EMOTIONAL CONTAGION AND ITS RELATIONSHIP TO MOOD

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For my parents,
Nadine Harumi Arakawa (1950 – 2010) & David Shoichi Arakawa,
With love and appreciation.

ABSTRACT

Emotional contagion has been defined as "the tendency to automatically mimic and synchronize expressions, vocalizations, postures, and movements with those of another person's and, consequently, to converge emotionally" (Hatfield, Cacioppo, & Rapson, 1994, p. 5). Study 1 explores the influence of personality on emotional contagion. Specifically, I propose that people's susceptibility to emotional contagion will be affected by their stable disposition towards happiness/sadness. Study 2 investigates the impact of a person's short-term (primed) mood on his or her susceptibility to emotional contagion. Two competing theoretical traditions will be compared to investigate just *how* mood—both stable and short-term—affects contagion.

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CHAPTER 1

CONCEPTUALIZATION OF THE RESEARCH PROBLEM

Background

When we are in a certain mood, whether elated or depressed, we often communicate this mood to others. Similarly, when we spend time with people in a positive or negative mood, we may have experienced "catching" their emotional state. This giving and catching of emotion may be so familiar to us that we take it for granted—a process occurring so naturally in our interactions with others that we barely register its occurrence or effects. We may have experienced this process of giving and taking emotion in our personal lives, but is this a "real," or scientifically proven, phenomenon?

In *Emotional Contagion*, Hatfield, Cacioppo and Rapson (1994) define emotional contagion as the "tendency to automatically mimic and synchronize facial expressions, vocalizations, postures and movements with those of another person and, consequently, converge emotionally" (p. 5). The authors note that the existence of emotional contagion has been well documented across a variety of disciplines, including social and developmental psychology, history, cross-cultural psychology, experimental psychology, and psychophysiology. Clinicians (Coyne, 1976), sociologists (Le Bon, 1896), primatologists (Hurley & Chater, 2005a), life span researchers (Hurley & Chater, 2005b), neuroscientists (Iacoboni, 2005; Wild, Erb, & Bartels, 2001; Wild, Erb, Eyb, Bartels, & Grodd, 2003) and historians (Klawans, 1990) have all provided evidence that people do in fact catch one another's emotions at various times, in all societies, and perhaps on a very large scale. Indeed, researchers from a breadth of disciplines and using a variety of

techniques have concurred that emotional contagion is not just an anecdotal phenomenon: it is an important area of study in interpersonal relations meriting further investigation.

Purpose

Although the existence of emotional contagion has been well documented, we have yet to fully understand its mechanisms and enabling or disabling factors. As emotional contagion is the give and take of emotion between people, two major areas of research include the giving of emotion (e.g., What makes someone good at infecting others with their mood?) and the taking of it (e.g., Who are the people particularly susceptible to catching emotion?). The present pair of studies further investigates one contributing factor within the latter area of research, i.e., susceptibility to emotional contagion.

Hatfield, Cacioppo, and Rapson (1994) identify six features that make a person relatively susceptible (or resistant) to catching another's emotion: 1) whether or not the person is paying *attention*; 2) how the individual self-defines their *identity*, as either interdependent or independent; 3) how adept the person is at *reading* the emotions of others; 4) how disposed he/she is to *mimicking* the facial expressions, vocalizations, and postures of others; 5) how *aware* the individual is of his/her own emotions, i.e., of feedback; and 6) how *receptive* the person is biologically to emotion.

This project, comprised of two studies, is concerned with the first feature of susceptibility to emotional contagion, i.e., the hypothesis proposed by Hatfield, et al. that "People should be more likely to catch others' emotions if their attention is riveted on others than if they are oblivious to others' emotions" (1994, p. 148). In considering whether individual differences in susceptibility to emotional contagion are influenced by

the degree to which one attends to the emotions of others, the influence of mood on attention comes into question. Some theorists argue that we are especially susceptible to catching certain emotions, or all emotions, when we are happy or sad. The resultant purpose of this project is to investigate the relationship between one's mood and susceptibility to catching the emotion of others.

Significance

Emotional contagion evidently factors into interpersonal encounters in a myriad of ways—in our relationships with our partners, friends, family members, colleagues, adversaries, and so on. Given the ubiquity of emotional contagion in social interactions and its potential implications, it is important both theoretically and practically to better understand the dynamics of the emotional contagion process.

In the workplace, harnessing the power of emotional contagion may have several practical benefits. In a study on group emotional contagion and its influence on work group dynamics and managerial decision making, Barsade (2002) used multiple, convergent measures of mood, individual attitudes, behavior, and group-level dynamics to find that group members who experienced the contagion of positive emotion also experienced improved cooperation, decreased conflict, and increased perceived task performance. In one application of this finding, learning and development professionals might begin training managers in the skills of emotional contagion to harness its benefits on group dynamics and functioning.

On an individual level, understanding variations in susceptibility to emotional contagion would give scientists a more thorough understanding of the phenomenon and its contribution to emotional intelligence. Emotional intelligence, as defined by Salovey

and Mayer (1990), is a "a set of skills hypothesized to contribute to the accurate appraisal and expression of emotion in oneself and in others, the effective regulation of emotion in self and others, and the use of feelings to motivate, plan, and achieve in one's life" (p. 185). A term made widely accessible through its success in the popular press (see Goleman, 2006) and within the business community, emotional intelligence can be thought of as a grab-bag skill comprised of other documented psychological constructs like self-mastery, self-regulation (see Baumeister, Gailliot, DeWall, & Oaten, 2006; Mischel & Ayduk, 2002), self-awareness, and hope (see Snyder, 2002). By understanding who is susceptible/resistant to emotional contagion, or how and when susceptibility/resistance is enabled, we may build practical skills and competencies in emotional intelligence, i.e., the perception, use, understanding, and regulation of our emotions—and thus gain in our ability to control our lives.

In *Emotional Contagion*, Hatfield and her colleagues conclude with the importance of further investigating the phenomenon:

> Did Hitler employ contagion in stirring up the crowds with his inflammatory oratory? Would it be possible for someone trained in the art of emotional contagion to exert a similar influence? Do totalitarian regimes or religious revival meetings or antiwar (or prowar) or prochoice (or antiabortion) rallies exploit the phenomenon? Can emotions be spread by the mass media, as suggested by the study of Mullen and his colleagues (1986) on the influence of the facial displays of newscasters on voting behavior? With the expansion and increased power of new

> communications, should we attend more carefully to the way this phenomenon functions? (1994, p. 205)

These questions raised point to the significance of emotional contagion as it relates to larger societal issues, and underscore the need to better understand this phenomenon and its macro-level implications. Emotional contagion may have far-reaching applications to new technologies and traditional means of mass communication (and exploitation).

Need and Rationale

As noted by Hatfield, Cacioppo, and Rapson (1994), disposition to emotional contagion is likely susceptible to a number of situational forces and internal states. In this work, I explore the effect of mood on emotional contagion. To date, no research has been conducted on this relationship; however, research on the effects of mood on social judgment and cognition provide general support for the approach of this study.

First, I propose that mood should influence emotional contagion as it governs attention or information-processing strategies. Research on affect and social information processing has found that the judgments (Bodenhausen, Sheppard, & Kramer, 1994; Van den Bos, 2003) and memories (Bower, 1981; Ellis, Thomas, & Rodriguez, 1984; Forgas, 1992) of people are affected by broad categories of positive and negative affect, i.e., a happy or sad mood can greatly impact how one perceives, thinks about, and remembers other people. A great deal of research has explored how mood elicits widespread effects on social decision-making (Forgas, 1992; Forgas & Bower, 1987; Park & Banaji, 2000) and mood has also been found to influence the accuracy of such social judgments (Ambady & Gray, 2002). The process by which mood is hypothesized to affect emotional contagion will be further discussed in Chapter 2; here the simple proposition is

that mood should affect susceptibility to emotional contagion, paralleling its broad effects on social judgment.

Second, the present work is concerned with exploring the effects of both enduring and transient affect on emotional contagion. At the trait level, research on enduring or stable affect has often centered on depression. Of significance to the mimicking-process theory of emotional contagion (see Chapter 2), depressed individuals often display a negative bias when judging facial expressions (Gur et al., 1992; Hale, 1998), rendering them less accurate than non-depressed controls at recognizing emotions from facial displays (Giannini, Folts, Melemis, Giannini, & Loiselle, 1995; Persad & Polivy, 1993). At the state level, transient mood states induced as part of the experimental design have been found to exert strong effects on social information processing by priming mood-congruent material (Bouhuys, Bloem, & Groothuis, 1995; Terwot, Kremer, & Stegge, 1991). Thus, research indicates that both trait and state measures of affect should influence emotional contagion, a process affected by attention and appropriately relevant to the aforementioned work on social judgment.

As discussed in the following chapter, findings on the effects of enduring and transient affect often appear incompatible. In this work, the effect of both trait and state affect on emotional contagion will be explored. This is for two reasons. First, the general relationship between mood and emotional contagion is still under preliminary investigation, so it seems prudent to explore both variants of affect known to impact social judgment (and presumably emotional contagion). Second, the inconsistency of findings regarding the effects of trait and state affect support the relevance of further

research comparing the two types of mood, to begin to parcel out their individual impacts and consider emotion holistically.

Hypotheses

For these reasons, two studies were proposed to explore whether a happy/sad personality and short-term variations in mood may influence susceptibility/resistance to emotional contagion. The following hypotheses are tested:

- *Study 1: Trait-based affect, i.e., a happy or sad personality, will affect susceptibility to catching either positive or negative emotions.*
- *Study 2: Transient affect, i.e., a happy or sad mood state, will affect susceptibility to catching either positive or negative emotions.*

In the following chapter, I further layout the constructs under consideration in both studies—emotional contagion and happiness/sadness—and discuss the competing processes by which affect is theorized to impact emotional contagion as stated in the aforementioned hypotheses. Chapters 3 – 4 present the Method and Results of Study 1, an investigation of the relationship between enduring or trait-based affect and emotional contagion. Chapters 5 – 6 present the Method and Results of Study 2, an investigation of the relationship between transient or state-based affect and emotional contagion. The findings and implications of both studies will be discussed in the final chapter, Chapter 7: Discussion.

CHAPTER 2

LITERATURE REVIEW

Emotional contagion

In these two studies, I will use the definition proposed by Hatfield, Cacioppo and Rapson for *primitive emotional contagion*, i.e. "the tendency to automatically mimic and synchronize facial expressions, vocalizations, postures, and movements with those of another person and, consequently, to converge emotionally" (1994, p. 5). This primitive emotional contagion is in contrast to the more complex process proposed by social philosopher Adam Smith, who described emotional contagion as a highly cognitive, imaginative, and analytical process (1759/1976). As emotional packages can be comprised of various components, e.g., facial expressions, behaviors, and psychophysiological reactions (Fischer, Shaver, & Carnochan, 1990), the process of emotional contagion has been theorized as a multi-level and multiply determined phenomenon (Hatfield, Cacioppo, & Rapson, 1993).

Emotional contagion has been cited to explain the facial expressions, vocalizations, postures, and behaviors of children with autism (Decety & Jackson, 2004); music lovers (Davies, 2011); religious fanatics, terrorists, and suicide bombers (Hatfield & Rapson, 2004); sports teams (Totterdell, 2000); people in crowds (Adamatzky, 2005) and in the workplace (Barsade, 2002), to name a few. While researchers have documented the occurrence of emotional contagion in such diverse circumstances, questions remain about what kinds of people in what kinds of relationships are most susceptible (or resistant) to emotional contagion, and under what conditions.

Hatfield, Cacioppo, and Rapson (1994) identify several features that make a person relatively susceptible (or resistant) to catching another's emotion. These factors will be discussed in order of increasing importance to the present work, ending on a discussion of attention and how affect is hypothesized to affect attention and thereby emotional contagion.

Identity. Work by cross-cultural scholars suggests that individuals who define their identity as interdependent may be more disposed to catching the emotions of others than are those who define themselves as being very independent and self-reliant (Markus & Kitayama, 1991), although individual differences occur within a culture on the extent to which an individual may identify with being interdependent or independent. As study participants were recruited primarily from the same environment, i.e., from the University of Hawaii (UH), differences in identity construal were not investigated in the present work. Although UH students tend to be very diverse in ethnic background, conducting a methodologically sound cross-cultural study (see Heine & Norenzayan, 2006; Matsumoto & Yoo, 2006; G. T. Smith, Spillane, & Annus, 2006) was outside the bounds of this investigation.

Awareness and reactivity. Individuals may differ on how *aware* they are of their own emotions, i.e., in the strength of their physiological feedback to emotion and their receptivity to such information. Cacioppo and colleagues (1992) posited a theory on "system gains," of awareness and reactivity to emotion, akin to the volume dials on a radio; proposing that individual differences exist in the system gain parameters governing 1) our expression of emotion; 2) our biological reactivity to emotion, i.e. our autonomic system; and 3) the stability over time of these system gain parameters. Two scales were

created to measure Facial Expressiveness and Autonomic Responsiveness (Hatfield et al., 1994), which had correlates with prior work measuring individual differences in emotional expressiveness and nonverbal communication (Friedman, Prince, Riggio, & DiMatteo, 1980; Friedman & Riggio, 1981). Although ideal, the inclusion of physiological feedback measures was outside the scope and resources of the present work; however, a self-report measure (Emotional Contagion Scale; Doherty, 1997) intended to measure individual differences in reactivity to five basic emotions, was included in Study 1.

Reading emotion. Individual differences have been found to exist in the ability to read the emotions of another person, which may then lead to differences in susceptibility to acquire such emotion. Haviland and Malatesta (1981) found gender differences in the ability and disposition to read the overall emotional cues of others, finding that women were better at reading emotion than were men. Other researchers have discussed the gender differences that may exist in the ability to read and thereby catch the emotions of others (Carlson & Hatfield, 1992; LaFrance & Banaji, 1992; Shields, 1987). In a meta-analysis, Hall (1984) summarizes these gender differences, suggesting that while men and women *feel* the same emotions, women may be better at reading the emotional displays of themselves and others. Wild, Erb, and Bartels (2001) tested the hypotheses by Hatfield et al. (1994) and found that women were more susceptible to emotional contagion than men, but only weakly so. The influence of gender was tested in both studies to further investigate gender differences in susceptibility to emotional contagion.

Mimicking. Differences have been documented in the propensity to mimic the facial expressions (Bourgeois & Hess, 2008; Hess & Blairy, 2001; Lundqvist, 1995; Wild

et al., 2003), vocalizations (Cappella & Planalp, 1981; Chapple, 1982), and postures (Bernieri, Davis, Rosenthal, & Knee, 1994; Condon, 1982; Condon & Ogston, 1966; Davis, 1985) of others. These automatic and reflexive acts of mimicking are theorized to help us "feel our way" into the emotions of others (Hatfield et al., 1994). Neuroscientists suggest that mirror neurons fire when we observe another, so that we experience it almost as if we are going through the same expression, vocalization, or movement ourselves (Hurley & Chater, 2005a, 2005b; Wild et al., 2003)—though researchers have yet to test whether the emotions that we pick up are just "pale imitations" of the original emotion (Hatfield et al., 1994). Discussing work on primates, Iacoboni (2005) suggested that the mirror neurons of monkeys fire when they are watching another monkey, and apparently 'doing nothing,' although we should guess that this is not the case – the monkeys are mimicking each other when the mirror neurons fire (Hatfield et al., 1994).

Research on facial mimicking and expression of emotion is of particular interest to this investigation. The speculation that emotions are highly influenced by the manipulation/mimicking of facial expressions (Laird, 1974, 1984) has received considerable empirical support (e.g., Duclos & Laird, 2001; Duclos et al., 1989; Lundqvist, 1995; Wild et al., 2003). The facial feedback hypothesis—that facial expressions regulate affective experience—is consistent with the James-Lange theory of emotions (that we perceive our emotion following physiological response to stimuli) and Bem's self-perception theory (1967), which posits that we make inferences about our emotions based on our behavior. In a pair of experiments, Laird et al. (1994) explored the role of mimicry and self-perception processes in emotional contagion. The researchers found that participants who reported feeling the target emotions were

identified as especially responsive to self-produced cues for feeling (higher in self-perception processes) and that subjects who visibly moved to mimic the behavior of the target actor were significantly more likely to be those who were more responsive to self-produced cues. When participants were inhibited from facial mimicry, they reported less contagion of the target emotion than when they were allowed to naturally mimic or exaggerate their movements. Again, this effect occurred only among subjects who, in a separate procedure, had been identified as more responsive to self-produced cues. The link between self-perception or awareness of one's emotions and outward displays of mimicry was explored through the inclusion of two outcome measures in both studies: self-report and rater evaluations of the participant's facial expression.

While self-report measures were used to evaluate the participants' self-perception, or awareness of their emotions, raters were used to evaluate the participants' facial expressions (mimicry) while watching the target videos. Perhaps the best known work in the facial expression of emotion is by Paul Ekman, an early pioneer in universal and cultural differences in the judgments of facial expressions (Ekman et al., 1987) and the measurement of facial movement (Ekman & Friesen, 1978) and emotion recognition ability (Matsumoto et al., 2000). The author would like to thank Dr. Ekman for his generous provision of his self-instructional training programs for the research assistants (RAs) in this study.

The Subtle Expression Training Tool (SETT) and Micro Expression Training Tool (METT) were both used to improve the RAs' ability to recognize facial expressions of emotion. SETT is designed to teach one to recognize the subtlest signs of emotions first beginning in another person, while METT trains one to see very brief (1/25 of a

second) micro expressions of concealed emotion. Between the two programs, eighty-four different people, males and females from six ethnic groups, display seven different emotions for the trainee to practice identifying subtle and micro expressions (Ekman, 2007). The use of these programs in the design of the study is further discussed in Chapter 5.

Attention. In considering what kinds of people are most (and least) likely to catch the emotions of another, it would seem likely that an individual would be more likely to pick up another's emotion if he/she was, quite simply, paying attention to that other person. Freud recognized that we often repress information we do not want to be aware of, and there may be significant differences in individual's disposition to pay attention to the feelings, thoughts, and behaviors of others. Some, the *Repressors*, pay little attention to other people, while *Sensitizers* are highly sensitive to what other people are doing, saying, thinking, and feeling; by paying attention to other people, sensitizers are thereby more likely to catch their emotions (Hatfield et al., 1994).

The distinction between repressors and sensitizers is marked by their disposition to pay attention—a disposition impacted by mood, which is the central focus of this work. Ambady and Gray (2002) discuss how mood can have both informational and processing effects on attention. Affect can bias the information that is perceived by the subject; this type of effect is often associated with mood congruency, the tendency for bias in the direction of the prevailing affective state. It can also impact how information is processed, by altering the information-processing strategies used by the subject. Research on the informational and processing effects of transient and enduring affect will be briefly reviewed as they relate to two competing frameworks—the Addition and

Interaction Theories—but first, I will discuss the construct of affect and its measurement in the proposed studies.

Happiness/Sadness

Throughout history, we find the topic of happiness as a concern among religious leaders and theologians like Jesus, the Buddha, Mohammed, Thomas Aquinas, and many others. Philosophers, from Aristotle and the Athenian philosophers in the West, to Confucius and Lao-Tsu in the East (Dahlsgaard, Peterson, & Seligman, 2005), have grappled to pin down a clear and all-encompassing definition of happiness (e.g., Aristotle's *Nicomachean Ethics*). Similarly, scientists have endeavored to demystify the concept of happiness. Although there is no consensus as to its definition (Snyder, Lopez, & Pedrotti, 2010), there are several synonyms used throughout the literature to describe a general state of wellbeing, e.g., happiness, self-actualization, contentment, adjustment, economic prosperity, and quality of life (Hefferon & Boniwell, 2011).

One way to operationally define happiness is as subjective wellbeing (SWB), a combination of satisfaction with life, high positive affect, and low negative affect (Diener, 1984). Thus, happiness, or SWB, encompasses how people evaluate their own lives in terms of affective and cognitive explanations (Diener, 2000). Some of the known objective consequences of subjective wellbeing are high income (Diener & Seligman, 2002), positive health outcomes (Pressman & Cohen, 2005), strong relationships, and educational and workplace achievement (Lyubomirsky, King, & Diener, 2005).

To measure SWB as an affective trait, there are multiple scales with very high levels of validity and reliability, including the Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985) and Subjective Happiness Scale (SHS; Lyubomirsky

& Lepper, 1999), among others. These tools converge with mood reports, expert ratings, experience sampling measures, reports of family and friends, and smiling (Diener, Lucas, Oishi, & Suh, 2002). In Study 1, the trait of happiness is assessed by the SHS, which measures strong happiness at one extreme and deep unhappiness, or sadness, at the other. The personality variable is thus considered on a continuum, with sadness being the absence of happiness; I therefore speak of happiness/sadness.

In Study 2, happiness and sadness are only measured as outcome variables, in the same manner as Study 1; all measures will be further described in Chapters 3 and 5, which describe the methodologies of studies 1 and 2, respectively. Upon this detail of the constructs of emotional contagion and happiness/sadness, I now present two competing theories to account for the possible relationships between emotional contagion and affect.

The Addition Theory

Considering the informational effects of mood, affect has been found to exert strong effects on social information by priming mood-congruent material. For example, both children (Terwot et al., 1991) and adults (Bouhuys et al., 1995; David, 1989) have been found to exhibit mood-congruent distortions in their perception of emotional displays after being exposed to a mood induction procedure. Affective states have also been found to congruently bias global evaluations of other people, i.e., happy people tend to evaluate others more positively, while those in a negative mood make more negative judgments of other people (Forgas & Bower, 1987; Schiffenbauer, 1974). Accounts for this mood congruency range from models where mood *indirectly* affects informational accessibility (Isen & Daubman, 1984) and memory (Bower, 1981), to the more direct,

mood-as-information model, where affect is a direct informational cue that judges rely on when making social decisions (Schwarz, 1990; Schwarz & Clore, 1983).

Mood congruency is primarily a cognitive theory referring to a match in affective content between a person's mood and his or her thoughts (Eich, Kihlstrom, Bower, Forgas, & Niedenthal, 2000), i.e., affect may influence cognitive organization, as people who are experiencing a certain emotion may be especially likely to perceive, attend to, process, and recall material consistent with that emotion. Applying this theory to social judgments, the mood congruent judgment effect states that attributes will be judged more characteristic, and events more likely, under conditions of mood congruence (Mayer, Gaschke, Braverman, & Evans, 1992).

Taking this cognitive theory and applying it to emotional contagion, one might predict that if participants are in a positive frame of mind, or in a happy mood, they should be especially likely to catch happy emotions and especially resistant to catching sad ones (Isen, 1987; Isen, Clark, & Schwartz, 1976). If participants are in a neutral mood, they should be slightly more likely to catch happy emotions than sad ones. If they are already in a negative frame of mind or in a sad mood, they should be more likely to catch sad emotions and especially resistant to catching happy ones. In brief, *participants will be most likely to catch emotions that are congruent with their current mood state.* Because this theory suggests that background mood and the mood of the target person(s) sum in the contagion process, it will be referred to as the addition theory.

