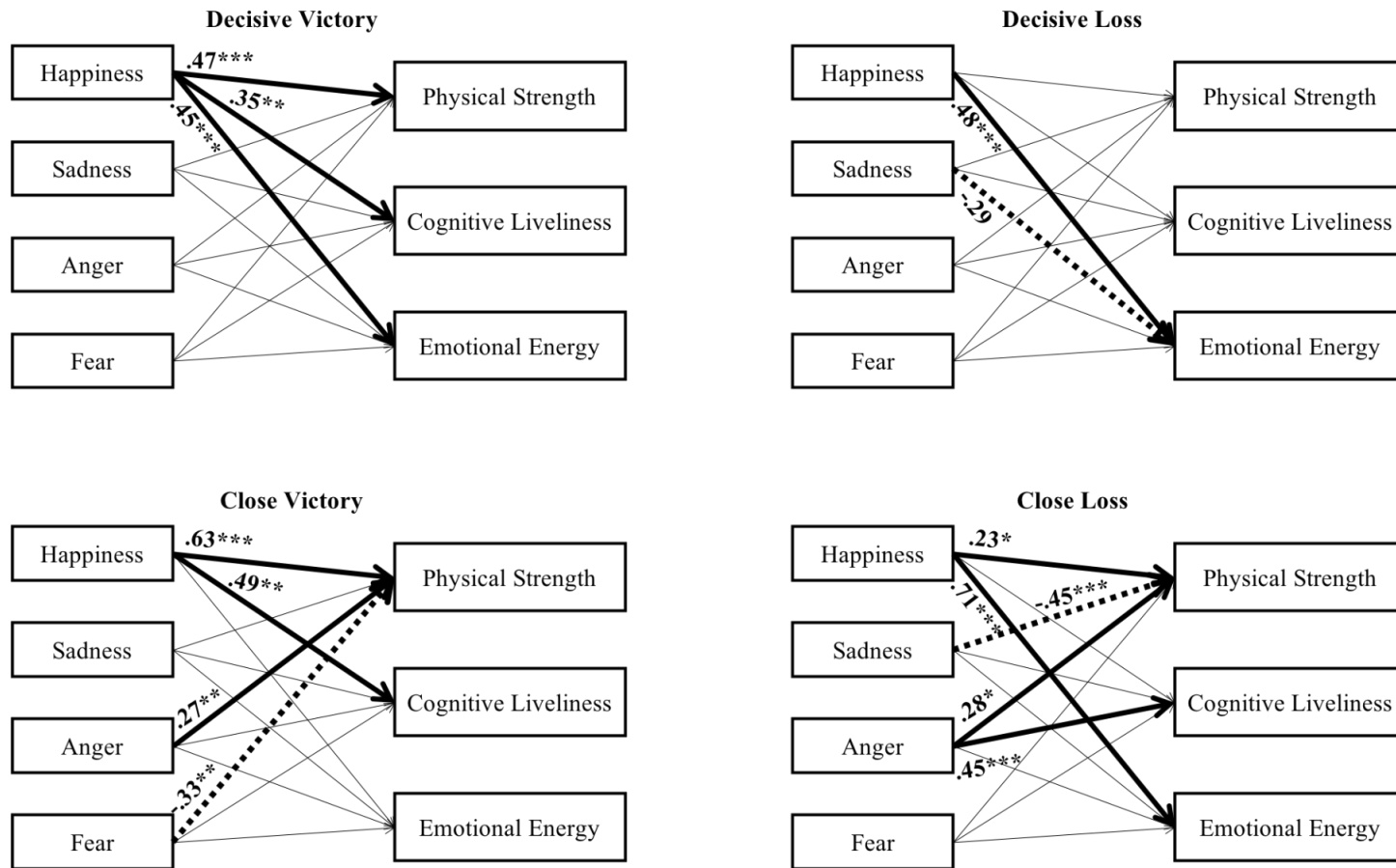


Figure 1
Spectators' emotional states by the end result of a game (victories vs. losses) and in-game dynamics (decisive vs. close)



Note. * $p < .05$. ** $p < .01$. *** $p < .001$. All four exogenous variables (i.e., Happiness, Sadness, Anger, and Fear) as well as all three endogenous variables (i.e., Physical Strength, Cognitive Liveliness, and Emotional Energy) are allowed to freely covary (Kellar & Kelvin, 2013; Rosseel, 2013).

Figure 2

The causal influence that context-dependent spectator emotions exert on the three facets of psychological vigor