It is important to note that the addition theory assumes that a happy or sad mood should have symmetrical effects on participants' tendency to attend to, process, and remember congruent information. However, the Pollyanna Principle would suggest that

this is not the case, as people are naturally motivated to maintain a positive state and change an unhappy one (Matlin & Stang, 1978). Thus, while one might expect happy people to show far more willingness to attend to, process, and recall happy material than sad, sad people may not be equally willing to deal with sad material. There may also be structural differences in the way happy and sad material is processed (Isen, 1987). For example, negative material has been found to be more salient and leave a longer lasting impression than positive information (Skowronski & Carlston, 1989), i.e., "bad emotions, bad parents, and bad feedback have more impact than good ones, and bad information is processed more thoroughly than good" (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001, p. 323). These processing effects will be further discussed in the following section on the interaction theory. However, for clarity's sake, the addition theory is stated in its starkest form, as this study seeks to contrast two very different theories on the process of emotional contagion—additive or interactive.

The Interaction Theory

A second theoretical perspective would lead to a very different prediction as to how mood should affect susceptibility to emotional contagion. Some cognitive psychologists argue that happy people are more attentive to incoming stimuli, better able to process it, and show better recall than do less happy people (Isen, 1987). In a study on how mood affects the way we learn about, judge, and remember characteristics of other people, Forgas and Bower (1987) found that positive mood had a more pronounced effect on judgments and memory than did negative mood. Isen and colleagues found that induced positive affect significantly improved creative ingenuity over conditions of induced negative affect and a control group of affectless arousal (Isen, Daubman, &

Nowicki, 1987); beyond impacting cognitive performance, the effect of good mood was also found to translate into higher levels of altruistic behavior (Isen et al., 1976).

There are different accounts for how mood may exert distorted or asymmetrical effects on social judgment. The broaden-and-build theory of positive emotions suggests that positive affect may have an evolutionary function to open us up to new opportunities; when infused with positive emotions like love and joy, we are more trusting and open, able to cognitively "broaden" our perspective and from this open state, "build" more intellectual, physical, social, and psychological resources that will serve us in the future, such as social bonds like romantic partners and friends (Fredrickson, 2004). While negative emotions dispose us to specific action tendencies and close our field of vision (and that is necessary when we are fleeing an attacker, or when we need to be angry and take action in the face of some transgression), Fredrickson argues that positive emotions may also have an evolutionary purpose, i.e., to increase our cognitive awareness to new opportunities, resulting in an upward spiral of growth. Work on the broaden-and-build effect of positive emotion has shown that higher ratios of positive to negative emotion are associated with improved performance in business teams (Fredrickson & Losada, 2005) and increased satisfaction and longevity in romantic dyads (Gottman & Krokoff, 1989; Gottman & Levenson, 2000).

Similarly, researchers have pointed out that sad people may find it difficult to attend to, process, and recall incoming information. At the trait level, negative affect is theorized to systematically distort social perception. Depressed individuals are found to exhibit a negative bias in social perception, including the judgment of facial displays (Gur et al., 1992; Hale, 1998) and the global interpretation of the behavior of those

around them (Gotlib & Meltzer, 1987). Using an information-processing paradigm, Gotlib et al. (2004) examined the attentional biases in clinically depressed participants against participants with generalized anxiety disorder (GAD) and a nonpsychiatric control group, finding that depressed participants directed their attention selectively to sad faces. Relevant to the present work on emotional contagion through facial mimicry, systematic attentional bias may render depressed individuals less accurate than nondepressed controls at recognizing emotion through facial displays as well as other verbal and nonverbal cues (Giannini et al., 1995; Persad & Polivy, 1993).

The notion that depressed individuals are always subject to systematic distortions in social perception has been challenged by a line of research on depressive realism, the theory that depressed people may be more accurate than nondepressives in judging their personal control over events (Alloy & Abramson, 1979). Depressed individuals have been found to be more accurate in their perception of the impressions they convey to others (Lewinsohn, Mischel, Chaplin, & Barton, 1980) and to be less susceptible to the fundamental attribution error, or pervasive tendency to underestimate the impact of situational forces and overestimate the role of dispositional factors when making social judgments (Forgas, 1998). In a study replicating their original paradigm, Alloy and colleagues (1981) induced depressed and elated mood states in naturally nondepressed and depressed students, respectively, to assess the impact of these transient mood states on susceptibility to the illusion of control. They found that naturally nondepressed women made temporarily depressed accurately judged the degree of their personal control while naturally depressed women made temporarily elated showed an illusion of control and overestimated their impact on an objectively uncontrollable outcome. This

finding supports the depressive realism proposition that negative mood may make individuals more realistic in social perception while positive affect leads to a distorted illusion of control.

However, empirical support for depressive realism has been inconsistent (see Campbell & Fehr, 1990; Dunning & Story, 1991; Gotlib & Meltzer, 1987) with the original paradigm criticized for a lack of realism, i.e., depressed individuals tend to show traditional negative biases and inaccuracy when more realistic, personally relevant stimuli were used in the experiment (Ambady & Gray, 2002). Pacini, Muir, and Epstein (1998) suggest that depressive realism may hold in artificial laboratory conditions but not in more realistic or emotionally engaging situations, due to an inability of depressed individuals to exercise rational control in more consequential situations.

Sadness and depression are of course different emotional states. Yet, researchers have observed that both sad and/or depressed people seem more preoccupied with themselves than with other people or with what is going on in the world around them. Thus, not surprisingly, they show deficits in attention (American Psychiatric Association, 2000; Beck, Rush, Shaw, & Emery, 1987; Friedman et al., 1980), which should result in less susceptibility to emotional contagion.

In line with this reasoning, it seems reasonable to predict that the happier people are, the more attentive and responsive to others' moods they will be, whether the target person is displaying happy or sad emotions. In sum, *the happier participants are, the more likely they will be to catch others' emotions—regardless of the type of emotion the target is expressing.* Because this theory predicts that the participants' mood will interact with the target's emotions in determining the outcome of the contagion process, it will be

referred to as the interaction theory. In sum, we now have a pair of competing theories for how mood is predicted to affect contagion:

- *Addition theory.* Participants will be most likely to catch emotions that are congruent with current affect, i.e., happy people will be more susceptible to catching positive emotions and more resistant to catching negative emotions; sad people will be more susceptible to catching negative emotions and more resistant to catching positive emotions. Affectively-neutral people should be equally susceptible to catching positive or negative emotions.
- *Interaction theory.* The happier participants are, they more likely they will be to catch others' emotions—regardless of the type of emotion the target is expressing, i.e., happy people will be more susceptible than both neutral and sad people to catching both positive and negative emotions. In effect, sadness insulates a person from emotional contagion of any sort, as it closes one off from attending to the emotions of others. Thus, affectively neutral people will be more susceptible than sad people to emotional contagion.

In the present work, I test the relationship between mood and the emotional contagion of both happiness and sadness, whether mood is measured as an enduring personality trait in Study 1, or as a transient state in Study 2. Recall that the overall hypotheses for the present work are as follows: Hypothesis 1) Trait-based affect, i.e., a happy or sad personality, will affect susceptibility to catching either positive or negative emotions; Hypothesis 2) Transient affect, i.e., a happy or sad mood state, will affect susceptibility to catching either positive or negative emotions. These hypotheses will be evaluated in light of the addition and interaction theories.

CHAPTER 3

METHOD OF STUDY 1: ENDURING AFFECT AND EMOTIONAL CONTAGION

In Study 1 we plan to test Hypothesis 1: Trait-based affect, i.e., a happy or sad personality, will affect susceptibility to catching either positive or negative emotions. We will explore which of two theories—the addition theory, which states that participants will be most likely to catch emotions that are congruent with current affect, or the interaction theory, which states that the happier participants are, the more likely they will be to catch others' emotions—is the best fit for the data.

Participants

The participant population consisted primarily of undergraduate students from the University of Hawai‘i at Mānoa (UH) who were recruited from courses in the social sciences. These students also recruited their family and friends, for a total of 158 participants (38% male, 62% female) whose ages ranged from 18 to 72 years (M = 22 years). As participants were mainly recruited from UH, the sample was representative of the demography of the university in categories such as education level and race/ethnicity (25% Caucasian; 20.9% Japanese; 14% Filipino; less than 10% African, American Indian, Chinese, Hawaiian, Hispanic, Korean, Middle Eastern, Pacific Islander, Indian/South Asian, Other Asian, and Other/Choose Not to Disclose).

Participants signed up on an electronic spreadsheet that randomly assigned them to one of two conditions by the target video, which was designed to induce positive or negative emotion. Following the experiment, participants were fully debriefed as to the full purpose of the study—to see whether people tend to catch other people's emotions

and if so, what impact does a person's personality have on his or her susceptibility to such contagion?

Debriefing included the disclosure that their facial expressions to the video clips of positive and negative emotional displays were recorded to investigate whether outside ratings of their emotion would correspond to their own self-report, thus giving a more complete assessment of the participant's emotional state. Upon debriefing, participants were given the opportunity to delete the recording, an option no participant selected.

Participants were only allowed to participate if they were at least 18 years old. Students enrolled in certain courses at UH received extra-credit for their participation, however no other compensation was offered to participants in the study.

Measures

Two surveys (pre and post-experiment) were administered to the sample population via SurveyMonkey.com, an online survey and questionnaire tool of increasing popularity (Evans et al., 2009). All surveys were administered by Research Assistants (RAs) in the Hatfield Lab and were comprised of pre-tested measures with demonstrated validity and reliability. The following measures were included in the pre- and post-experiment surveys, and are available in full in the appendices:

Pre-experiment:

- Demographic information
- Subjective Happiness Scale, SHS (Lyubomirsky & Lepper, 1999)
- Emotional Contagion Scale, ECS (Doherty, 1997)
- Life Orientation Test-Revised, LOT-R (Scheier, Carver, & Bridges, 1994)[1]

Post-experiment:

- Positive and Negative Affect Schedule, PANAS (Watson, Clark, & Tellegen, 1988)
- Joviality and Sadness scales from the Positive and Negative Affect Schedule – Extended Form, PANAS-X (Watson & Clark, 1999)

[1] The LOT-R is included to collect additional information, but is not part of the formal hypotheses.

Subjective Happiness Scale (SHS). Subjective wellbeing, or happiness, encompasses how people evaluate their own lives in terms of both affective and cognitive explanations (Diener, 2000) and was measured using the Subjective Happiness Scale (SHS; Lyubomirsky & Lepper, 1999; See Appendix B) a four-item measure comparable to the five-item Satisfaction with Life Scale (SWLS; Diener, Emmons, et al., 1985). Both tools have been shown to converge with mood reports, expert ratings, experience sampling measures, reports of family and friends, and smiling (Diener et al., 2002).

As the key measure of trait-based mood, the SHS would ideally be used in tandem with other assessments of personality; e.g., comparisons to in-person interviews or anonymous questionnaires by outsiders to contain impression management, experience sampling methods to reduce memory biases, or physiological measures to reduce subjective biases associated with self-report scales. While Hefferon and Boniwell (2011) rightly argue that the future of happiness measurement should include more experience sampling, qualitative methods, physiological measures, and longitudinal designs, many studies, as is this one, will be practically dependent on self-report questionnaires given on a single occasion.

The SHS consists of four items on a seven-point Likert scale, with high internal consistency and reliability. Construct validation studies of convergent and discriminant validity have confirmed the use of this scale to measure the construct of subjective happiness (Lyubomirsky & Lepper, 1999). A single composite score for global subjective happiness is computed by averaging responses to the four items (the fourth reverse-coded), resulting in a possible range of scores on the SHS from 1.0 to 7.0, with higher scores reflecting greater happiness ($\alpha = .70$).

Emotional Contagion Scale (ECS). Susceptibility to emotional contagion was measured using the Emotional Contagion Scale (ECS; Hatfield et al., 1994), a 15-item measure assessing individual differences to catching the five basic emotions of happiness, love, fear, anger and sadness (See Appendix C). The ECS is a reliable and valid measure of susceptibility to others' emotions based on mimetic tendency, which has been shown to predict people's responses to various emotional expressions and to be associated with emotionality, sensitivity to others, and empathy (Doherty, 1997).

Responses to the items were measured using a four-point response scale ranging from 1 (never true for me) to 4 (always true for me) and were summed to give an overall score for emotional contagion; the higher the total score, the more susceptible to emotional contagion a person is said to be ($\alpha = .81$).

Life Orientation Test – Revised (LOT-R). Dispositional optimism, as measured by the Life Orientation Test – Revised (LOT-R; See Appendix D), is a general assessment of whether one views the proverbial glass half-full or half-empty; hence, whether one's overall disposition is sunny or gloomy (Scheier et al., 1994). The LOT-R is a short 10-item questionnaire with no 'cut-offs' for optimism or pessimism; higher scores reflect higher levels of optimism, and lower scores reflect lower levels of optimism, i.e., pessimism. Although not part of the formal hypotheses of this study, the LOT-R was included in the pre-experiment survey as an exploratory measure designed to collect additional information on how personality may influence susceptibility or resistance to emotional contagion ($\alpha = .70$).

Positive and Negative Affect Schedule (PANAS). In the Positive and Negative Affect Schedule (PANAS), respondents are presented with words describing positive

moods (e.g., excited) and negative moods (e.g., hostile), and asked to rate each according to the extent to which it describes them (See Appendix E). As noted by Shiota and colleagues (2006), critics of the PANAS contend that several of the items on the tool are not actually emotions (e.g., determined, alert), and that several important positive emotions for wellbeing are absent from the scale (e.g., love, contentment, amusement).

A widely used scale across psychological and physical activity research, the PANAS thus consists of two 10-item mood scales for Positive Affect (PA) and Negative Affect (NA) that are shown to be highly internally consistent (0.86 – 0.90), largely uncorrelated, and stable at appropriate levels over a two-month time period (Watson et al., 1988). The PANAS allows for temporal variations in the assessment; researchers may choose whether to ask for a rating "right now," "over the past few days," or simply "in general." In this study, participants were asked to indicate to what extent they felt the mood in question "right now, at this present moment."

Responses to the 20 items were measured using a seven-point response scale ranging from 0 (not at all) to 6 (extremely much). Ratings were then summed separately across the two scales, allowing positive affectivity to be calculated independent of negative affectivity, e.g., people can be high in both positive affect and negative affect. Scores on both scales could range from 10 to 50, with low scores indicating low positive or negative affect and high scores indicating high PA or NA (PA, $\alpha = .92$; NA, $\alpha = .75$).

Joviality and Sadness Scales from the Positive and Negative Affect Schedule – Extended Form (PANAS-X). Positive affect and negative affect have reliably emerged as the dominant dimensions of emotional experience across diverse descriptor sets, time frames, response formats, languages, and cultures (see Almagor & Ben-Porath, 1989;

Mayer & Gaschke, 1988; Meyer & Shack, 1989; Watson et al., 1988; Watson & Tellegen, 1999; See Appendix E). Nevertheless, although PA and NA account for most of the variance in self-rated affect, Watson and Clark (1999) found that specific emotional states can also be identified within these overarching dimensions. They proposed a hierarchical taxonomic scheme in which PA and NA describe the valence of 11 correlated, yet ultimately distinguishable affective states: Fear, Sadness, Guilt, Hostility, Shyness, Fatigue, Surprise, Joviality, Self-Assurance, Attentiveness, and Serenity. Thus, the PANAS-X measures mood at two different levels.

In this study, the Joviality (Happiness) and Sadness scales were clearly the most relevant to the research questions and hypotheses. These two scales were selected to supplement the original 20 items from the PANAS on the post-experiment survey. The original Joviality scale from the PANAS-X includes eight items (happy, cheerful, joyful, excited, enthusiastic, lively, energetic, delighted), of which the latter three had the weakest varimax-rotated factor loadings, with lively and energetic loading onto separate factors as well (Watson & Clark, 1999). Thus, the three weakest performing items were excluded to form a five-item measure commensurate with the five-item Sadness scale. Scores on the Joviality and Sadness scales could range from 5 to 25, with low scores indicating low happiness/sadness, and high scores indicating high happiness/sadness (Joviality, $\alpha = .93$; Sadness, $\alpha = .83$).

Stimuli

Stimuli consisted of two videos, or Targets, commensurate with the two experimental conditions—whether the participant was exposed to Happy or Sad emotional displays. The clip of positive emotion (Happy Target) showed the response to

David Freese's homerun to win Game 6 of the 2011 Major League Baseball World Series, i.e., the ensuing celebration by the Saint Louis Cardinals and their fans—their joyous faces, expressions of exultation and delight, and joyous postures. The clip of negative emotion (Sad Target) focused on the sad and disappointed reactions by the Texas Rangers and their fans; e.g., mournful faces, agonized moans, and hunched postures.[2] Both clips were approximately two minutes long.

Design

Participants were randomly assigned to one of two conditions (Happy or Sad), where they would watch a video clip of people displaying either positive or negative emotion (Target). Participants' scores on the personality scale measuring general tendency towards happiness/sadness (SHS) were used in a multivariate, multilevel model (see the following section on analyses), to test whether trait-based mood (a happy or sad personality) affects susceptibility to catching either happy or sad emotion.

In each condition, the outcome was measured in the following three ways:

1. Self-report by the PANAS, which yields a score of Positive Affect (PA) and Negative Affect (NA), on the post-experiment survey.
2. Self-report by the Joviality and Sadness scales from the extended PANAS-X, on the post-experiment survey.
3. Two raters trained using either the Micro Expression Training Tool (METT) or the Subtle Expression Training Tool (SETT), created by the Paul Ekman

[2] To control for gender differences in reaction to the sports videos, gender will also be tested in the model as a covariate. The issue of gender-specific reaction to emotional stimuli is a different problem beyond the scope of this study.

Group, LLC,[3] evaluated two snapshots[4] of the participant's facial expressions using three items each from the Joviality and Sadness scales of the PANAS-X. Since the raters used abbreviated versions of the aforementioned scales, further discussion of the ratings as outcome measures will be referred to as Joviality – Revised (JOV-R) and Sadness – Revised (SAD-R), to differentiate these variables from the self-report measures of Joviality and Sadness.

Procedure

Two different electronic forms were used for the study, depending on the target video condition: form A—Happy and form B—Sad. Each form included: 1) the pre-experiment survey; 2) the target video; and 3) the post-experiment survey. The RAs were blind to which target video was included in each form, to contain experimenter effects. Additionally, participants watched the video with headphones on, so that the RA was unable to hear the video and could not respond to it along with the participant.

1. *Pre-experiment survey*. The participant was welcomed into the lab by an RA and seated in front of a Mac laptop. The consent form was already loaded on the screen as the preliminary page of the pre-experiment survey. Participants were informed of the possibility of recording their facial expressions in the consent form (See Appendix A). The pre-experiment survey took under 10 minutes and ended on a page instructing the participant to wait for the RA to

[3] The author would like to thank Dr. Paul Ekman for his generosity in offering the METT and SETT training to our team of RAs.
[4] See the Generalizability Theory study in Chapter 5 for further information on the rating process and decisions made regarding the optimal number of raters, scale items, and rating occasions.

input a code: "Please STOP here. Please inform the research assistant that you have completed this survey."

2. *Experiment*. After the participant completed the pre-experiment survey, when the RA inputed the "code," he or she surreptitiously started the Photo Booth[5] program as well. As noted above, the RA was blind to which condition the participant was in, knowing only which form (A or B) the participant was assigned to. After starting the video, the RA sat in a corner, ready and able to answer any questions that occurred to the participant, but out of his/her viewing radius. The participant watched the video clip of positive or negative emotion on the computer, while his/her facial expressions were simultaneously recorded.
3. *Post-experiment survey*. After watching the clip, the participant took the post-experiment survey comprised of the PANAS and the Joviality and Sadness scales from the PANAS-X. The post-experiment survey ended on a page that signifies completion of the study and the participant was instructed to print this page in order to receive extra credit for his/her participation.
4. *Debriefing.* The participant was then informed of the full purpose of the study—to assess whether emotional contagion is affected by enduring affect—and given the opportunity to review the recording of his/her facial expressions and delete it if desired (which no participant chose to do).
5. *Rating recordings.*

[5] Photo Booth is a small software application by Apple Inc. for taking photos and videos with a camera built into the Mac. Other than a small green light at the top of the laptop, participants are not able to see themselves being recorded, minimizing the potential for distractions and induced participant effects.

a. A set of eight RAs was trained in recognizing emotion with the either the Micro Expression Training Tool (METT) or the Subtle Expression Training Tool (SETT), both administered online. The METT/SETT takes approximately one hour to complete, and trainees received pre- and post-test scores of their accuracy in reading emotional cues. All RAs were required to receive over 80% accuracy on the post-test in order to participate in coding.
b. The entire set of 340 videos from both Studies 1 and 2 was divided amongst four pairs of raters; thus, each pair rated the same 85 videos (for reliability analysis between raters), i.e., each participant's video was independently coded by two raters.
c. For each video coded, the RA watched the entire recording of the participant one time through, and then on the second viewing stopped the video at the two points or "occasions" at which the participant expressed the most emotion.
d. These two occasions were then rated using the three-item JOV-R and SAD-R scales (abridged versions of the Joviality and Sadness scales of the PANAS-X, respectively). Raters were instructed as follows:

> This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then indicate to what extent you think the person in the snapshot feels this way at that moment.

Items were evaluated on the following metric:

0	1	2	3	4	5	6
Not at all	Very slight	Somewhat	Moderate	Much	Very much	Extremely much

Inter-rater reliabilities. The reliability of the raters' scores is displayed below in Table 3.1, which shows the inter-rater reliability between each pair of raters, as well as the overall reliability and average reliability between pairs. On an index from 0 to 1, we see that the average reliability across the pairs for the JOV-R outcome is about 0.64, which is just short of 0.70, a commonly accepted standard of reliability. On the SAD-R outcome, however, we can see the reliabilities are very low, with an average of 0.347. This low inter-rater reliability is likely why there are few significant findings for the rater scores in the main model and a statistically significant discrepancy between rater pairs, as shown in Chapter 4. In brief, the reliability of the rater pairs would be considered marginal for the JOV-R scale and poor for the SAD-R outcome.[6]

Table 3.1
Study 1 Rater Dependability (Reliability)

Variable	JOV-R	SAD-R
Rater 1 – Rater 2	0.667	0.483
Rater 3 – Rater 4	0.602	0.312
Rater 5 – Rater 6	0.680	0.448
Rater 7 – Rater 8	0.616	0.146
All Pairs	0.607	0.312
Average Rater Pairs	0.641	0.347

Analyses

Limitations of a traditional ANOVA/MANOVA design. Traditional experimental designs use either Analysis of Variance (ANOVA), if there is a single outcome, or

[6] From the Generalizability Theory study in Chapter 5, the reliability of judges' ratings was predicted to be between 0.7 and 0.8; thus, an average reliability of 0.641 on the JOV-R scale is close to expectation.

Multivariate Analysis of Variance (MANOVA), if there are two or more outcomes. Participants' scores on the personality scale measuring general tendency towards happiness/sadness (SHS) would be used to break the participants into three groups: 1) those with a low score on the SHS (habitually sad); 2) those with a medium score on the SHS (affectively neutral); and 3) those with a high score on the SHS (habitually happy). Thus, the ANOVA/MANOVA would investigate the difference in emotional contagion between groups distinguished by differences in trait-based happiness/sadness. One of the disadvantages of this approach, however, is that need to split the participants into three groups based on artificial cutoffs in their SHS score in order to implement the comparative analysis between target conditions.

A second limitation of the traditional ANOVA/MANOVA approach is its inability to handle individuals with partial data (i.e., where some observations may be missing). Subjects with any missing data are simply dropped, which is known as listwise deletion. Because this approach assumes missing cases are missing completely at random (MCAR), which is typically only the case when a random sample is drawn from a population, it will lead to biased model estimates in almost all situations (Hox, 2010).

A third limitation of this approach is the inability to incorporate data on discrepancies due to raters, occasions of measurement, or their interaction directly into the model, since this information is nested within the individual participants in the model (Hox, 2010). In the ANOVA or MANOVA approach, this would require averaging data on raters and occasions after they evaluated the recordings; that is, the information on each individual participant compiled from raters over occasions would be averaged and used along with the participants' self-reports as the outcome measures in separate

ANOVAs, or analyzed together in a MANOVA, to see if the data supported the main effect of target condition by comparing the means for the outcome variables, i.e. the mean ratings by self-report and judges' ratings for participants who watched the video clip of either positive or negative emotion.

Mixed modeling approach. As discussed below, the traditional ANOVA/MANOVA design was replaced with a mixed (or random coefficients) design, which is a type of multilevel model where repeated measurements (e.g., occasions) and rater assessments are nested within individuals. In its simplest form, this mixed model represents a type of two-level model where rater assessments compiled over one or more occasions are nested within individuals at Level 1 (within subjects), while the conditions having to do with the experiment, as well as any other covariates, are entered as Level 2 (between subjects) data. Use of this sophisticated multivariate and multilevel model thereby negates the need to justify artificial groupings in the data based on arbitrary cut-offs on the SHS measure.

There are a number of advantages for specifying the analyses in this manner. Most important for this study is the ability to include individuals with partial data in the analyses. In contrast to ANOVA or MANOVA, which use listwise deletion of any individuals with missing data, individuals with partial data can be included in the mixed modeling approach. This analysis makes use of full information maximum likelihood (FIML), which can provide efficient estimates in the presence of individuals with some missing data. FIML estimation will lead to unbiased estimates when it can be assumed that the data are missing at random (MAR); that is, if the probability of data being missing on the outcome is related to missing data on a covariate, but not to subjects'

standing on the outcome, then the data are MAR (Hox, 2010). A second advantage for purposes of this study is that the mixed modeling approach allows the incorporation of error facets due to raters, occasions of measurement, or their interactions (as well as other potential sources of error) directly into the model, which will provide more efficient estimates of experimental conditions between subjects. A third advantage of the mixed modeling approach is that it can facilitate the examination of multiple dependent variables within one model (Hox, 2010).

Proposed model. The proposed models are presented in Figures 3.1 through 3.4. From these figures, we can see the overall predictions for how happiness/sadness is expected to influence susceptibility to emotional contagion, based on the two competing hypotheses and using the different outcome measures (positive or negative affect, based on either self-report or judges' ratings). These predictions are expected to hold whether happiness/sadness is measured as an enduring trait, as in Study 1, or as a transient mood, as in Study 2 (to follow). The theoretical model assumes that there will be differences in trait-based affect (i.e., a happy or sad personality) leading to different susceptibilities to catching the positive or negative affect of others. Information about the measurement qualities of the assessments is not shown in Figures 3.1 – 3.4, but is added to the within-subjects part of the model (described in the next section). Figures 3.1 – 3.4 are continued on the next page.

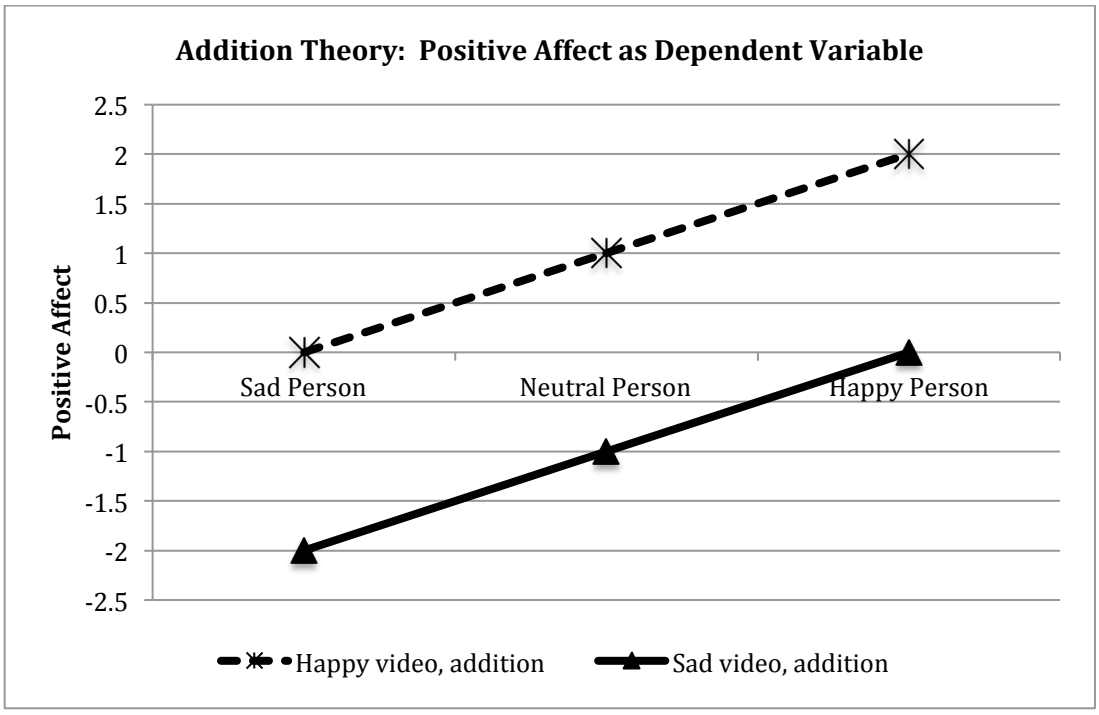

Figure 3.1. Addition theory: Positive affect as dependent variable

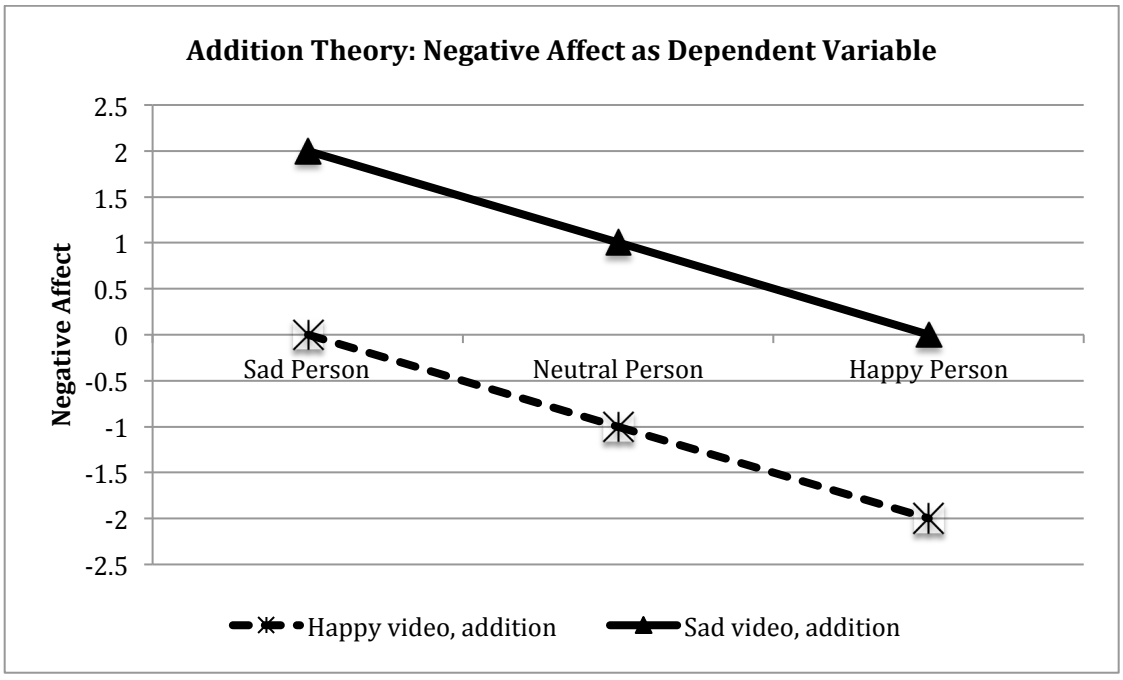

Figure 3.2. Addition theory: Negative affect as dependent variable

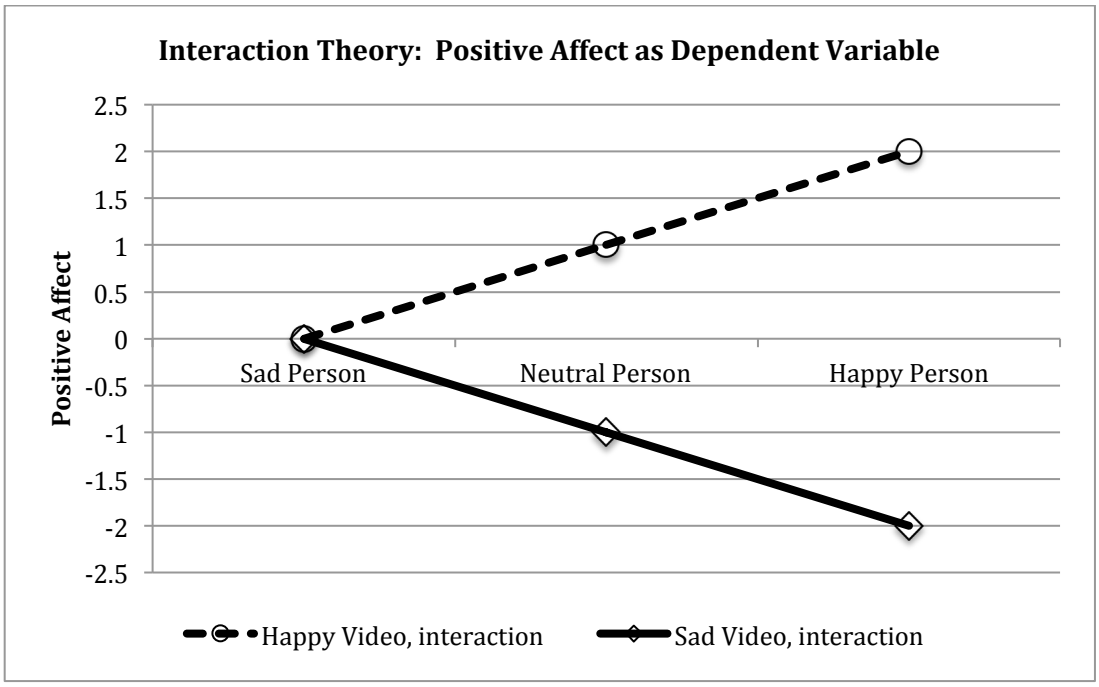

Figure 3.3. Interaction theory: Positive affect as dependent variable

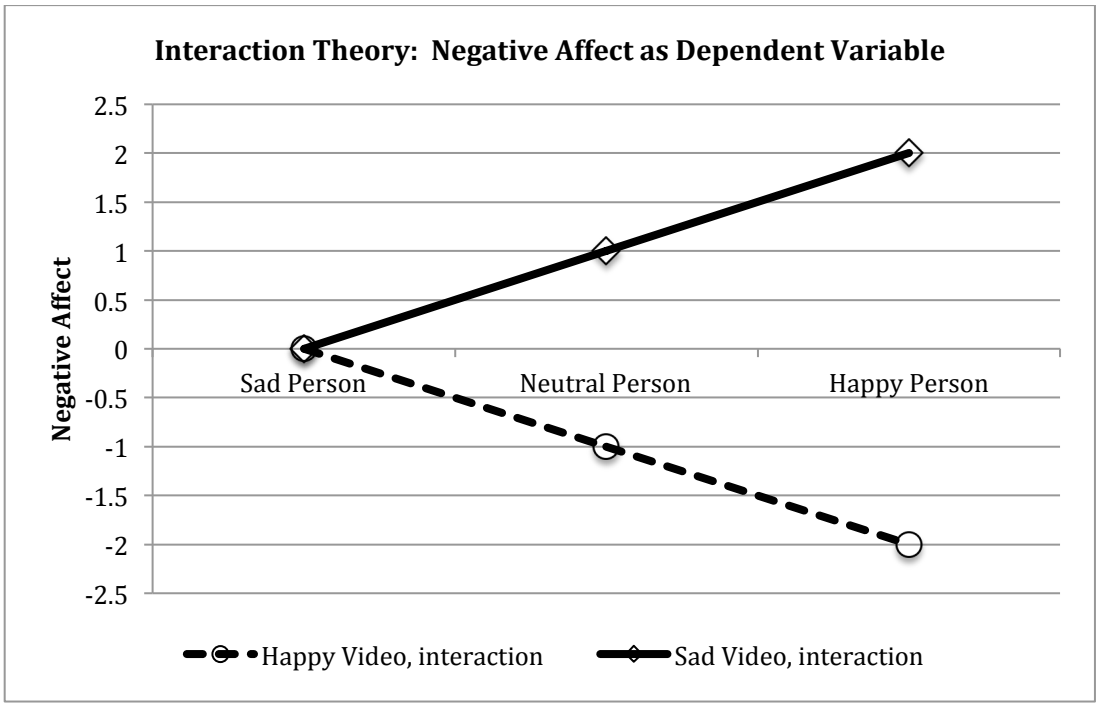

Figure 3.4. Interaction theory: Negative affect as dependent variable

Two-level models. As noted previously, mixed, or random coefficients, modeling is appropriate in research situations where data are nested within individuals. For each participant in the study, there is a measurement model nested within the individuals. More specifically, in the final models, two raters provided information on participants' responses on two occasions which also covered multiple items. Such designs, which require individuals to assess participants under various conditions, have the potential to introduce considerable measurement error, which should be considered in the analyses to explain participant responses to the experimental stimuli. What was needed was a design that would include possible variability due to various errors facets (e.g., raters, occasions, interactions) as part of the analyses (Marcoulides, 1998).

These measurement facets were included in the model at Level 1 (where the assessment information is nested within subjects). The Level 1 model to explain an individual's observed emotional score (Y_{1ij}) can be described as follows:

$$Y_{1ij} = \beta_{0j} + \beta_1 rater_{ij} + \beta_2 occasion_{ij} + \beta_3 rater_{ij} * occasion_{ij} + e_{ij}, \qquad (3.1)$$

where β_{0j} is the adjusted score for individual *j* on assessment *i* after adjusting for possible discrepancies due to rater differences, the occasion they are assessing, and possible rater*occasion interactions, and e_{ij} represents residual variability in assessing each individual's emotional response.[7] Level 1 (the within-group level) estimates are presented in a log odds metric, since the outcome variable, i.e., the rater's score, is measured on an ordinal scale (i.e., 0 to 6).

[7] Note that "items" were not included as a measurement facet in the main model. This decision was made based upon the preliminary Generalizability Theory study discussed in Chapter 5.

At Level 2, the experimental condition (i.e., whether the person was watching a happy or sad video) was added to the model, along with the emotional contagion score, the subjective happiness score, the interaction between condition and subjective happiness (to test between the addition and interaction theories), as well as demographic controls for gender and age:

$$\begin{aligned}\beta_{0j} &= \gamma_{00} + \gamma_{01}condition_j + \gamma_{02}emotcont_j + \gamma_{03}subhappy_j + \\ &\gamma_{04}subhappy_j * condition_j + \gamma_{05}female_j + \gamma_{06}age_j + u_{0j},\end{aligned} \tag{3.2}$$

where γ_{00} is the intercept representing the average score when watching the happy video (coded 0) and γ_{01} represents the change in the average score due to watching the other condition (i.e., the sad video), $\gamma_{02} - \gamma_{06}$ represent the coefficients for the other between-subjects predictors, and u_{0j} represents the random component, that is, variability in predicting the scores on the dependent variable across individuals. Through substitution of Eq. 3.2 into 3.1, the combined equation representing the within-subject and between-subject variables is as follows:

$$\begin{aligned}Y_{ij} &= \gamma_{00} + \gamma_{01}condition_j + \gamma_{02}emotcont_j + \gamma_{03}subhappy_j + \\ &\gamma_{04}subhappy_j * condition_j + \gamma_{05}female_j + \gamma_{06}age_j + \\ &\gamma_{10}rater_{ij} + \gamma_{20}occasion_{ij} + \gamma_{30}rater_{ij} * occasion_{ij} + u_{0j} + e_{ij}.\end{aligned} \tag{3.3}$$

The mixed-model approach also facilitates the specification of other relationships either within or between individuals. In this case, a second model can be specified between-individuals. This second equation considers the self-report measure (Y_{1j}) as the between-subjects outcome:

$$\beta_{0j} = \gamma_{00(1)} + \gamma_{01(1)} condition_j + \gamma_{02(1)} emotcont_j + \gamma_{03(1)} subhappy_j + \gamma_{04(1)} subhappy_j * condition_j + \gamma_{05(1)} female_j + \gamma_{06(1)} age_j + u_{0(1)j}. \quad (3.4)$$

As Eq. 3.4 indicates, there is no within-subjects model, since the outcome is a self-report measure. Between-individual estimates for Eq. 3.3 and Eq. 3.4 are presented as standardized ($M = 0$, $SD = 1$), since ordinal variables are treated as measured on an underlying continuous scale at Level 2 in Mplus (Muthén & Muthén, 1998-2006), and each participant's self-report was measured on a continuous scale. The mixed model was estimated using Mplus 6.12 (Muthén & Muthén, 2005), a statistical software package which can be used to estimate multilevel models with outcomes measured on different types of scales simultaneously. Figure 3.5 visually depicts the complete set of variables and predicted interactions in the two-level model.

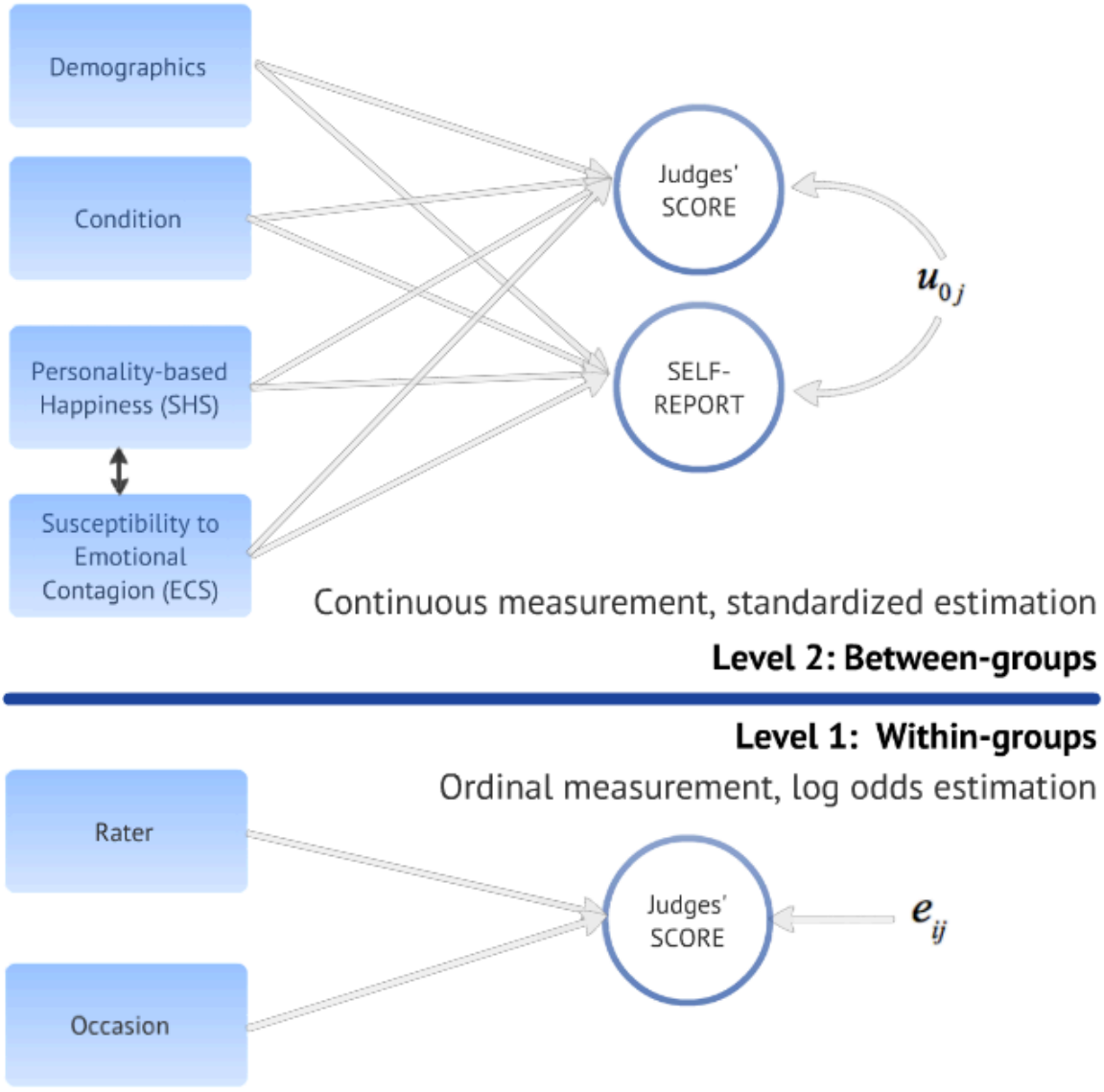

Figure 3.5. Two-level model for Study 1

Preliminary Analyses. Several preliminary analyses were conducted on the two types of outcome variables—judges' rating and self-report. The preliminary analysis for judges' ratings will be discussed in Chapter 5 (Method of Study 2). The preliminary analysis for self-report data is discussed here, as Study 1 includes self-report measures as both predictor and outcome variables.

In review, prior to watching the target video in the main experiment, participants in Study 1 took a pre-experiment survey that included the Subjective Happiness Scale (SHS), the Emotional Contagion Scale (ECS), and the Life Orientation Test-Revised (LOT-R). After viewing the target video, participants took a post-experiment survey including the Positive and Negative Affect Schedule (PANAS), and the Joviality and Sadness scales from the extended version of the PANAS (PANAS-X). Collectively these data will be referred to as the self-report database.

As the goal is to provide a preliminary test of the proposed relationships, it is assumed that the available sample may not fully represent the population at large; therefore, the results should not be extrapolated beyond this particular sample. A preliminary step in the data analysis process was to use exploratory factory analysis to improve the psychometric properties of the self-report data prior to testing the study's main hypotheses. More specifically, it is important to first ensure that the variables were appropriately and reliably measured before the data is used in the main analysis to examine the effects of the various experimental conditions on subjects' responses.

Field (2009) identifies three purposes of factor analysis: 1) to understand the structure of the latent variable(s) behind a set of variables; 2) to construct a scale to measure an underlying variable; and 3) to reduce a data set to a more manageable size while retaining as much of the original information as possible. In this study, principal component analysis (PCA) was used for the latter purpose; that is, as a data reduction method, rather than a theoretical approach, to weight the specific items defining their proposed underlying constructs.

The goal was to create a single scale, or one "weighted" component, in which each of the items is weighted according to the strength of its relationship to the dimension. For example, merely adding three items together assumes that they contribute equally to the dimension, i.e., they are given the same weight. However, in fact, one item may be more strongly related to the dimension than the other two items and should be given greater weight, which will yield a more accurate estimate than not accounting for differences in the strength of the relationship between each item and the dimension. Each item is allowed to contribute to the component through its weighted factor score, and the researcher can then investigate how the reliability (Cronbach's alpha) of the scale would be affected by the removal of the item. This process reduces problems of multicollinearity, as the correlated items are combined to form a factor.

To conduct the PCA, variables that are reverse scored on the original measures were recoded (e.g., SHS4r in Table 3.2 is a reverse score "r" of item 4 in the Subjective Happiness Scale) to positively correlate with the scales. Reliability analyses were then conducted, and items whose deletion would most increase the reliability of the scale were removed to adopt a minimum of $\alpha = 0.70$ for each scale. See Tables 3.2 – 3.8 (continued on the next page) for the resultant component matrices and reliability scores of each scale used in Study 1 (and Study 2).

Table 3.2
Component Matrix of SHS

	Component
	1
SHS2	.800
SHS3	.873
SHS4r	.709

α = 0.70

Table 3.3
Component Matrix of ECS

	Component
	1
ECS1	.578
ECS2	.484
ECS3	.584
ECS4	.596
ECS5	.404
ECS6	.443
ECS7	.406
ECS8	.638
ECS9	.612
ECS10	.473
ECS11	.544
ECS12	.533
ECS13	.413
ECS14	.628
ECS15	.445

α = 0.81

Table 3.4
Component Matrix of LOTR

	Component
	1
LOTR1	.552
LOTR3r	.669
LOTR4	.749
LOTR7r	.688
LOTR9r	.702

α = 0.75

Table 3.5
Component Matrix of PA Scale (PANAS)

	Component
	1
PA1	.755
PA2	.577
PA3	.638
PA4	.803
PA5	.857
PA6	.842
PA7	.808
PA8	.705
PA9	.782
PA10	.813

α = 0.92

Table 3.6
Component Matrix of NA Scale (PANAS)

	Component
	1
NA1	.575
NA2	.513
NA3	.606
NA4	.388
NA5	.613
NA6	.438
NA7	.616
NA8	.617
NA9	.706
NA10	.579

$\alpha = 0.75$

Table 3.7
Component Matrix of Joviality Scale (PANAS-X)

	Component
	1
Happy1	.893
Happy2	.904
Happy3	.906
Happy4	.884
Happy5	.839

$\alpha = 0.93$

Table 3.8
Component Matrix of Sadness Scale (PANAS-X)

	Component
	1
Sad1	.850
Sad2	.810
Sad3	.729
Sad4	.706
Sad5	.767

$\alpha = 0.83$

It is noted that one item was removed from the SHS (item 1) and one item was removed from the LOTR (item 10), in addition to the filler items that should be excluded from the scoring of the original LOTR scale (items 2, 5, 6, and 8). In sum, PCA was used

to create weighted factor scores ($M = 0$, $SD = 1$) for each variable that were then saved into the database for use in the main analyses. The self-report measure, now "weighted" in terms of each item's contribution to the underlying construct, was then brought into the main multilevel model at Level 2 (between subjects), where condition effects and other between-subjects variables should be.

Another benefit to the PCA is the ability to identify the best performing outcome measure of the four self-report scales (PA, NA, Joviality, Sadness). Overall, the positive affect measures (PA and Joviality) had greater reliability (alphas) than the negative affect scales (NA and Sadness). Indeed, we might select just the highest performing measure, the Joviality scale ($\alpha = 0.93$), for use as the self-report outcome variable in the main two-level model. However, for consistency, it was desirable to keep a measure of negative affect in the analysis as well. Therefore, both the Joviality and Sadness measures were used as the self-report outcome variables, in addition to the JOV-R and SAD-R scores from the judges' ratings (see Chapter 5). While the collection of data on the full PANAS was instructive, including the PA and NA scales as additional outcome measures in the main model would be redundant, as the Joviality ($\alpha = 0.93$) and Sadness ($\alpha = 0.83$) scales outperform the PA ($\alpha = 0.92$) and NA scales ($\alpha = 0.75$), respectively.

CHAPTER 4

RESULTS OF STUDY 1: ENDURING AFFECT AND EMOTIONAL CONTAGION

Descriptive Statistics

The descriptive results of the self-report data are presented in Table 4.1 below. As the Joviality and Sadness scales were transformed into factor scores (see Chapter 3), the scale means (*M*) and standard deviations (*SD*) for the two conditions are standardized. The means for the two conditions reflect how far each group's mean deviates from the sample mean ($M = 0.0$, $SD = 1$). For example, considering the Joviality scale, participants who watched the sad target video, as expected, reported lower positive affect ($n = 81$, $M = -0.388$, $SD = 0.838$) at the end of the experiment than participants in the Happy condition ($n = 77$, $M = 0.350$, $SD = 1.037$), indicating a statistically significant difference in means of 0.738 ($t(156) = 4.866$, $p < .001$), i.e., a considerable difference in perceptions between the two experimental conditions. In contrast, when the outcome was measured by self-report on the Sadness scale, participants in Happy condition reported less sadness than average ($n = 77$, $M = -0.186$, $SD = 0.962$); however, those exposed to the sad stimuli did as well ($n = 81$, $M = -0.062$, $SD = 0.800$). The overall difference in standardized means between the two conditions was much smaller on the Sadness scale (0.124) than the Joviality scale (0.738), and non-significant.

Table 4.1
Descriptive Statistics for Self-Report by Factor Scores Within Conditions by Joviality and Sadness Scales

		Joviality			Sadness		
Condition	*n*	*M*	*SD*	T-Test	*M*	*SD*	T-Test
Happy Stimuli	77	0.350	1.037	4.866**	-0.189	0.963	-0.894
Sad Stimuli	81	-0.388	0.838		-0.062	0.800	

Note. $^{**}p < .001$

The descriptive results of the data from the judges' ratings are shown in Table 4.2, which presents the means and standard deviations of the JOV-R and SAD-R ratings on a 7-point ordinal scale. From the table, we get a sense that the overall scoring of emotion was relatively low, as all the means are close to zero, suggesting that the raters evaluated the participants as having very little visible signs of emotion. Overall, while not definitive, since both differences are small and non-significant, the results in Table 4.2 imply that raters identified slightly more expressed emotion regarding the sad stimuli for both scales (i.e., the means on both the JOV-R and SAD-R scales are higher sad stimuli). Table 4.2 also suggests that the JOV-R scale provided more variability (higher standard deviations) in terms of emotional response, which was interpreted as supportive evidence for emphasizing the JOV-R scale to determine the effects of the various experimental conditions on participants.

Table 4.2
Descriptive Statistics for Judges' Ratings on an Ordinal Scale Within Conditions by JOV-R and SAD-R Items

		JOV-R			SAD-R		
Condition	*n*	*M*	*SD*	T-Test	*M*	*SD*	T-Test
Happy Stimuli	77	0.849	1.402	1.100	1.039	1.019	-1.694
Sad Stimuli	81	0.767	1.538		-0.062	1.147	

Summary of Two-Level Model

The proposed model as tested is presented in Figure 4.1 (continued on the next page). Between subjects, there are two between-subjects (Level 2) outcomes in the model. The first is the judges' score (on the JOV-R or SAD-R scales) and the second is the subjects' self-report factor score (on the Joviality or Sadness scales). Within subjects

(Level 1), only the judges' score is shown, since this outcome is dependent on ratings over two occasions.

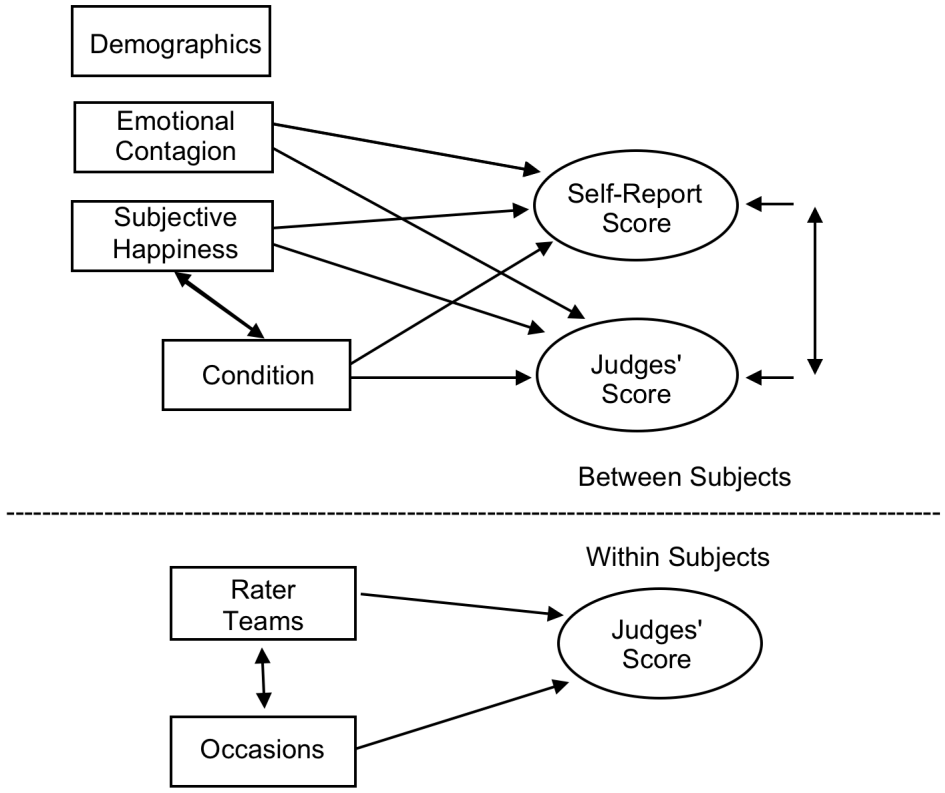

Figure 4.1. Proposed model for Study 1.

Two-Level Model Results with Positive Affect Outcome Measures

In Table 4.3, the results of the main two-level model with positive affect outcome measures are presented. Between subjects, the JOV-R score represents judges' ordinal ratings of subjects' displayed emotion. The second outcome is subjects' self-report factor score on the Happiness scale. Both are standardized ($M = 0$, $SD = 1$) between subjects. The reference condition for both outcomes is the Happy condition (watching the happy target video).

Table 4.3
Two-Level Model Estimates on the JOV-R Scale

Variables	Estimate	SE	T-Test	Sig.
Between Subjects (N = 158)				
Happiness Score[a]				
Sad Target	-0.063	0.079	-0.795	0.322
Emotional Contagion	0.061	0.110	0.553	0.612
Subjective Happiness	0.170	0.289	0.591	0.494
Subjective Happiness*Sad Target	-0.098	0.291	-0.338	0.735
Age	-0.063	0.060	-1.047	0.295
Female	-0.020	0.095	-0.216	0.829
Within Subjects[b]				
Occasions	0.018	0.241	0.076	0.939
Rater Teams	0.059	0.355	0.167	0.867
Occasions x Rater Teams	-0.400	0.352	-1.137	0.256
Between Subjects[a]				
Self-Report Happiness Intercept	1.171	0.464	2.524	0.012
Sad Target	-0.365	0.068	-5.356	0.000
Emotional Contagion	0.136	0.076	1.780	0.075
Subjective Happiness	0.666	0.230	2.901	0.004
Subjective Happiness*Sad Target	-0.379	0.214	-1.770	0.077
Age	0.015	0.085	0.173	0.836
Female	-0.109	0.073	-1.488	0.137
Level 2 variance (Score)	10.882	1.883	5.778	0.000
Level 2 variance (Self-Report)	0.727	0.081	9.014	0.000
Correlation	0.091	0.087	1.046	0.295
Log likelihood	-1620.5			
Free parameters	25			

Note. [a] Between-subject estimates are standardized coefficients; [b] Within-subject estimates are log odds coefficients; thresholds not shown.

For the judges' ordinal outcome, we can see that participants in the Sad condition were evaluated as expressing less happiness on average (-0.063) than the participants who watched the happy target video when controlling for other variables in the model; this relationship is in the right direction but was not significant (p = .322). Emotional contagion, as measured by the Emotional Contagion Scale (ECS), had an estimated effect on JOV-R judges' ratings in the predicted direction (though non-significant); that is, a

one standard deviation increase on the ECS, reflecting higher susceptibility to emotional contagion, would predict a .061 increase in emotion as measured by the JOV-R scale. Similarly, enduring affect, as measured by the Subjective Happiness Scale (SHS), also influenced JOV-R scores in the predicted direction—according to both the addition and interaction hypotheses, higher levels of trait-based happiness would predict higher susceptibility to picking up happy emotion. Although the relationship between subjective happiness and judges' ratings of participant happiness was in the predicted direction (γ = .170), it was non-significant (p = .494). The interaction between SHS and condition (i.e., the Sad Target) was also not significant (γ = -0.098, p = .735).

While the data by judges' ratings yielded no significant results, turning to the self-report factor scores (for Joviality), Table 4.3 suggests that participants watching the sad target video reported significantly lower self-report happiness scores (γ = -0.365, $p < .001$) compared to their peers watching the happy target video. This finding suggests that participants in the Sad condition reported their happiness level on the Joviality scale to be 0.37 of a standard deviation less than those who watched the Happy target video. Importantly, an increase in subjective happiness of one standard deviation would result in a 0.666 *SD* increase in self-reported happiness (on the Joviality scale) when assigned to the Happy condition (p = .004), controlling for the other variables in the model. At α = .10, the interaction between condition and SHS is significant (γ = -.379, p = .077). These findings are graphically depicted in Figure 5.2 (continued on the next page).

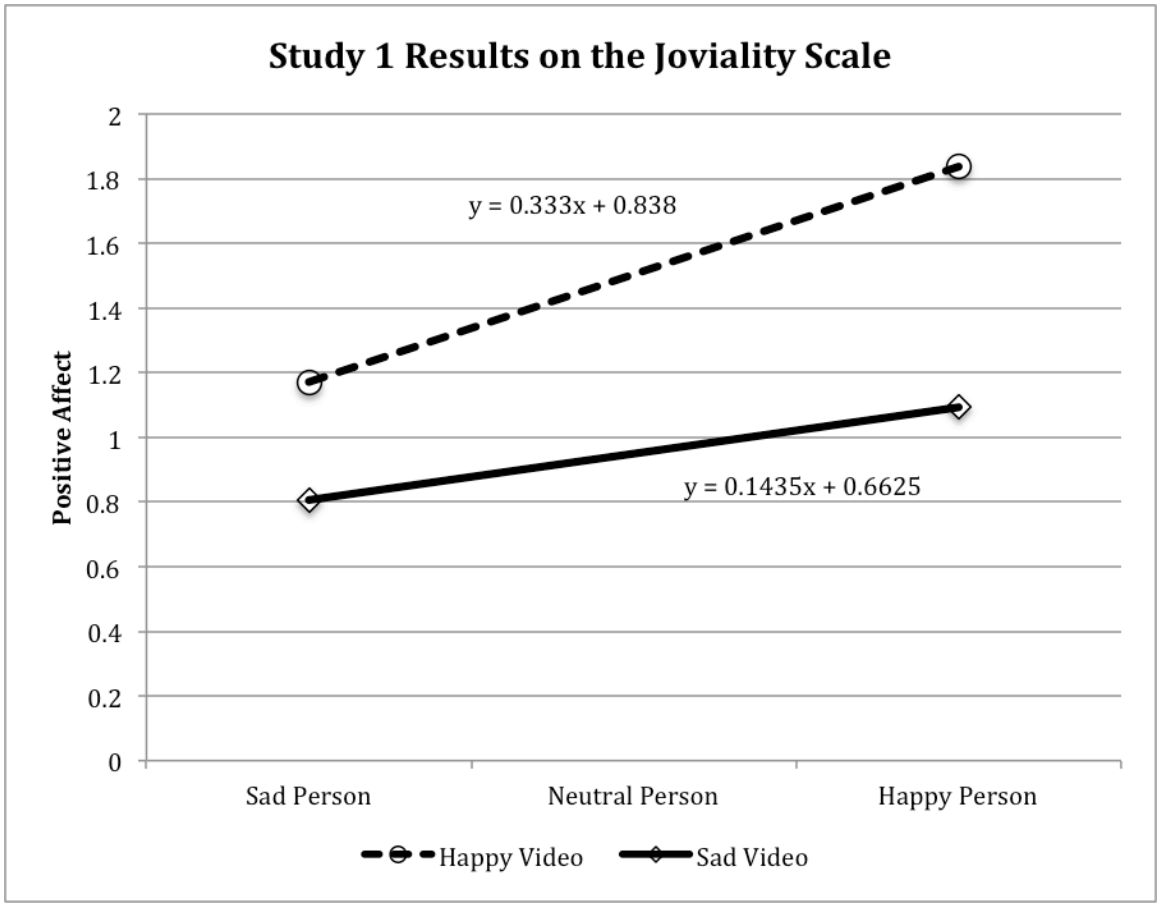

Figure 4.2. Results of Study 1 with the outcome measured on the Joviality scale.

Considering the other covariates in the model, a one *SD* increase on the ECS would result in an increase of 0.136 (p = .075) in observed emotion; this finding is significant at the more lenient alpha level of .10. The influence of demographic characteristics such as age and gender was not significantly related to the outcome on either measurement scale.

Importantly, the non-significance of the Level 1 (within subjects) variables for the JOV-R score in Table 4.3 suggests little possible impact of differences between occasions measured (p = .939), raters (p = .867), or their interaction (p = .256); i.e., variability on these components is not significantly predicting the outcome measured on the JOV-R scale. We can also note that the JOV-R and Joviality outcome measures are positively,

but non-significantly correlated ($r = 0.091$, $p = .295$), suggesting that the rater scoring and participants' self reports may be tapping into different constructs (as will be discussed further in Chapter 7).

Two-level Model Results With Negative Affect Outcome Measures

Table 4.4 (continued on the next page) presents the results of the main model with judges' scores on the SAD-R scale and the self-report Sadness scale used as outcome measures. Again, the baseline comparison is to the Happy condition. In contrast to the data collected on the positive affect measures, there were no significant relationships found on either the SAD-R or Sadness scales, even at the more lenient alpha of $\alpha = .10$.

Again, we find a non-significant, small correlation between the SAD-R and Sadness scales ($r = -0.025$, $p = .896$), suggesting that raters' scoring and participants' self reports are not measuring the same thing (see Chapter 7). None of the Level 1 (within subjects) variables contributed significant variance to these estimates, suggesting that raters, occasions, and the interaction between these terms did not affect judges' scores on the SAD-R scale.

Table 4.4
Two-Level Model Estimates on the SAD-R Scale

Variables	Estimate	SE	T-Test	Sig.
Between Subjects (N = 158)				
Sadness Score[a]				
Sad Target	-0.068	0.087	-0.776	0.438
Emotional Contagion	0.062	0.110	0.561	0.575
Subjective Happiness	0.165	0.289	0.571	0.586
Subjective Happiness*Sad Target	-0.090	0.291	-0.308	0.758
Age	-0.058	0.061	-0.952	0.341
Female	-0.025	0.095	-0.261	0.794
Within Subjects[b]				
Occasions	-0.170	0.208	-0.816	0.414
Rater Teams	-0.244	0.981	-0.248	0.804
Occasions x Rater Teams	0.071	0.626	0.114	0.910
Between Subjects[a]				
Self-Report Sadness Intercept	-0.205	0.425	-0.482	0.630
Sad Target	0.102	0.081	1.259	0.208
Emotional Contagion	0.149	0.138	1.085	0.278
Subjective Happiness	-0.058	0.240	-0.244	0.807
Subjective Happiness*Sad Target	-0.111	0.241	-0.460	0.645
Age	-0.054	0.041	-1.329	0.184
Female	-0.015	0.076	-0.198	0.843
Level 2 variance (Score)	10.893	1.125	5.237	0.000
Level 2 variance (Self-Report)	0.745	0.188	3.962	0.000
Correlation	-0.025	0.190	0.130	0.896
Log likelihood	-1621.0			
Free parameters	25			

Note. [a] Between-subject estimates are standardized coefficients; [b] Within-subject estimates are log odds coefficients; thresholds not shown.

CHAPTER 5

METHOD OF STUDY 2: TRANSIENT AFFECT AND EMOTIONAL CONTAGION

In Study 2 we plan to test Hypothesis 2: Transient affect, i.e., a happy or sad mood state, will affect susceptibility to catching either positive or negative emotions. We will explore which of the two theories—the addition theory, which states that participants will be most likely to catch emotions that are congruent with current affect, or the interaction theory, which states that the happier participants are, the more likely they will be to catch others' emotions—is the best fit for the data.

Participants

The participant population consisted primarily of undergraduate students from the University of Hawai‘i at Mānoa (UH) who were recruited from courses in the social sciences. These students also recruited their family and friends, for a total of 182 participants (37% male, 63% female) whose ages ranged from 18 to 72 years (M = 23 years). As participants were mainly recruited from UH, the sample was representative of the demography of the university in categories such as education level and race/ethnicity (21.4% Caucasian; 20.3% Japanese; 14.8% Filipino; less than 10% African, American Indian, Chinese, Hawaiian, Hispanic, Korean, Middle Eastern, Pacific Islander, Indian/South Asian, Other Asian, and Other/Choose Not to Disclose).

Participants signed up on an electronic spreadsheet, which randomly assigned them to one of six conditions by combination of mood manipulation (positive, neutral, or negative mood induction procedure) and stimuli, which was designed to induce positive or negative emotion. Following the experiment, participants were fully debriefed as to the full purpose of the study—to see whether people tend to catch other people's

emotions and if so, what impact a person's transient mood has on his or her susceptibility to such contagion.

Debriefing included the disclosure that their facial expressions to the video clips of positive and negative emotional displays were recorded to investigate whether outside ratings of their emotion would correspond to their own self-report, thus giving a more complete assessment of the participant's emotional state. Upon debriefing, participants were given the opportunity to delete the recording, an option no participant selected.

Participants were only allowed to participate if they were at least 18 years old. Students enrolled in certain courses at UH received extra-credit for their participation, however no other compensation was offered to participants in the study.

Measures

Two surveys (pre and post-experiment) were administered to the sample population via SurveyMonkey.com, an online survey and questionnaire tool of increasing popularity (Evans et al., 2009). All surveys were administered by Research Assistants (RAs) in the Hatfield Lab and were comprised of pre-tested measures with demonstrated validity and reliability. The measures included in both the pre- and post-experiment surveys are listed below and then described in further detail.

Pre-experiment:

- Demographic information

Post-experiment:

- Positive and Negative Affect Schedule, PANAS (Watson et al., 1988)
- Joviality and Sadness scales from the Positive and Negative Affect Schedule – Extended Form, PANAS-X (Watson & Clark, 1999)

Positive and Negative Affect Schedule (PANAS). In the Positive and Negative Affect Schedule (PANAS), respondents are presented with words describing positive moods (e.g., excited) and negative moods (e.g., hostile), and asked to rate each according

to the extent to which it describes them. As noted by Shiota and colleagues (2006), critics of the PANAS contend that several of the items on the tool are not actually emotions (e.g., determined, alert), and that several important positive emotions for wellbeing are absent from the scale (e.g., love, contentment, amusement).

A widely used scale across psychological and physical activity research, the PANAS thus consists of two 10-item mood scales for Positive Affect (PA) and Negative Affect (NA) that are shown to be highly internally consistent (0.86 – 0.90), largely uncorrelated, and stable at appropriate levels over a two-month time period (Watson et al., 1988). The PANAS allows for temporal variations in the assessment; researchers may choose whether to ask for a rating "right now," "over the past few days," or simply "in general." In this study, participants were asked to indicate to what extent they felt the mood in question "right now, at this present moment."

Responses to the 20 items were measured using a seven-point response scale ranging from 0 (not at all) to 6 (extremely much). Ratings were then summed separately across the two scales, allowing positive affectivity to be calculated independent of negative affectivity, e.g., people can be high in both positive affect and negative affect. Scores on both scales could range from 10 to 50, with low scores indicating low positive or negative affect and high scores indicating high PA or NA (PA, $\alpha = .92$; NA, $\alpha = .75$).

Joviality and Sadness Scales from the Positive and Negative Affect Schedule—Extended Form (PANAS-X). Positive affect and negative affect have reliably emerged as the dominant dimensions of emotional experience across diverse descriptor sets, time frames, response formats, languages, and cultures (see Almagor & Ben-Porath, 1989; Mayer & Gaschke, 1988; Meyer & Shack, 1989; Watson et al., 1988; Watson &

Tellegen, 1999). Nevertheless, although PA and NA account for most of the variance in self-rated affect, Watson and Clark (1999) found that specific emotional states can also be identified within these overarching dimensions. They proposed a hierarchical taxonomic scheme in which PA and NA describe the valence of 11 correlated, yet ultimately distinguishable affective states: Fear, Sadness, Guilt, Hostility, Shyness, Fatigue, Surprise, Joviality, Self-Assurance, Attentiveness, and Serenity.

In this study, the Joviality (Happiness) and Sadness scales were clearly the most relevant to the research questions and hypotheses. These two scales were selected to supplement the original 20 items from the PANAS on the post-experiment survey. The original Joviality scale from the PANAS-X includes eight items (happy, cheerful, joyful, excited, enthusiastic, lively, energetic, delighted), of which the latter three had the weakest varimax-rotated factor loadings, with lively and energetic loading onto separate factors as well (Watson & Clark, 1999). Thus, the three weakest performing items were excluded to form a five-item measure commensurate with the five-item Sadness scale. Scores on the Joviality and Sadness scales could range from 5 to 25, with low scores indicating low happiness/sadness, and high scores indicating high happiness/sadness (Joviality, $\alpha = .93$; Sadness, $\alpha = .83$).

Mood Induction

After completing the pre-experiment survey (demographic information only), participants engaged in a task designed to induce temporary affect. Imagery tasks were used as Mood Induction Procedures (MIPs), a form of affect induction common in studies involving laboratory mood manipulations (e.g., Delp & Sackeim, 1987; Larsen & Sinnett, 1991; Salovey & Birnbaum, 1989). This MIP has also been referred to as the

autobiographical recollections method (Goodwin & Williams, 1982) or as self-generated imagery (Singer & Salovey, 1988).

Choosing a MIP can be a difficult task, as the literature on the effectiveness of MIPs is varied and conflicted (Coan & Allen, 2007; Philippot, 1993). One of the most common procedures, the Velten technique (1968), instructs the participant to read 60 self-referential statements that begin neutrally and become progressively more elated or depressed in content, depending on the particular induction. The technique has spawned several modifications (see Larsen & Sinnett, 1991; Pignatiello, Camp, & Rasar, 1986; Sinclair, Mark, Enzle, Borkovec, & Cumbleton, 1994) and continues to receive support (Finegan & Seligman, 1995) despite criticism for inducing demand characteristics (Buchwald, Strack, & Coyne, 1981; Polivy & Doyle, 1980). The Velten technique was considered for this study but eschewed for considerations of time (the procedure takes around 20 minutes) and efficacy.

Other MIPs considered include written procedures (Baker & Gutterfreund, 1993), listening to music (Pignatiello et al., 1986; Västfjäll, 2001), and watching film clips[8] (Hewig et al., 2005). The imagery task was eventually selected after a review of several meta-analyses of MIP effectiveness and validity (see Gerrards‐Hesse, Spies, & Hesse, 1994; Larsen & Sinnett, 1991; Westermann, Spies, Stahl, & Hesse, 1996), which suggested that the imagery task would most efficiently induce stable and reasonably intense moods for the purpose of this study.

[8] The film clip MIP is evidently similar to the experimental design of the study, i.e., to have participants watch a clip of either positive or negative emotion. It may be that the film clip MIP works precisely through the process of emotional contagion, as the viewer "catches" the emotion of the target.

Using a between-subjects design, participants were manipulated into one of three affect conditions: positive, neutral, or negative. Three videos were created and put on YouTube to allow the video to be embedded within the online survey, along with the target video of either positive or negative emotion (see the following section on Stimuli). The MIP videos involved written directions that were shown on the screen while they were also read out loud by an actor chosen for having a neutral and professional voice. Mood-congruent music was played in the background of each video to further enhance the affect induction (Pignatiello et al., 1986; Västfjäll, 2001). The total length of each mood-induction video was approximately three minutes.

Each condition involved having participants read (and listen to) two written scenarios designed to induce the intended affect. Participants were asked to create a vivid image of themselves in each situation described by the scenarios. Before being guided through the affective scenarios, participants were told that they might be asked to recall parts of the scenarios later and that their memory would be improved if they could actually "get into the feeling" of each scene as they read and imagined it. Specifically, participants were instructed to do the following:

> Imagine the situation as vividly as you can. Picture the event happening to you. Try to imagine all the details of the situation. Picture in your "mind's eye" the surroundings as clearly as possible. See the people or objects; hear the sounds; experience the event happening to you. Think the thoughts you would actually think in this situation. Feel the same feelings you would feel in this situation. Let yourself react as if you were actually there.

After this preparation, the participant was guided through a pair of scenarios of the same hedonic tone depending on the experimental condition, with one minute following each statement in which he/she was asked to "Please concentrate on this scene, relax, close your eyes, and imagine being in that situation until you hear my voice again." The scenarios used in each condition are as follows:

1. Positive
    a. You have won $50,000 in a lottery and you are now taking a vacation to your dream destination.
    b. Now imagine that you are feeling relaxed and healthy as you take a walk on a beautiful day. You find a $5 bill on the ground.
2. Neutral
    a. You go to the supermarket.
    b. You go on a walk.
3. Negative
    a. A close friend of yours gets into a car accident. You go to the hospital and find out that he/she has just died an hour ago and you didn't get the chance to say goodbye.
    b. You are going through a breakup with a significant other that you have been with for a while and you hear a sad song on the radio that reminds you of him/her.

Manipulation check. Following the MIP, participants were asked if they experienced any emotions, memories, or physical sensations. If emotions were reported, their intensity was rated on a 0 to 8 scale, with 8 equivalent to the strongest experience of

that emotion in the participant's entire life. Participants were also asked to rate the difficulty of engaging or "getting into" the MIP using a 0 to 8 scale. This manipulation check was used successfully in a study by Levenson, Carstensen, Friesen and Ekman (1991) to assess the efficacy of a relived emotion task.

Stimuli

Stimuli consisted of two videos, or targets, commensurate with the two groups of experimental conditions—whether the participant was exposed to a Happy or Sad emotion. The clip of positive emotion (Happy Target) showed the response to David Freese's homerun to win Game 6 of the 2011 Major League Baseball World Series, i.e., the ensuing celebration by the Saint Louis Cardinals and their fans—their joyous faces, expressions of exultation and delight, and joyous postures. The clip of negative emotion (Sad Target) focused on the sad and disappointed reactions by the Texas Rangers and their fans; e.g., mournful faces, agonized moans, and hunched postures.[9] Both clips were approximately two minutes long.

Design

Participants were randomly assigned to one of six conditions through the interaction of three MIPs and two stimuli. Participants were first manipulated into one of three moods using a guided imagery task previously demonstrated to effectively induce a happy, neutral, or negative mood (Larsen & Ketelaar, 1991). They were later asked to watch a video clip of a target displaying either positive or negative emotion. The resultant MIP/stimuli combinations were as follows: 1) Positive MIP / Happy Target; 2)

[9] To control for gender differences in reaction to the sports videos, gender will also be tested in the model as a covariate. The issue of gender-specific reaction to emotional stimuli is a different problem beyond the scope of this study.

Neutral MIP / Happy Target; 3) Negative MIP / Happy Target; 4) Positive MIP / Sad Target; 5) Neutral MIP / Sad Target; and 6) Negative MIP / Sad Target. Both MIP condition and Target condition are between-subjects factors.

As in Study 1, the outcome was measured in the following ways: 1) Self-report by the PANAS, which yields a score of Positive Affect (PA) and Negative Affect (NA), on the post-experiment survey; 2) Self-report by the Joviality and Sadness scales from the extended PANAS-X, on the post-experiment survey; and 3) Two raters trained using either the Micro Expression Training Tool (METT) or the Subtle Expression Training Tool (SETT)[10] evaluated two snapshots of the participant's facial expressions using an abridged version of the Joviality and Sadness scales of the PANAS-X. Thus, we had a total of six outcome measures: four self-report scales (PA, NA, Joviality, and Sadness), and two scores by raters. Since the raters used abbreviated versions of the Joviality and Sadness scales, further discussion of the scales used by the judges on the rating task will be referred to as JOV-R and SAD-R, to differentiate these variables from the self-report measures of Joviality and Sadness.

Considering the latter outcome measure (judges' ratings), the use of multiple raters, items, and occasions of assessment introduces a margin of error. Generalizability theory (G theory; Shavelson & Webb, 1991) is one approach that considers multiple errors in an evaluation design. A G theory preliminary study was conducted (see the Analysis section) to consider a number of different scenarios before deciding on the optimum combination of raters, items, and occasions that would yield data at an acceptable level of reliability.

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[10] Again, sincere appreciation is extended to the Paul Ekman Group, LLC, for use of the METT and SETT programs.

Procedure

Six different electronic forms were used for the study (Forms C – H, as Forms A – B were used for Study 1), depending on the MIP / Target video condition. Each form included: 1) the pre-experiment survey; 2) the MIP video (inducing Positive, Neutral, or Negative affect); 3) the target video; and 4) the post-experiment survey. The RAs were blind to which target video was included in each form, to contain experimenter effects. Additionally, participants watched the video with headphones on, so that the RA was unable to hear the video and could not respond to it along with the participant.

6. *Pre-experiment survey*. The participant was welcomed into the lab by an RA and seated in front of a Mac laptop. The consent form was already loaded on the screen as the preliminary page of the pre-experiment survey. Participants were informed of the intent to possibly record their facial expressions in the consent form. The pre-experiment survey took under four minutes and ended on a page instructing the participant to wait for the RA to input a code: "Please STOP here. Please inform the research assistant that you have completed this survey."
7. *Mood Priming and Manipulation check*. The participant then watched a video to induce positive, neutral, or negative affect, depending on the assigned condition. The MIP videos were each approximately three minutes long, and were followed by two survey questions designed to assess the effectiveness of the mood induction. Data yielded from this manipulation check were not used in the main analyses, but will be discussed in a separate analysis of the efficacy of the mood induction procedure.

8. *Experiment*. After the participant completed the pre-experiment survey, when the RA entered the "code," he or she surreptitiously started the Photo Booth[11] program as well. As noted above, the RA was blind to which condition the participant was in, knowing only which form (C – H) the participant was assigned to. After starting the video, the RA sat in a corner, able to answer any questions that came up by the participant, but out of his/her viewing radius. The participant watched the target video while his/her facial expressions were simultaneously recorded.
9. *Post-experiment survey*. After watching the stimuli, the participant took the post-experiment survey comprised of the PANAS and the Joviality and Sadness scales from the PANAS-X. The post-experiment survey ended on a page that signified completion of the study. The participant was instructed to print this page in order to receive extra credit for his/her participation.
10. *Debriefing.* The participant was then informed of the full purpose of the study—to assess whether emotional contagion is affected by transient affect—and given the opportunity to review the recording of his/her facial expressions and delete it if desired (which no participant chose to do).
11. *Rating recordings.* The recordings of the participants' facial expressions were judged by outside raters and these scores were used as an outcome variable in addition to the self-report measures.

[11] Photo Booth is a small software application by Apple Inc. for taking photos and videos with a camera built into the Mac. Other than a small green light at the top of the laptop, participants are not able to see themselves being recorded, minimizing the potential for distractions and induced participant effects.

a. A set of eight RAs was trained in recognizing emotion with the either the Micro Expression Training Tool (METT) or the Subtle Expression Training Tool (SETT), both administered online. The METT/SETT takes approximately one hour to complete, and trainees receive pre- and post-test scores of their accuracy in reading emotional cues. All RAs received over 80% accuracy on the post-test in order to participate in coding.

b. The entire set of 34 videos from both Studies 1 and 2 was divided amongst four pairs of raters; thus, each pair rated the same 85 videos (for reliability analysis between raters), i.e., each participant's video was independently coded by two raters.

c. For each video coded, the RA watched the entire recording of the participant one time through, and then on the second viewing stopped the video at the two points or "occasions" at which the participant expressed the most emotion.

d. These two occasions were then rated using three items from the Joviality and Sadness scales of the PANAS-X (see the following section for further detail on the items selected). Raters were instructed as follows:

> This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then indicate to what extent you think the person in the snapshot feels this way at that moment.

Items were evaluated on the following metric:

0	1	2	3	4	5	6
Not at all	Very slight	Somewhat	Moderate	Much	Very much	Extremely much

Inter-rater reliabilities. The reliability of the raters' scores is displayed below in Table 5.1, which shows the inter-rater reliability between each pair of raters, as well as the overall reliability and average reliability between pairs. While the reliability is relatively low for the judges' ratings (i.e., 0.659 on the JOV-R outcome and 0.285 on the SAD-R scale), one of the reasons that the rating data was included at Level 1 in the main multi-level model was to show that there are no "statistically significant" differences in the discrepancies between pairs of judges. In brief, the reliability of the rater pairs would be considered marginal for the JOV-R scale and poor for the SAD-R outcome, and the low inter-rater reliability is likely why there are few significant findings for the rater scores in the main model, as shown in Chapter 6. As discussed in the following analysis of judges' ratings using generalizability theory, the reliability of judges' ratings was predicted to be between 0.7 and 0.8; thus, an average reliability of 0.659 on the JOV-R scale is close to expectation.

Table 5.1
Study 2 Rater Dependability (Reliability)

Variable	JOV-R	-R
Rater1 – Rater 2	0.573	0.488
Rater 3 – Rater 4	0.692	0.285
Rater 5 – Rater 6	0.608	0.267
Rater 7 – Rater 8	0.764	0.099
All Pairs	0.626	0.155
Average Rater Pairs	0.659	0.285

Analyses

Judges' ratings. Within individuals, preliminary analyses focused on establishing the minimum number of raters, items (from the Joviality and Sadness scales of the

PANAS-X), and occasions necessary to ensure reliable information could be gathered relative to subject responses to the video stimuli. In this case, there are several possible sources of error that could bias the analyses of differences between individuals due to the experimental conditions. These facets included variability due to raters, variability due to the items of the measures, and the number of occasions being assessed.

One useful psychometric model for assessing reliability, among other uses, is referred to as generalizability (G) theory (Cronbach, Glesser, Nanda, & Rajaratnam, 1972; Marcoulides, 1996, 1998). G theory presents multifaceted sources of variability in a measurement, including multiple sources of error variability (Shavelson & Webb, 1991). This ability to account for multiple sources of error allows us to identify how individual differences between raters affected the reliability of their evaluations of the participants' facial displays of emotion (similar to Cronbach's alpha).

The goal of a G study is to separate the variability in the evaluation object (i.e., the rating of emotion), into a variety of different sources, or variance components. Typically, variance components may include variability due to differences among the objects being evaluated, the raters assessing the objects, the type of instrumentation being used, the number of occasions on which the objects are assessed, as well as various interactions between these components (Marcoulides & Heck, 1992). A G study usually involves a preliminary study using a subset of information (i.e., a pilot study) that can strengthen the overall evaluation design by identifying aspects of the assessment procedures that can be changed to reduce error.

In this analysis, it is assumed that an observed score (i.e., a rating of the emotion in the participant's facial expression) represents an evaluation of a sample of items made

at a given point in time, and if a different set of items were used, the observed score would be somewhat different (Shavelson & Webb, 1991). As it is seldom practical or attainable to obtain data on all possible items (Cronbach et al., 1972), the evaluation must be generalized from a limited sample of items to the universe of all possible observations.

G theory allows us to ask how well the raters are performing over the number of items they are using in the assessment, the number of occasions when the participants' facial expressions are evaluated, and whether there is any interaction between any of these components. We first decompose the raters' scores into a universe score (i.e., the score over all combinations of raters, items, and occasions) and variance components for any other errors associated with the measurement study (Marcoulides, 1998). After identifying major sources of error, a generalizability coefficient (ρ_{Δ}^{2}) can be estimated to describe the dependability of generalizing from an observed score based on the sample observations to the mean score derived from all acceptable observations (Cronbach et al., 1972; Heck, Johnsrud, & Rosser, 2000).

G theory model. In this case, we will use the raters' score (0 – 6) as the main object of assessment, decomposing the ratings into components that describes differences in observations (referred to as the universe score) versus any variance in scores due to errors introduced by the number of raters employed, the number of items used in the assessment, the number of occasions being evaluated (snapshots taken from the participant's recording), any combination between these components, plus other unknown errors. Thus, we have a *three-facet crossed* design, in which the objects of measurement are assessed on each of the three measurement facets under consideration (raters, items, and occasions). The main effects of this model are as follows:

1. Persons (*p*). The video recordings of five participants watching the target stimuli were selected for this preliminary study. Differences in the emotional expressiveness between individuals may account for variance in their observed scores.
2. Raters (*r*). Seven raters trained in either the METT or SETT participated in this preliminary study to investigate how changing the number of raters would impact reliability. Traditionally, the focus of a reliability analysis is to investigate the variance in evaluations due to systematic differences between raters. In this G theory analysis, the effect of raters will be considered along with other sources of variance.
3. Items (*i*). The evaluation object (i.e., a single snapshot of the participant's face while watching the target video) was rated on a total of 10 items, five items from both the Joviality and Sadness scales of the PANAS-X. The full 10 items were included to investigate how reliability would be affected by excluding certain items. The objective was to increase the efficiency of the raters by decreasing their rating load, if and when possible.
4. Occasions (*o*). The raters were asked to freeze the recording at the three points at which they saw the participant expressing the most emotion in reaction to the target stimuli. These three "occasions," or snapshots of the participant's face, were then evaluated on the 10 items by each of the seven raters. The objective was to investigate how well the raters were performing over the three occasions to see if the number of occasions could be decreased without significantly reducing reliability.

5. Two-way interactions due to persons crossed with raters (*pr*), persons crossed with items (*pi*), persons crossed with occasions (*po*), raters crossed with items (*ri*), raters crossed with occasions (*ro*), and occasions crossed with items (*oi*).
6. Three-way interactions due to persons crossed with raters crossed with items (*pri*), persons crossed with raters crossed with occasions (*pro*) and other residual error (*e*).

The total variance ($\sigma^2_{X_{prio}}$), then is equal to the sum of these thirteen variance components (Marcoulides, 1998) which is summarized as follows:

$$\sigma^2_{X_{prio}} = \sigma^2_p + \sigma^2_r + \sigma^2_i + \sigma^2_o + \sigma^2_{pr} + \sigma^2_{pi} + \sigma^2_{po} + \sigma^2_{ri} + \sigma^2_{ro} + \sigma^2_{oi} + \sigma^2_{pri} + \sigma^2_{poi} + \sigma^2_{pro,e} \qquad (5.1)$$

This model facilitates evaluating the quality of the rating information provided by raters over the number of items and occasions selected. Table 5.2 provides the variance estimates of the raters' scores measured on the Joviality scale due to persons, raters, items, occasions, and the various two-way and three-way interactions plus other error.

Table 5.2
Full Variance Estimates on the Joviality Scale

Component	Estimate
Var(Persons)	2.806
Var(Raters)	.610
Var(Items)	.116
Var(Occasions)	.000[a]
Var(Persons * Raters)	.123
Var(Persons * Items)	.052
Var(Persons * Occasions)	.041
Var(Raters * Items)	.032
Var(Raters * Occasions)	.000[a]
Var(Occasions * Items)	.003
Var(Persons * Raters * Items)	.089
Var(Persons * Occasions * Items)	.014
Var(Persons * Raters * Occasions)	.595
Var(Error)	.199

Note. Dependent Variable = Score; Method = Restricted Maximum Likelihood Estimation; [a] This estimate is set to zero because it is redundant.

From Table 5.2, we see that the main effects of Occasions and Raters by Occasions were redundant ([a]). The Items variable was subsequently dropped since that facet accounted for only 13% of total variance; i.e., only 0.116 of the total 4.68. Taking Items out, we can see in Table 5.3 below that Occasions actually did account for some variance through its interactions, but the Items component was "hiding" this effect.

Table 5.3
Partial Variance Estimates on the Joviality Scale

Component	Estimate
Var(Persons)	2.796
Var(Raters)	.590
Var(Occasions)	.000[a]
Var(Persons * Raters)	.300
Var(Persons * Occasions)	.107
Var(Raters * Occasions)	.078
Var(Error)	.788

Note. Dependent Variable = Score; Method = Restricted Maximum Likelihood Estimation; [a] This estimate is set to zero because it is redundant.

As Table 5.3 highlights, only Raters and Occasions were included as separate factors influencing potential error facets, with combinations thereof. For Table 5.3, Total variance = 4.659 (summing the variance components). Importantly, variance due to persons is 60% (2.796/4.659). Setting this variance aside, since subjects are the object of measurement, regarding error facets, combined sources due to Occasions and interactions contribute 20.9% of the variance, i.e., .107 + .078 +. 788 = .973/4.659 = 20.9%. Combined sources due to Raters contribute 37.7% of the total variance, i.e., .590 + .300 +.078 + .788 = 1.756/4.659 = 37.7%. Of course, some of this variance is overlapping. We note that occasion variance (σ_o^2) was 0, which suggests that the number of occasions used to rate the same participant did not directly introduce any observable variability into the assessment of subjects' emotional scores. Any unreliability, therefore, came from interactions between these observations and other effects, i.e., persons and raters.

Because the evaluations were made on two sets of items expected to have an inverse relationship (Joviality vs. Sadness scales), the variance estimates were calculated

with the observed score rated either on the Joviality (Tables 5.2 and 5.3) or Sadness (Table 5.4) scale, as seen below.

Table 5.4
Full Variance Estimates on the Sadness Scale

Component	Estimate
Var(Persons)	.941
Var(Raters)	.214
Var(Items)	.013
Var(Occasions)	.019
Var(Persons * Raters)	.093
Var(Persons * Items)	.118
Var(Persons * Occasions)	.122
Var(Raters * Items)	.001
Var(Raters * Occasions)	.000[a]
Var(Occasions * Items)	.005
Var(Persons * Raters * Items)	.064
Var(Persons * Occasions * Items)	.001
Var(Persons * Raters * Occasions)	.380
Var(Error)	.297

Note. Dependent Variable = Score; Method = Restricted Maximum Likelihood Estimation;
[a] This estimate is set to zero because it is redundant.

Again, from Table 5.4, once again variance due to differences between persons contributes the most to explaining variance (0.941/2.268 = 0.415). Regarding error facets, item variability was dropped since it accounted for little of total variance; i.e., only 0.013 of the total 2.268. The various interactions with items also accounted for little variability. Taking Items out, Table 5.5 below indicates that Occasions accounted for about 9.8% of the total variance (2.262), but the Items component was "hiding" this effect in the full

model (.014 + .165 +. 043 = .222/2.262 = 9.8%). Combined, Raters is contributing 19.8% of the total variance, i.e., .200 + .206 +.043 = .449/2.262 = 19.8%.

Table 5.5
Partial Variance Estimates on the Sadness Scale

Component	Estimate
Var(Persons)	.950
Var(Raters)	.200
Var(Occasions)	.014
Var(Persons * Raters)	.206
Var(Persons * Occasions)	.165
Var(Raters * Occasions)	.043
Var(Error)	.684

Note. Dependent Variable = Score; Method = Restricted Maximum Likelihood Estimation.

Perhaps the most important thing to notice in addition to the rater reliability is the total variance captured on these two scales. When raters assessed the participants on the Joviality scale, total variance was 4.659, vs. only 2.262 on the Sadness scale. In assessments, more variance is actually a good thing (especially due to persons), that is, we want to use a scale that provides more discrimination between the objects of measurement. More specifically, person variability is about 60% on the Joviality scale but only about 41.5% on the Sadness scale. Thus, the first useful conclusion of this preliminary study is the preliminary evidence providing justification to use only the Joviality scale as an outcome measure, since it picked up roughly 45% more variance in subjects' observed emotion compared with the Sadness scale.

Generalizability coefficient. G theory considers two types of error variance corresponding to two different decisions that are often made (referred to relative and absolute decisions, respectively). In this case, we are concerned with absolute error, as

our primary concern is to make decisions based on the judges' ratings without regard to the relative standing or ranking between the participants being assessed (Heck et al., 2000). Absolute error decisions take in error related to occasions and raters as well as combined sources due to persons by raters, persons by occasions, and raters by occasions plus other remaining error. Absolute error is defined as σ_{Δ}^2 and includes all of the variance components except the object of measurement, i.e., the person effect (σ_p^2):

$$\sigma_{\Delta}^2 = \frac{\sigma_r^2}{n_r} + \frac{\sigma_o^2}{n_o} + \frac{\sigma_{pr}^2}{n_r} + \frac{\sigma_{po}^2}{n_o} + \frac{\sigma_{ro}^2}{n_r n_o} \qquad (5.2)$$

Thus, we calculate the absolute error on the Joviality scale plugging in the values from Table 5.3 to equation 5.2:

$$\sigma_{\Delta}^2 = \frac{.59}{7} + \frac{0}{3} + \frac{.30}{7} + \frac{.107}{3} + \frac{.078}{21} + \frac{.788}{21} = .205$$

Using the values from Table 5.5, the absolute error on the Sadness scale is defined as follows:

$$\sigma_{\Delta}^2 = \frac{.2}{7} + \frac{.014}{3} + \frac{.206}{7} + \frac{.165}{3} + \frac{.043}{21} + \frac{.684}{21} = .153$$

The formula for the generalizability (ρ_{Δ}^2) coefficient of an absolute decision is:

$$\rho_{\Delta}^2 = \Phi = \frac{\sigma_p^2}{\sigma_p^2 + \sigma_{\Delta}^2} \qquad (5.3)$$

Using equation 5.3, we can calculate the generalizability coefficients for both scales:

Joviality

$$\rho_{\Delta}^2 = \Phi = \frac{2.796}{2.796 + .205} = .934$$

Sadness

$$\rho_{\Delta}^2 = \Phi = \frac{.950}{.950 + .153} = .861$$

The generalizability coefficient can be interpreted as the extent to which the sample observations generalize to the larger universe of possible effectiveness measures (Marcoulides, 1998). A generalizability coefficient of .934 or .861 (whether calculated on the Joviality or Sadness scales, respectively) suggests that this particular combination of facets yields highly dependable information on the emotion displayed by the participants in reaction to the target videos (Heck et al., 2000). Again, we can note that the Joviality scale appears to be performing better than the Sadness scale, with a higher degree of generalizability. Thus, in Table 5.6 below, we can summarize the sources of variability on this G study using seven raters who assessed five persons on three different occasions using the five items of the Joviality scale.

Table 5.6
Sources of Variability in a G-Study Using Five Persons, Seven Raters and Three Occasions

Source of Variation		Variance Components	Percent
σ_p^2	Persons	2.796	60%
σ_r^2	Raters	0.590	13%
σ_o^2	Occasions	0.000	0%
σ_{pr}^2	Persons * Raters	0.300	6%
σ_{po}^2	Persons * Occasions	0.107	2%
σ_{ro}^2	Raters * Occasions	0.078	2%
$\sigma_{pro,e}^2$	Interactions plus Error	0.788	17%
Total observed-score variation		4.659	100%

$\rho_{\Delta}^2 = .934$

This table allows us to compare the magnitude of the variance components relative to the total observed variability, i.e., the percentage of variance they are contributing to the total, and identify potentially problematic components by their large

value. We note that the largest source of variability with respect to the dependability of the assessments of the participants' emotional expressiveness is between the participants themselves (60%), meaning that participants are varying in their reactions to the stimuli—implying differences in their susceptibility to emotional contagion. This is to be expected and suggests most of the variability observed is due to actual differences in subjects' emotional responses. Regarding possible sources of error, raters contribute the largest source of error (13%), followed by persons crossed with raters (6%), persons by occasions and raters by occasions (both 2%), with no variance contributed directly by occasions alone (0%). As these results suggest, in contrast to the internal consistency approach to reliability, i.e., using Cronbach's alpha to provide a general account of measurement error, G theory allows the partitioning of measurement error into the aforementioned components. From this information, it is possible to design studies that will minimize these potential sources of error. The approach also facilitates the inclusion of such potential sources of assessment directly into the analyses of the effects of experimental conditions on the study participants (see Chapters 4 and 6).

Decision studies. After the G study is conducted to estimate the magnitudes of potential sources of error, a decision study, or D study, uses this information to design a measurement procedure that minimizes error for a particular purpose (Shavelson & Webb, 1991), in this case, to optimize the use of rating resources. With rating being a time and energy intensive task, the objective was to lower the rating burden upon each individual in the hopes of reducing fatigue and subsequent error, with minimal sacrifices to reliability. To this end, different combinations of raters, items, and occasions were considered to find the optimal combination of resources. As it is conceptually difficult to

compare changes in all three facets simultaneously, we can examine two sets of D-studies that evaluate changes in generalizability based on changes in the number of raters and items (see Figure 5.1) or raters and occasions (see Figure 5.2).

Changing the number of items. Our preliminary G study suggested that one way to decrease the time-intensive scoring load of the raters would be to decrease the number of items used on each scale (since items did not contribute much to the total variance). Figure 5.1 (continued on the next page) summarizes the effect upon the generalizability coefficient (ρ^2_Δ) of changing the number of items used on the rating task, from one to all five items (on each scale). These changes are examined when varying the number of raters used (between two and four) on either the Joviality or the Sadness scales.

The first point of interest is that nearly all of the ρ^2_Δ estimates are higher when using the Joviality scale than the Sadness scale. The higher performance of the Joviality scale suggests that this outcome measure would yield the most reliable results when used in the main two-level model. Second, we note diminishing returns on the inclusion of more items, i.e., a flattening slope on the curves, particularly after three items. Across nearly all combinations of raters and scale, the figure suggests that after three items we would get very little improvement in the dependability of the assessment. For this reason, it was decided to cut the number of items used by the raters from five to three, which decreased their workload (thereby reducing fatigue and hopefully increasing efficiency), without sacrificing reliability. The next section discusses which items were selected for exclusion from the original Joviality and Sadness scales to make the three-item JOV-R and SAD-R scales used by the raters in the full evaluation task. These

scoring scales were renamed JOV-R and SAD-R in order to distinguish them from the Joviality and Sadness scales used as self-report outcome measures.

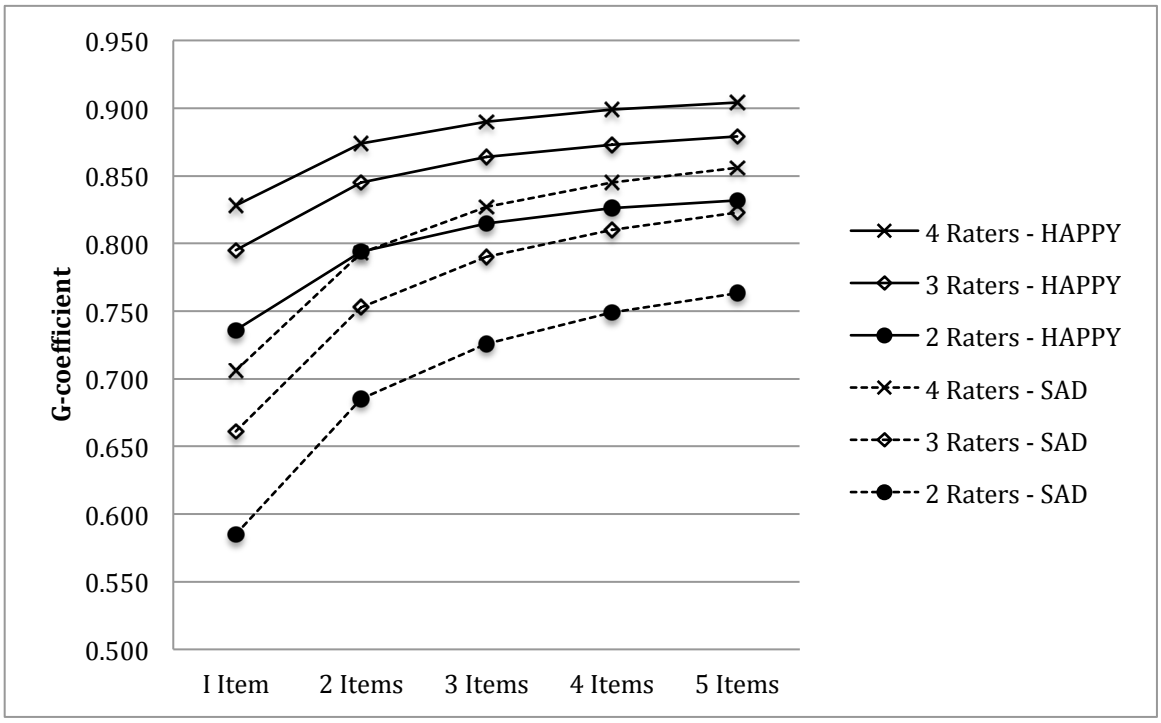

Figure 5.1. Six D-Studies comparing the effect of changing the number of items by the number of raters on both the Joviality (JOV-R) and Sadness (SAD-R) scales.

Item selection. After concluding that the rating process would be optimized by the exclusion of three items from the Joviality scale, the task remained to decide which items to remove. To that end, a Principal Component Analysis (PCA; see Chapter 3 for more detail on this procedure) was conducted on the dataset from this preliminary study[12] to identify the weakest items, i.e., those items with the lowest factor loadings. From Table 5.7 below, we can see that the items "Excited" and "Enthusiastic" contribute the

[12] Note that Tables 5.6 and 5.8 are similar to Tables 3.6 and 3.7, respectively, as both are component matrices of the Joviality and Sadness scales. However, the figures are different because the matrices are calculated on different datasets. The tables shown here reflect data from the preliminary study (n = 105); those in Chapter 3 come from the full dataset (n = 340).

least to the principal component. Although all five items have high factor loadings, if we were to select two items to remove, "Excited" and "Enthusiastic" would be the best candidates for exclusion, as they have the weakest relationship to the underlying trait.

Table 5.7
Component Matrix of Joviality Scale

	Component
	1
Joyful	.986
Happy	.978
Cheerful	.967
Excited	.941
Enthusiastic	.927

This proposition is also confirmed by examination of Table 5.8 below, which shows the intercorrelations between the five items on the Joviality scale. We see that all of the correlations are high ($r > .8$) and significant ($p < .01$), however Excited and Enthusiastic have generally lower correlations with the other items, while they are more highly correlated with each other ($r = .963$, $n = 105$, $p < .01$). For example, the correlation (r) between Happy and Enthusiastic was the lowest at .885 ($n = 105$, $p < .01$). Thus, Excited and Enthusiastic were eliminated from the scale, yielding a 3-item (Joyful, Happy, Cheerful) measure renamed JOV-R.

Table 5.8
Intercorrelations of Items of Joviality Scale

Variable	*n*	1	2	3	4	5
1. Happy	105	-				
2. Joyful	105	.968**	-			
3. Cheerful	105	.955**	.951**	-		
4. Excited	105	.905**	.924**	.900**	-	
5. Enthusiastic	105	.885**	.909**	.889**	.963**	-

* $p < .05$. ** $p < .01$.

Next, we examined the PCA of the Sadness scale to identify its weakest items. From Table 5.9, we see that the items "Alone" and "Lonely" had the lowest factor loadings, i.e., they had the weakest relationship to the principal component. In Table 5.10, the intercorrelation matrix of these items, we note that Alone and Lonely have generally lower correlations with the other items; e.g., the correlation between Alone and Downhearted was the lowest at .691 (n =105, $p < .01$). Similarly to the weakest items on the Joviality scale, Alone and Lonely were highly correlated with each other ($r = .994$, n =105, $p < .01$). Thus, these items were selected for exclusion, yielding a three-item SAD-R measure consisting of the items Sad, Blue and Downhearted.

Table 5.9
Component Matrix of Sadness Scale

	Component
	1
Sad	.941
Blue	.939
Downhearted	.934
Alone	.887
Lonely	.890

Table 5.10
Intercorrelations of Items of Sadness Scale

Variable	*n*	1	2	3	4	5
1. Sad	105	-				
2. Blue	105	.949**	-			
3. Downhearted	105	.929**	.954**	-		
4. Alone	105	.711**	.696**	.691**	-	
5. Lonely	105	.719**	.695**	.697**	.994**	-

* $p < .05$. ** $p < .01$.

Selecting the number of occasions. The next facet considered was the number of occasions at which the raters would be asked to freeze the recording of the participants'

facial expressions in reaction to the stimuli. In addition to the time required to evaluate multiple occasions, selecting these points of peak-emotion was a time consuming task for raters. Thus, to optimize the raters' time and energy, it was prudent to balance the number of occasions they were asked to rate with commensurate increases in the generalizability coefficient (ρ_{Δ}^{2}).

In Figure 5.2 (continued on the next page), we note that *all* of the ρ_{Δ}^{2} estimates were higher on the JOV-R scale than the SAD-R. Second, comparable to the pattern displayed in Figure 5.1 when increasing the number of items, we see a trend of diminishing returns on the inclusion of more occasions, i.e., a flattening slope on the curves between occasions 2 and 3. Across nearly all combinations of raters and scale, the figure below suggests that we would get very little improvement in generalizability from the inclusion of a third occasion. Thus, it was decided that the raters would create and evaluate two occasions, or snapshots of emotion from the participants' recordings.

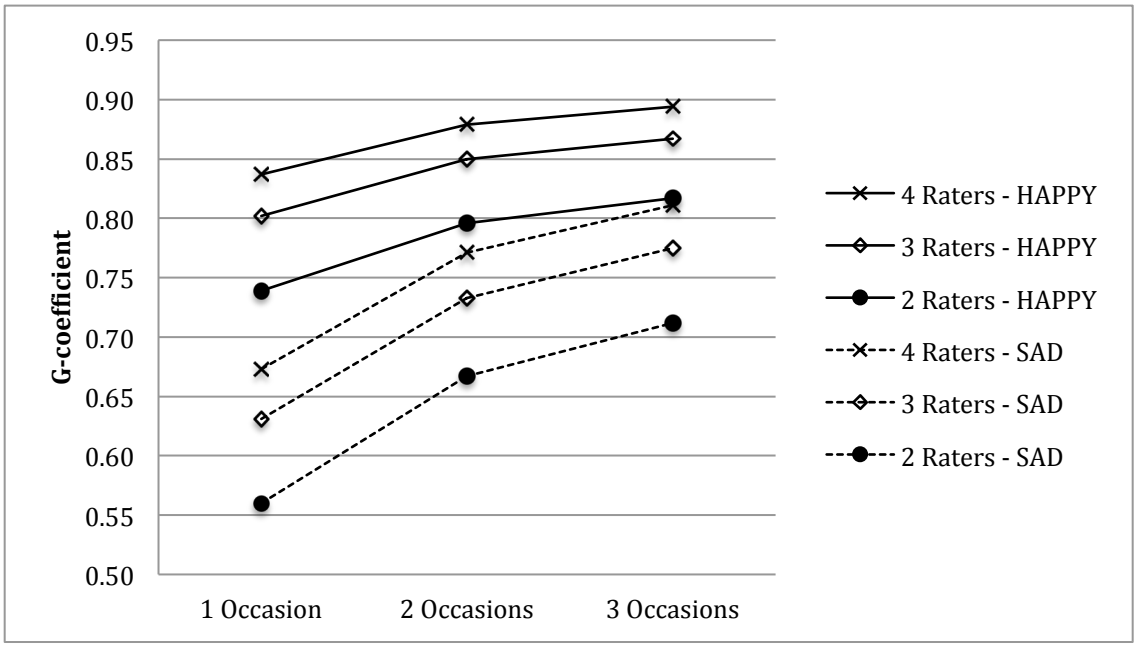

Figure 5.2. Six D-Studies comparing the effect of changing the number of occasions by the number of raters on both the Joviality (JOV-R) and Sadness (SAD-R) scales.

Selecting the number of raters. After examining the various D studies, it was evident that the raters' task could be decreased from five to three items, and from three to two occasions with minimal sacrifices to the quality of the assessment. The next decision was on the number of raters to use, and how to optimally distribute the workload of eight research assistants (RAs). We can see in Figures 5.1 and 5.2 that a relatively large increase in generalizability results from increasing the number of raters from two to three at every level of item and occasion. However, with a large number of participant recordings to evaluate (340 videos), and in consideration of the tradeoffs between reliability and time to complete the task, it was decided that using four groups of two raters would optimize the rating process. Thus, each pair evaluated 85 videos, i.e., each of the 340 videos was rated independently by two people. This combination of two raters, three items, and two occasions still produces an acceptable (target) generalizability coefficient of over 0.80 (Heck et al., 2000), which is appropriate for the study's purposes.

Two-level analyses. As suggested previously, one of the advantages of using a mixed-model formulation is the ability to incorporate the measurement variability due to raters, occasions, and their possible interaction directly into the analysis. For the second study, the Level 1 model to explain an individual's observed emotional score (Y_{1ij}) can be described as follows:

$$Y_{1ij} = \beta_{0j} + \beta_1 rater_{ij} + \beta_2 occasion_{ij} + \beta_3 rater_{ij} * occasion_{ij} + e_{ij}, \qquad (5.4)$$

where β_{0j} is the adjusted score for individual *j* on assessment *i* after adjusting for possible discrepancies due to rater differences, the occasion they are assessing, and possible rater*occasion interactions, and e_{ij} represents residual variability in assessing

each individual's emotional response. Once again, estimates at Level 1 (the within-group level) are log odds, since the outcome variable, i.e., the rater's score, is measured an ordinal scale (i.e., 0 to 6).

At Level 2, there are six experimental conditions (with condition 8 serving as the reference condition), along with the two demographic controls for gender and age:

$$\beta_{0j} = \gamma_{00} + \gamma_{01} cond3_j + \gamma_{02} cond4_j + \gamma_{03} cond5_j + \gamma_{04} cond6_j + \gamma_{05} cond7_j + \gamma_{06} female_j + \gamma_{07} age_j + u_{0j}, \quad (5.5)$$

where γ_{00} is the intercept representing the average score when watching the happy video (coded 0) and $\gamma_{01} - \gamma_{05}$ represent the coefficients for the between-subjects experimental conditions in Study 2 (with condition 8 serving as the reference group, $\gamma_6 - \gamma_7$ represent the coefficients for the demographic controls, and u_{0j} represents the random component, that is, variability in predicting the scores on the dependent variable across individuals. Through substitution of Eq. 5.2 into 5.1, the combined equation representing the within-subject and between-subject variables explaining the outcome rating is as follows:

$$Y_{ij} = \gamma_{00} + \gamma_{01} cond3_j + \gamma_{02} cond4_j + \gamma_{03} cond5_j + \gamma_{04} cond6_j + \gamma_{05} cond7_j + \gamma_{06} female_j + \gamma_{07} age_j + \gamma_{10} rater_{ij} + \gamma_{20} occasion_{ij} + \gamma_{30} rater_{ij} * occasion_{ij} + u_{0j} + e_{ij}, \quad (5.6)$$

Between individuals, the estimates for Eq. 5.2 and Eq. 5.3 are standardized ($M = 0$, $SD = 1$), as both outcome variables, i.e., the rater's score and the participant's self-report, were measured on a continuous scale (Muthén & Muthén, 1998-2006).

The mixed-model approach also facilitates the specification of other relationships either within or between individuals. As in Study 1, a second model can be specified between-individuals to consider the self-report outcome (Y_{1j}) between individuals:

$$Y_{1j} = \gamma_{00(1)} + \gamma_{01(1)}cond3_j + \gamma_{02(1)}cond4_j + \gamma_{03(1)}cond5_j + \gamma_{04(1)}cond6_j + \\ + \gamma_{05(1)}cond7_j + \gamma_{06(1)}female_j + \gamma_{05(1)}age_j + u_{0(1)j} + e_{ij}. \quad (5.7)$$

Again, as Eq. 5.4 indicates, there is no within-subjects model for the self-report outcome. Models for Study 2 were also estimated using Mplus (Muthén & Muthén, 2005), which facilitates estimating multilevel models with outcomes measured on different types of scales simultaneously. Figure 5.3 (continued on the next page) visually depicts the complete set of variables and predicted interactions in the two-level model.

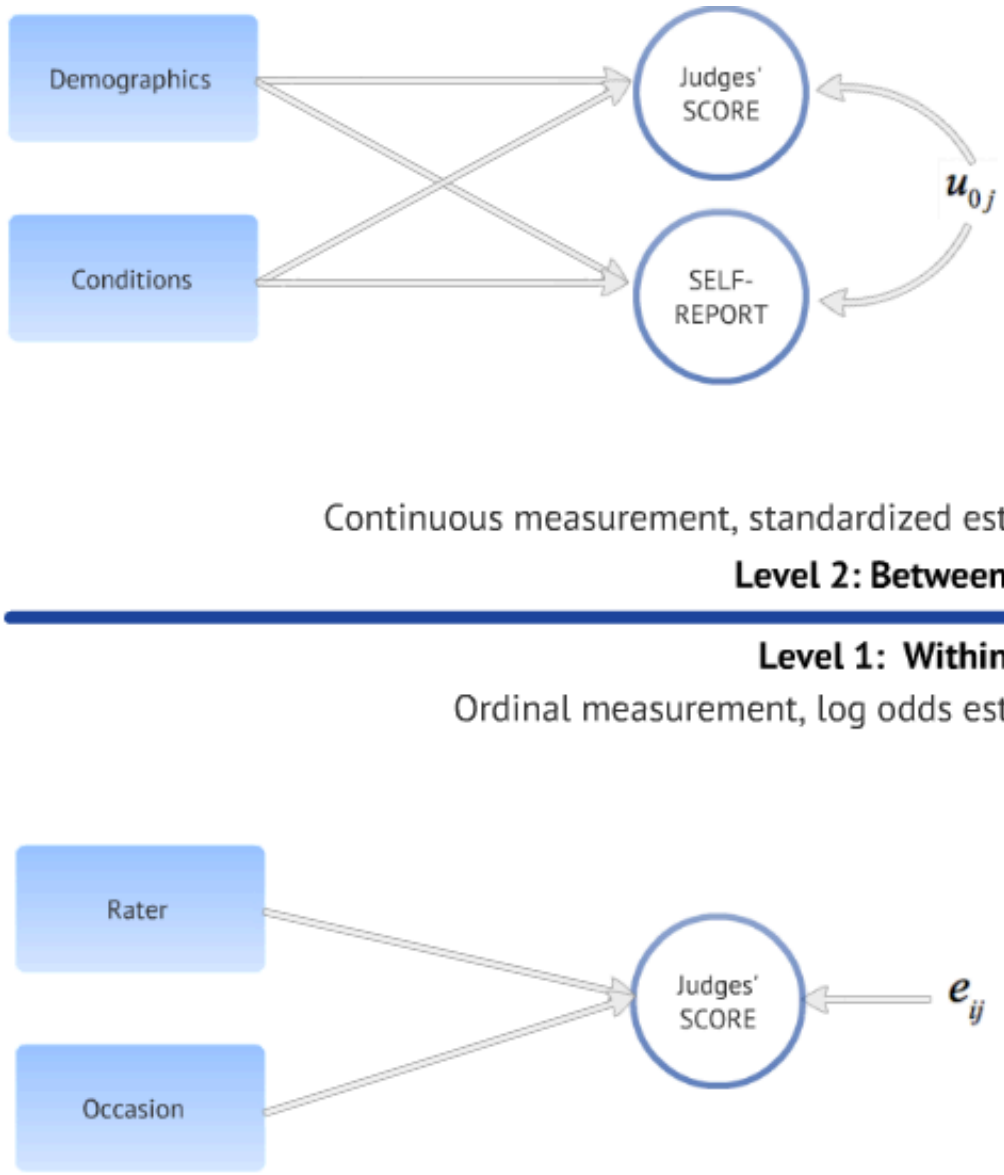

Figure 5.3. Two-level model for Study 2

CHAPTER 6

RESULTS OF STUDY 2: TRANSIENT AFFECT AND EMOTIONAL CONTAGION

Descriptive Statistics

The descriptive results of the self-report data are presented in Table 6.1 below. As the Joviality and Sadness scales were transformed into factor scores (see Chapter 3), the scale means and standard deviations for the two conditions are standardized. Considering the results on the Joviality scale, we see participants in all three conditions who watched the happy target video did self-report higher positive affect than those in the three conditions watching the sad target video. When the outcome was measured by self-report on the Sadness scale, we see the same overall consistency in the main effect of stimuli condition; i.e., those in the Sad target conditions report higher sadness than those in the Happy target conditions.

Table 6.1
Descriptive Statistics for Self-Report by Factor Scores Within Conditions by Joviality and Sadness Scales

		Joviality		Sadness	
Condition	*n*	*M*	*SD*	*M*	*SD*
Positive MIP / Happy Target	33	0.562	1.069	-0.090	1.048
Neutral MIP / Happy Target	23	0.256	0.970	-0.337	0.841
Negative MIP / Happy Target	32	0.402	0.824	-0.172	0.674
Positive MIP / Sad Target	32	-0.418	0.968	0.467	1.438
Neutral MIP / Sad Target	30	-0.051	0.942	0.316	0.986
Negative MIP / Sad Target	32	-0.547	0.677	0.349	1.130

The descriptive results of the data from the judges' ratings are shown in Table 6.2, which presents the means and standard deviations of the JOV-R and SAD-R ratings on a seven-point ordinal scale. From the table, we see that the overall scoring of emotion was relatively low, as all the means are below 1.4 (on a 0 to 6 scale), suggesting that the raters

saw very weak expression of emotion in the participants. Similar to the results in Table 4.2, we find that the means on the SAD-R scale are generally higher than on the JOV-R scale, i.e., the raters were identifying slightly more negative emotion on both conditions.

Table 6.2
Descriptive Statistics for Judges' Ratings on an Ordinal Scale Within Conditions by JOV-R and SAD-R Items

		JOV-R		SAD-R	
Condition	*n*	*M*	*SD*	*M*	*SD*
Intercept		0.610	1.257	0.916	1.217
Positive MIP / Happy Target	33	0.661	1.265	1.158	1.155
Neutral MIP / Happy Target	23	0.662	1.375	1.190	1.317
Negative MIP / Happy Target	32	1.361	1.664	1.051	1.355
Positive MIP / Sad Target	32	0.808	1.419	1.082	1.356
Neutral MIP / Sad Target	30	0.697	1.242	1.334	1.204
Negative MIP / Sad Target	32	0.412	1.008	1.343	1.147

Effectiveness of Mood Induction Procedures

To assess whether the affective imagery tasks produced the intended effect on participants' moods, a mixed model analysis of variance was conducted on the three main mood induction conditions, e.g., the Positive MIP / Happy Target and Positive MIP / Sad Target conditions were recoded into one new variable, as both conditions experienced the same Mood Induction Procedure (MIP) prior to viewing the stimuli. Table 6.2 below summarizes the self-reported intensity of the emotion experienced immediately following the MIP rated on a 0 to 8 scale, with 8 equivalent to the strongest experience of that emotion in the participant's entire life. The average answer to this question in the neutral condition was around 2.8, a fairly low intensity of emotion. Compared to the neutral MIP, those engaging in the negative induction procedure reported a 1.239 increase, i.e., an average of 4.031, which was significant at $p = .002$. Those engaging in the positive

manipulation also reported a small (0.577) increase in the intensity of the emotion experienced, but this effect was not significant (p = .144).

Table 6.3
Self-Reported Intensity of the Emotions Experienced During Mood Induction Procedure

Condition	Coefficient	Standard Error	Significance
Positive MIP	0.577	0.393	0.144
Negative MIP	1.239	0.395	0.002
Intercept (Neutral MIP)	2.792	0.292	0.000

The aforementioned results are corroborated in Table 6.3, which presents the self-reported difficulty of engaging in the MIP. Overall, the participants seemed to have a hard time engaging in the imagery task, as the reported difficulty on the neutral condition was 5.180—above average on a 0 to 8 scale. Compared to the neutral condition, those engaging in the Negative MIP reported the task as being significantly less difficult (β = -0.730, p = .033). Participants assigned to the positive induction procedure also reported the task as being less difficult than the neutral condition (though by a smaller magnitude than those in the Negative MIP conditions), but this effect was not significant (p = .694).

Table 6.4
Self-Reported Difficulty of Engaging in Mood Induction Procedure

Condition	Coefficient	Standard Error	Significance
Positive MIP	-0.132	-0.335	0.694
Negative MIP	-0.730	-2.153	0.033
Intercept (Neutral MIP)	5.180	0.250	0.000

Two-level Model Results With Positive Affect Outcome Measures

In Table 6.5, the results of the main two-level model are presented when the outcome was measured on the JOV-R and Joviality scales and the baseline comparison is to the condition that engaged in the Negative MIP and watched the sad target video

(Negative MIP / Sad Target). Considering the Between-Subjects (Level 2) results with the rating data, we see that participants who were put into a temporary sad mood before watching the happy stimuli (Negative MIP / Happy Target) were 0.233 of a standard deviation higher in observed happiness ($p = .01$) compared to the baseline group (Negative MIP / Sad Target). No other conditions were significantly different from the baseline. Considering the demographic factors, we see that age did significantly decrease the happiness of the participants ($\beta = -0.088$, $p = .005$), controlling for the other conditions in the model, but gender did not have a significant effect.

Although the judges' score and self-report measures were positively and significantly correlated ($r = 0.209$, $p = .005$), the magnitude of this correlation was low, suggesting that the JOV-R and Joviality are still defining separate constructs. We also note that the Within-Subject factors relating to the assessment of judges' scores were all non-significant, suggesting that occasions measured ($p = .981$), raters ($p = .561$), and their interaction ($p = .182$) were not significantly related to the outcome measured on the JOV-R scale.

Table 6.5
Two-Level Model Estimates on the JOV-R Scale

Variables	Estimate	SE	T-Test	Sig.
Between Subjects (N = 182)				
Happiness Score[a]				
Positive MIP / Happy Target	0.025	0.021	1.203	0.229
Neutral MIP / Happy Target	0.014	0.021	0.696	0.487
Negative MIP / Happy Target	0.233	0.090	2.584	0.010
Positive MIP / Sad Target	0.052	0.074	0.699	0.485
Neutral MIP / Sad Target	0.058	0.071	0.820	0.413
Age	-0.088	0.031	-2.832	0.005
Female	0.078	0.063	1.235	0.217
Within Subjects[b]				
Occasions	-0.005	0.195	-0.023	0.981
Rater Teams	-0.203	0.355	0.581	0.561
Occasions x Rater Teams	-0.446	0.334	-1.336	0.182
Between Subjects				
Self-Report Happiness Intercept[a]	0.154	0.204	9.850	0.000
Positive MIP / Happy Target	0.087	0.026	3.407	0.000
Neutral MIP / Happy Target	0.025	0.022	1.138	0.255
Negative MIP / Happy Target	0.139	0.070	1.988	0.047
Positive MIP / Sad Target	-0.154	0.076	-2.019	0.044
Neutral MIP / Sad Target	-0.067	0.074	-0.908	0.364
Age	-0.020	0.051	-0.397	0.692
Female	-0.070	0.061	-1.156	0.248
Level 2 variance (Score)	0.195	0.042	4.624	0.000
Level 2 variance (Self-Report)	0.931	0.033	27.943	0.000
Correlation	0.209	0.074	2.822	0.005
Log likelihood	-3173.0			
Free parameters	23			

Note. [a] Between-subject estimates are standardized; [b] Within-subject estimates are log odds coefficients; thresholds not shown.

While the data by judges' ratings yielded only one significant difference by condition, the self-report data showed significant differences among three of the five conditions (the sixth being the baseline). Participants who experienced a happy transient mood state before watching the happy video (Positive MIP / Happy Target) had a 0.087 SD increase (p = .000) in self-reported happiness compared to participants who were

induced into a sad mood before watching the sad stimuli (Negative MIP / Sad Target). Those in the Negative MIP / Happy Target condition also reported higher levels of positive affect on the Joviality scale compared to the baseline group (γ = 0.139, p = .047). Interestingly, being induced into a happy mood prior to watching the sad stimuli significantly decreased self-reported happiness compared to those who were induced into a negative affective state before watching the same video (γ = -0.154, p = .044). While age was a significant predictor using the judges' ratings as the outcome measure, neither age nor gender significantly predicted self-reported happiness. The significant findings from this model with self-reported happiness as the outcome measure are depicted below in Figure 6.1.

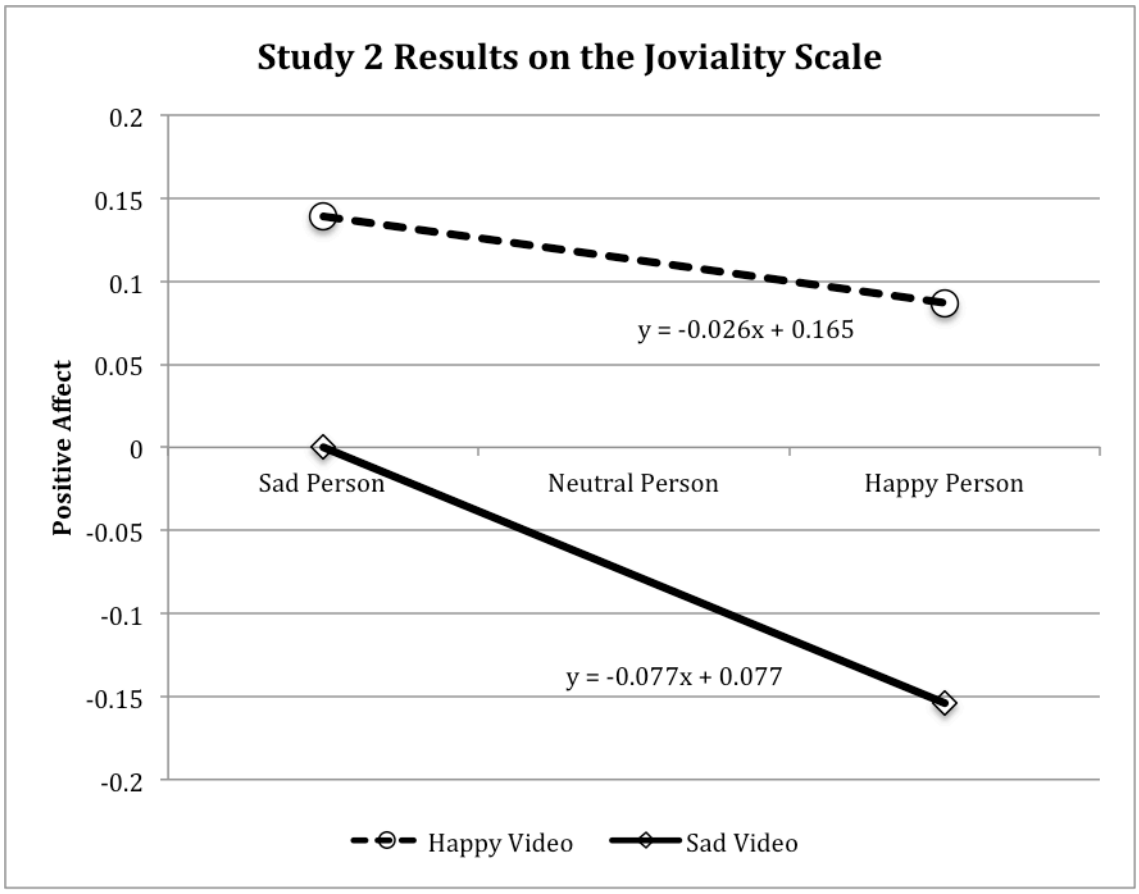

Figure 6.1. Results of Study 2 with the outcome measured on the Joviality scale.

Two-level Model Results With Negative Affect Outcome Measures

In Table 6.6, the results of the main two-level model are presented when the outcome was measured on the SAD-R and Sadness scales and the baseline comparison is to the condition that engaged in the Negative MIP before watching the sad stimuli (Negative MIP / Sad Target). Considering the Between-Subjects (Level 2) results with the judges' rating data, there is no significant result observed by experimental condition or by demographic variables at a conventional significance level of 0.05. However, it should be noted that one experimental condition (the Neutral MIP / Sad Target) would be statistically significant at $p < .06$.

While the data by judges' ratings yielded only one possible significant difference by condition, the self-report data showed significant differences among two of the five conditions. Participants in the Neutral MIP / Happy Target condition had a 0.141 SD decrease ($p = .030$) in self-reported sadness compared to participants who were induced into a sad mood before watching the sad stimuli (Negative MIP / Sad Target). Those induced into a sad mood before watching the happy stimuli (Negative MIP / Happy Target) also experienced less negative emotion compared to the baseline group ($\gamma = -0.162$, $p = .044$). Neither age nor gender significantly predicted self-reported sadness.

We can also note that the SAD-R and Sadness outcome measures were positively and significantly correlated ($r = 0.141$, $p = .024$); however, the magnitude of this correlation was low, suggesting that the measures are consistent in defining separate constructs in each study. Additionally, at Level 1 (within subjects), these results may be impacted by the significant relationship of occasions ($p = .01$) to the outcome. This finding suggests that occasions were systematically contributing some variance to judges'

scores on the SAD-R scale. Raters (p = .091) and their interaction with occasions (p = .673) were not significantly related to the outcome measured on the SAD-R scale.

Table 6.6
Two-Level Model Estimates on the SAD-R Scale

Variables	Estimate	SE	T-Test	Sig.
Between Subjects (N = 186)				
Sadness Score[a]				
Positive MIP / Happy Target	0.148	0.095	1.555	0.120
Neutral MIP / Happy Target	0.076	0.095	0.801	0.423
Negative MIP / Happy Target	-0.011	0.111	-0.100	0.921
Positive MIP / Sad Target	-0.032	0.114	-0.276	0.782
Neutral MIP / Sad Target	0.179	0.094	1.908	0.056
Age	-0.093	0.088	-1.054	0.292
Female	0.048	0.032	1.477	0.140
Within Subjects[b]				
Occasions	0.347	0.134	2.589	0.010
Rater Teams	-0.437	0.258	-1.691	0.091
Occasions x Rater Teams	-0.096	0.228	-0.422	0.673
Between Subjects				
Self-Report Sadness Intercept[a]	0.413	0.244	1.693	0.091
Positive MIP / Happy Target	-0.141	0.096	-1.477	0.140
Neutral MIP / Happy Target	-0.176	0.081	-2.165	0.030
Negative MIP / Happy Target	-0.162	0.080	-2.019	0.044
Positive MIP / Sad Target	0.033	0.109	0.305	0.760
Neutral MIP / Sad Target	0.012	0.089	0.131	0.896
Age	-0.043	0.054	-0.795	0.427
Female	-0.005	0.036	-0.147	0.883
Level 2 variance (Score)	5.064	0.837	6.051	0.000
Level 2 variance (Self-Report)	1.080	0.226	4.771	0.000
Correlation	0.141	0.062	2.250	0.024
Log likelihood	-2667.0			
Free parameters	27			

Note. [a] Between-subject estimates are standardized; [b] Within-subject estimates are log odds coefficients; thresholds not shown.

CHAPTER 7

GENERAL DISCUSSION

This investigation began with the premise that emotional contagion is a phenomenon nearly ubiquitous in daily life—and that while we have scientifically documented its existence, there remains much to learn about how people catch the emotions of others and what factors influence this process. One of the factors hypothesized to influence a person's susceptibility to emotional contagion is their affective state, or whether the person is in a happy or sad mood.

Previous research suggested that mood should influence emotional contagion through attentional or information-processing strategies. In the empirical literature on emotions, mood has been conceptualized and measured as both an enduring trait, i.e., a happy or sad personality, and as a transient state affected by temporary manipulation. However, findings on the impact of trait vs. state emotion have been inconsistent, and the general relationship between mood and emotional contagion was yet to be explored. Thus, the purpose of the present investigation was to examine the effect of both enduring and transient affect on susceptibility to emotional contagion.

Study 1 tested the hypothesis that trait-based affect, i.e., a happy or sad personality, would affect susceptibility to catching either positive or negative emotions. Study 2 tested the hypothesis that transient affect, i.e., a momentary happy or sad mood state, would affect susceptibility to catching either positive or negative emotions. Previous research suggested two competing processes by which mood—whether enduring or transient—may impact such emotional contagion. In the addition theory, people are thought to most likely to catch emotions that are congruent with their current

mood. According to the interaction theory, then, the happier people are, the more likely they should be to catch others' emotions, regardless of the type of emotion they are exposed to.

As I evaluate the results of the data analyses in light of these hypotheses and theoretical predictions, I must begin by considering the validity of the measurement. In these two studies, outcomes were measured across two dimensions: 1) positive and negative affect; and 2) self-report and judges' ratings. Thus, before turning to the hypotheses, we will examine these two dimensions and consider their impact on the main findings of this investigation.

Positive vs. Negative Affect

There is strong consensus for the presence of two main structures of self-reported mood at its broadest level—positive and negative affect (Diener, Larsen, Levine, & Emmons, 1985; Larsen & Diener, 1985; Russell, 1978, 1979; Watson & Tellegen, 1999). Given these findings, it seemed theoretically important to measure positive and negative affect separately on univariate scales, rather than on a bivariate continuous measure, with happiness on one extreme and sadness on the other (happiness being the absence of sadness and vice versa). Thus, the outcome measures in this set of studies assessed positive and negative affect separately, and both types of measurement were included in the main two-level model. However, preliminary analyses-—including a factor analysis of the self-report measures, a generalizability study of the raters' scores, and a review of the descriptive data—all suggested that positive affect might provide a more reliable and useful scale of outcome measurement.

Factor analysis. In the preliminary analysis of Study 1 (Chapter 3), a factor analysis was conducted to investigate the reliability of the self-report scales used to measure the outcomes in both studies, i.e., the Positive Affect (PA), Negative Affect (NA), Joviality, and Sadness scales from the Positive and Negative Affect Schedule – Extended Form (PANAS-X). Principal Component Analysis (PCA) yielded a component matrix for each scale showing which items contributed most strongly to the main component and its overall reliability (alpha).

When I considered the matrices of the PA, NA, Joviality, and Sadness scales (Tables 3.4 – 3.7), I found that the positive affect measures (PA and Joviality) had greater reliability, or alpha levels, than the negative affect scales (NA and Sadness). I noted then the possibility of using just the highest performing measure, the Joviality scale ($\alpha = 0.93$), as the self-report outcome variable in the main two-level model, but I subsequently decided to keep a measure of negative affect in the analysis for consistency. Therefore, both the Joviality and Sadness measures were used as self-report outcome variables, in juxtaposition to the JOV-R and SAD-R scores from the judges' ratings. However, the Joviality scale clearly outperformed the Sadness scale (by an alpha difference of .10); an effect even more pronounced on the general scales, where the reliability of the PA scale was 0.17 higher than the reliability of the NA scale. Thus, as I interpret the overall results of the studies, the preliminary factor analysis may justify prioritizing data on the positive affect dimension.

Generalizability study. In the preliminary analysis of Study 2 (Chapter 5), a generalizability theory study (G study) was conducted to investigate the reliability of the rating data by accounting for multiple sources of variance due to raters, occasions, their

interaction, and other sources of error. The initial study had five raters evaluate a set of five participant videos using the five-item Joviality and Sadness scales from the PANAS-X over three different occasions. Using the magnitudes of potential sources of error from this G study, a decision study (D study) was conducted to design a measurement procedure that optimized the use of rater resources. The D study compared the generalizability coefficient produced by various combinations of raters, items, and occasions. Ultimately, a combination of two raters, three items on the scale, and two occasions was selected to most efficiently utilize the number of raters available with minimal sacrifices to reliability (see Table 5.5). As the five-item Joviality and Sadness scales were shortened to three-item scales used for the rating task, they were renamed JOV-R and SAD-R, respectively, to avoid confusion.

In addition to providing information on rater reliability, I noted the total variance captured on the JOV-R and SAD-R rating scales. When raters assessed the participants on the JOV-R scale, total variance was 4.659, vs. only 2.262 on the SAD-R scale. In assessments, it is often beneficial to use a scale that provides more discrimination between the objects of measurement, and so more variance is useful. More specifically, variability due to persons (or differences between the participants themselves) is about 60% on the JOV-R scale but only about 41.5% on the SAD-R scale. Thus, the G study provided justification to emphasize the JOV-R scale as an outcome measure, as it picked up roughly 45% more variance in participants' observed emotion compared to the SAD-R scale. Echoing the conclusion drawn from the factor analysis, the G study suggested that the main analyses could be conducted using only outcome measures on the positive affect dimension, i.e., the Joviality and JOV-R scales.

Descriptive statistics. Finally, in evaluating the relative merits of the positive and negative affect outcome measures, we can compare the descriptive results on each type of scale. In Study 1, considering the self-report descriptive data in Table 4.1, we see the standardized means and standard deviations for the Joviality and Sadness scales, previously transformed into factor scores. The Joviality scale picked up considerable differences between the two experimental conditions in the predicted direction, i.e., participants watching the Happy stimuli reported higher happiness than those in the Sad condition, with a mean difference of 0.738. In comparison, the Sadness scale yielded a mean difference between conditions of only 0.124, with those watching the Sad stimuli actually reporting slightly less sadness, in non-conformance to the prediction. Additionally, on both the self-report (Table 4.1) and raters' data (Table 4.2), the positive affect scales (Joviality and JOV-R) provided more variability—i.e., higher standard deviations—than the negative affect scales (Sadness and SAD-R). Again, scales yielding higher variability are often desirable in assessment, to allow possible differences between subjects to be observed. Moreover, the ability of the Joviality scale to pick up a much larger mean difference between experimental conditions than the Sadness scale also suggests that it is a better measure for our purposes, consistent with the findings from the factor analysis in Chapter 3. The descriptive statistics of Study 2 do not suggest a preference for measurement on either type of affect scale.

Altogether, considering the preliminary factor analysis, G study, and descriptive data, we have a case to exclude the negative affect outcome measures from our main analyses, and concentrate on interpreting the data gathered on the Joviality and JOV-R

scales. Next, I turn to the question of discriminating between these two types of outcomes—self-report and judges' ratings.

Self-Report vs. Judges' Ratings

After deciding to focus primarily on the positive affect measures, there are two types of measurement outcomes in the main two-level model: self-report and judges' ratings. The purpose of our preliminary analyses—factor analysis of the self-report data and generalizability study of the judges' ratings—was to improve each type of measurement before entering it into the model. It is now possible to look at the main models with positive affect outcomes to compare the qualities of the self-report and observational measures.

Previous research has found that observational measures (e.g., judges' ratings) can be useful when the credibility of self-report is questioned and even when credible self-report is available, but that behaviors can be difficult for observers to decode (Hadjistavropoulos & Craig, 2002). Indeed, the results of both studies suggested that raters had difficulty decoding the emotional displays of the participants. The descriptive statistics for the observational data (Table 4.2 in Study 1 and Table 6.2 in Study 2) revealed an overall low scoring of emotion. Across all conditions in both studies, the average score of emotion on an ordinal scale from 0 to 6 was 0.978—meaning that the raters evaluated most of the participants as having between "not at all" and "very slight" visible signs of emotion.

Unfortunately, we cannot compare the mean level of emotion between the observational data on an ordinal scale and the self-report data, which were transformed into standardized factor scores. Had the self-report and observational measures been on

the same scale, we could compare whether participants were indeed feeling (i.e., self-reporting) more emotion than the judges perceived. An alternate explanation is that participants may have actually been experiencing very little emotion, i.e., the judges' ratings of the participants' emotion were low because the participants were simply not feeling strong emotions. However, the explanation that raters had difficulty perceiving the emotion of the participants is intriguing.

Although we cannot directly compare the means of the self-report and observational measures, we can investigate their correlation. In Study 1, the Joviality and JOV-R measures were both weakly and non-significantly correlated ($r = .091$, $p = .295$); in Study 2, the measures were significantly correlated ($p = .005$), but at a low magnitude ($r = .209$). Altogether, these findings provide very little support for the supposition that self-report and observational measures are identifying the same construct, i.e., raters are not able to observe participants' emotion in direct proportion to the strength with which that emotion is perceived and reported by the participants themselves.

Thus far, the descriptive data suggests that the judges' were having difficulty observing emotion in the participants, and the non-correlation of the self-report and rating scales supports the argument that the two measures were not identifying the same construct. When we compare the two outcome measures in the main models, we find that participants did indeed report more emotion than the judges were able to observe. In Study 1, none of the six between-subject variables was significantly related to judges' ratings of observed emotion; however, measured by self-report, four of these same six variables were significant; "Sad Target" and "Subjective Happiness" at $\alpha = .05$, and "Emotional Contagion" and "Subjective Happiness*Sad Target" at $\alpha = .10$. In Study 2,

one of the five experimental conditions (the sixth being the baseline) was significant when measured by judges' ratings, whereas three of the five conditions were significant when measured by self-report. Altogether, the main experimental effects in both studies were stronger when measured by self-report than observation, suggesting that we could eschew the judges' ratings and focus on the self-report outcomes. Thus, having considered both dimensions of outcome measurement—positive vs. negative affect and self-report vs. observation—and settled on the most appropriate measure, the self-report of positive affect, i.e., the Joviality scale, we can now turn to our hypotheses and theoretical predictions.

Testing Hypothesis 1

In review, Hypothesis 1 states: "Trait-based affect, i.e., a happy or sad personality, affects susceptibility to catching either positive or negative emotions." Table 4.3 presented the results of the main two-level model with positive affect outcome measures. Considering the between-subjects results on the Joviality scale, I found that participants watching the sad target video reported significantly less happiness ($\gamma = -0.365$, $p < .001$) compared to their peers watching the happy target video, i.e., the main effect of emotional contagion by condition was demonstrated.

Next, given that participants in the Sad condition reported their happiness level on the Joviality scale to be 0.37 of a standard deviation less than those who watched the Happy target video—i.e., evidence of emotional contagion—we turn to the influence of enduring affect on this process. Here, we find that the variable measuring trait-based mood was significantly related to Joviality scores: an increase on the Subjective Happiness Scale (SHS; the measure of enduring affect) of one standard deviation would

result in a 0.67 *SD* increase in self-reported happiness when assigned to the Happy condition ($p = .004$), controlling for the other variables in the model. The significance of the SHS variable supports the research hypothesis and supports the view that trait-based affect does indeed affect susceptibility to emotional contagion.

Enduring Affect and Emotional Contagion by Addition or Interaction?

Given that personality-based mood did significantly affect susceptibility to emotional contagion, I next examine the competing theories on how this process may operate, i.e., by addition or interaction. According to the addition theory, participants will be more likely to catch emotions that are congruent with their affective state. For example, people who tend towards habitual sadness will be more likely to catch sad emotion from a target. In contrast, the interaction theory predicts that happier people will be more likely to catch all emotions, in other words, a happy personality increases susceptibility to emotional contagion.

To test this theory, I return to the significant relationship between SHS and Joviality). This finding means that as a person becomes habitually happier (i.e., as indicated through a one standard deviation increase in SHS), he/she picks up more happy emotion (0.67 *SD*, to be exact) when watching a happy video. However, both the addition and interaction theories predict that a happy personality will increase susceptibility to emotional contagion when watching a happy video. To test between the theories, we need to look at the interaction term in the model, Subjective Happiness*Sad Target, which is essentially a test of whether the lines are parallel, as in Figure 3.1, or non-parallel, as in Figure 3.3.

At a lenient test of significance (α = .10), the interaction between condition and SHS was significant (γ = -.379, p = .077). This finding provides cautious support for the premise that a person with a happy personality (i.e., with a high score on the SHS) will decrease in happiness by an additional .379 of a standard deviation when watching a sad video. In essence, the interaction term tests whether the relationship between the target type (happy or sad) and self-reported emotional response is contingent on reported subjective happiness. More specifically, the finding suggests that having a self-reported happy personality becomes an added disadvantage in the Sad Target condition, which then gets added to the person's overall score. Thus, if a person's average reported happiness is already declining by being in the Sad Target condition (-0.365), an individual with a reported happy personality (i.e., 1-*SD* above the mean) will decrease their happiness even more (-0.369 + -0.379 = -0.748) than someone at an average level of happiness by-trait. Thus, if we decide to accept the interaction term at a lenient level of significance, it provides support for interaction theory as the process by which mood affects emotional contagion; i.e., happy people are more susceptible to catching both happy and sad emotions, as shown in Figure 3.3

Testing Hypothesis 2

In review, Hypothesis 2 states: "Transient affect, i.e., a happy or sad mood state, affects susceptibility to catching either positive or negative emotions." The descriptive data on the self-report scales in Table 6.1 provides general support for the main effect of the Happy target condition, as the participants in the three conditions that watched the Happy Target all had higher means on the Joviality scale than the participants in the conditions who watched the Sad Target. The same main effect of target condition was

also observed on the Sadness scale. Thus, the descriptive data provide preliminary support that emotional contagion did indeed take place as predicted.

However, to know whether transient mood actually affected susceptibility to emotional contagion, it is necessary that at least one of the experimental conditions be statistically significant. In Table 6.5, three of the five conditions (the sixth condition being the reference group) were significant, which supports the hypothesis that transient mood impacts emotional contagion. Having any of the mood conditions be significantly related to the outcome on the Joviality scale implies that transient affect did indeed affect susceptibility to emotional contagion; in order to investigate the process by which this contagion occurred, we can examine which specific conditions were significant.

Transient Affect and Emotional Contagion by Addition or Interaction?

With the hypothesis that transient affect affects emotional contagion evidentially supported, I can now consider the theoretical predictions for how mood may impact catching another's emotions. To investigate the theories, we can refer back to Figures 3.1 and 3.3, which show the addition and interaction theories with positive affect as a dependent variable, respectively.

In the two-level model, all conditions are compared to a baseline control group, which was selected to be the condition in which participants were induced into a sad mood prior to watching a sad video (Negative MIP / Sad Target). According to the addition theory, people should catch emotions congruent with their current mood state, and as Figure 3.1 suggests, every condition is predicted to have higher levels of positive affect than the Negative MIP / Sad Target condition.

According to the interaction hypothesis, people in a happy mood should be more susceptible to catching all emotions. Considering the inequality ("<") shape created by the prediction lines in Figure 3.3, we see that the baseline group is at the left-most point of conjunction—and that the Negative MIP / Happy Target group is predicted to be at roughly the same level of positive affect.

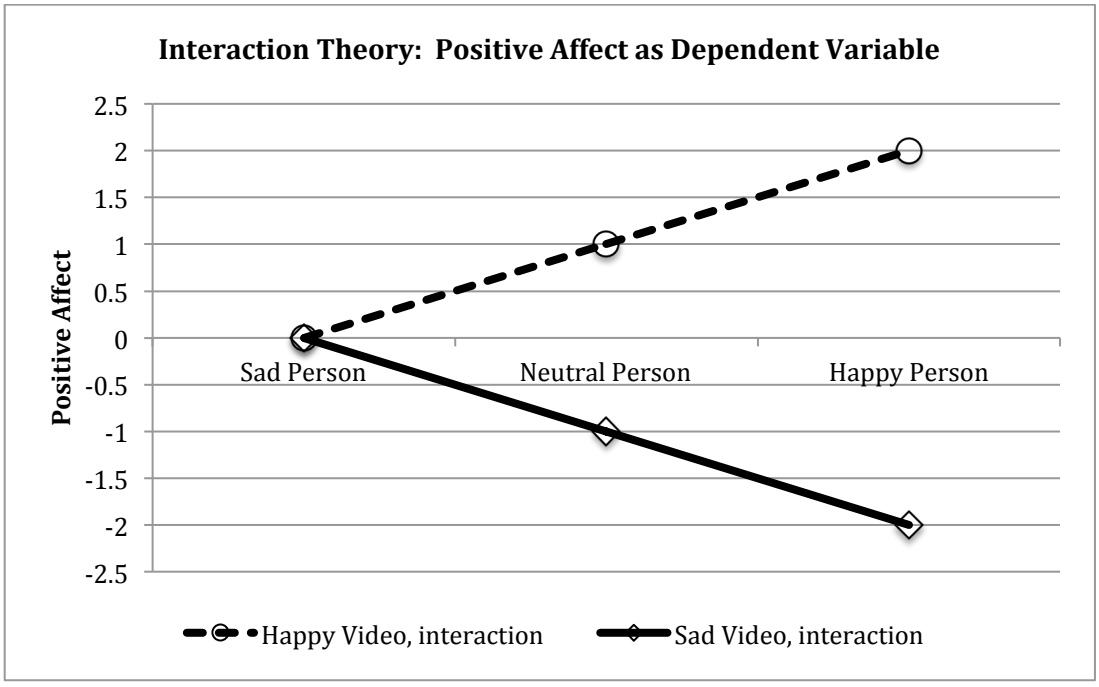

Figure 3.3. Interaction theory: Positive affect as dependent variable

Moving upward along the top line of the inequality sign, which represents those watching the happy video, we see that the Positive MIP / Happy Target condition is predicted to be significantly higher than the baseline group, with the Neutral MIP / Happy Target somewhere in between. Moving downward along the bottom line of the inequality sign, representing those watching the sad video, we find the Positive MIP / Sad Target condition significantly lower in positive affect than the baseline group, with the neutral MIP condition in between.

To simplify the analysis, if the interaction theory holds, we can compare the positive affect levels of the three main points of the inequality sign and hope to find the following ascending order, beginning with the lowest group: 1) Positive MIP / Sad Target; 2) Negative MIP / Sad Target; 3) Positive MIP / Happy Target. In other words, compared to the Negative MIP / Sad Target condition, the Positive MIP / Happy Target condition should be higher in positive affect, and the Positive MIP / Sad Target condition even lower in positive affect.

Consulting Table 6.5, we find that three of the conditions were significantly related to the baseline condition. Considering our first point of interest, we find that being induced into a happy mood prior to watching the sad stimuli (Positive MIP / Sad Target) did significantly decrease self-reported happiness compared to the baseline group by about 0.15 SD, i.e., the Positive MIP / Sad Target condition was lower in positive affect compared to the Negative MIP / Sad Target condition. This finding alone is the key point in support of the interaction theory, as it opposes the addition theory, which would predict every condition to be higher in positive affect than the baseline group.

Next, we see that participants who experienced a happy transient mood state before watching the happy video (Positive MIP / Happy Target) had a 0.087 *SD* increase in self-reported happiness compared to participants who were induced into a sad mood before watching the sad stimuli (Negative MIP / Sad Target). This finding completes the most simple checkpoints of the interaction theory, i.e., that positive affect be lower in the Positive MIP / Sad Target condition and higher in the Positive MIP / Happy Target condition than the baseline Negative MIP / Sad Target group.

According to the interaction theory, the final significant condition, Negative MIP / Happy Target, should be relatively close in affect to the baseline group, i.e., we find the two conditions at the same conjunction in the inequality-shaped prediction figure. While we do find that it is relatively close to the baseline, with an increase of only 0.14 *SD* over the Negative MIP / Sad Target group, this increase is actually higher than the Positive MIP / Happy Target group, which does not conform to the prediction. This finding may be indicative of the strong power of positive emotional contagion, above the affect of current mood state; i.e., if you are in a sad mood, a positive emotional target can lift you up even higher than if you started in a happy mood.

Conclusion

In sum, these studies suggest that affect, whether enduring or transient, does indeed affect susceptibility to emotional contagion. Moreover, this investigation suggests the relationship between mood and emotional contagion is an interactive one; i.e., that being in a happy mood makes a person more likely to catch the emotions of others.

A limitation of this study was the inability of the raters to strongly detect the participants' emotional displays. The literature on facial expressions and mimicking suggests that the participants should have expressed more emotion, and the inability of the raters to identify these displays is inconsistent. Ideally, we would have liked to see a stronger correlation between the judges' ratings and self-reports of emotion, which points to an area of future research. What accounts for the differences in performance between the self-report and observational measures? An investigation of the lower performance of the judges' ratings would improve our understanding of how emotion is experienced, expressed, and measured.

APPENDIX A

CONSENT FORM, DEMOGRAPHIC INFORMATION, DEBRIEFING SCRIPT

Consent Form

AGREEMENT TO PARTICIPATE IN
A study on emotional reactions to stimuli

Researchers:

Dana Rei Arakawa, Principal Investigator	(808) 291-1800
Elaine Hatfield, Project Supervisor	(808) 956-6276

Description of the study and participation:

The current study is a component of the psychology graduate program requirements. The principal investigator is a graduate student. The purpose of this research is to investigate people's reactions to different experimental stimuli. While we do not expect there to be immediate benefits to you as a participant, your participation will help us to better understand facial expressions, which may lead to other research.

Participation in the project will consist of filling out demographic information and a short questionnaire before watching a series of short video clips, followed by a second brief questionnaire, after which you be given more information about the study in a short debriefing session lasting approximately two minutes. No personal identifying information will be included with the research results. Approximately 150 people will participate in this study.

The scientific validity of our study depends on the truthfulness of your answers to the survey and natural participation in the experiment, so please answer each question and participate in the experiment honestly and to the best of your ability. By participating in the study, you will be exposed to emotional content. Additionally, you may be videotaped during a portion of this experiment; should you choose, you will of course be allowed to censor this tape before or after viewing it.

If you find yourself experiencing discomfort at any time, please know that your participation is completely voluntary. You may withdraw from the study at any point without penalty or loss of benefit to which you would otherwise be entitled.

Research data will be confidential to the extent allowed by law. Agencies with research oversight, such as the UH Committee on Human Studies, have the authority to review research data. All research records will be stored in a locked file in the primary investigators' office for the duration of the research project. All participant materials will be destroyed after completion of the project.

Completion of the questionnaires should take no more than 10 minutes. By participating in this study, it will be recommended that you receive one extra credit point for the class from which you were recruited, for those who are participating as an undergraduate student.

If you have any questions regarding this research project, please contact the researchers listed at the top of the page.

If you have any questions regarding your rights as a research participant, please contact the UH Committee on Human Studies at (808)956-5007, or uhirb@hawaii.edu, or the Principal Investigator listed above.

Participant:
I have read and understand the above information, and by understand that by continuing on to the next page, I agree to participate in this research project and affirm I am at least 18 years of age.

PLEASE PRINT THIS PAGE NOW FOR YOUR RECORDS.

Demographic Information

What is your age? _____

What is your gender?
___1. Male
___2. Female
___3. Other: _____
___4. Choose not to disclose

Which group best describes your ethnic identity, or the ethnic group with which you most strongly identify?
___1. African, African-American
___2. American Indian or Alaskan Native
___3. Caucasian
___4. Chinese
___5. Filipino(a)
___6. Hawaiian, Part-Hawaiian
___7. Hispanic/Latino(a)/Mexican-American
___8. Japanese
___9. Korean
___10. Middle Eastern
___11. Other Asian
___12. Pacific Islander (Samoan)
___13. Indian, Pakistani, and other South Asians
___14. Portuguese
___15. Other:_____
___16. Choose not to disclose

Debriefing Script

Thank you for participating in this study. You were told that the purpose of this study was to investigate people's reactions to different experimental stimuli. We are interested in your facial reactions in order to see whether the emotion seen in the video

would be “contagious.” For example, if you smile while seeing people celebrate joyfully, or if you frown while seeing people disappointed. Your reactions to the video clip were recorded by the computer’s camera and will be analyzed by outside raters. Please let us know now or at any time in the future if you would like to see your video recording, which you may also delete at any time.

APPENDIX B

SUBJECTIVE HAPPINESS SCALE

For each of the following statements and/or questions, please circle the point on the scale that you feel is most appropriate in describing you.

1. In general I consider myself

1	**2**	**3**	**4**	**5**	**6**	**7**
Not a very happy person					**A very happy person**	

2. Compared to most of my peers, I consider myself

1	**2**	**3**	**4**	**5**	**6**	**7**
Less happy					**More happy**	

3. Some people are generally very happy. They enjoy life regardless of what is going on, getting the most out of everything. To what extent does this characterization describe you?

1	**2**	**3**	**4**	**5**	**6**	**7**
Not at all					**A great deal**	

4. Some people are generally not very happy. Although they are not depressed, they never seem as happy as they might be. To what extent does this characterization describe you?

1	**2**	**3**	**4**	**5**	**6**	**7**
Not at all					**A great deal**	

Scoring: Add together the four item scores. Item 4 is reverse coded, so that if you scored 1 give yourself 7. Then divide the total score by 4 to give a range of 1 to 7.

Interpretation: The world adult population scores, on average, between 4.5 and 5.5.

APPENDIX C

EMOTIONAL CONTAGION SCALE

This is a scale that measures a variety of feelings and behaviors in various situations. There are no right or wrong answers, so try very hard to be completely honest in your answers. Results are *completely confidential.* Read each question and indicate the answer which best applies to you. Please answer each question very carefully. Thank you.

1. If someone I'm talking with begins to cry, I get teary-eyed.

4 = *Always*. Always true for me.
3 = *Often*. Often true for me.
2 = *Rarely*. Rarely true for me.
1 = *Never*. Never true for me.

2. Being with a happy person picks me up when I'm feeling down.

4 = *Always*. Always true for me.
3 = *Often*. Often true for me.
2 = *Rarely*. Rarely true for me.
1 = *Never*. Never true for me.

3. When someone smiles warmly at me, I smile back and feel warm inside.

4 = *Always*. Always true for me.
3 = *Often*. Often true for me.
2 = *Rarely*. Rarely true for me.
1 = *Never*. Never true for me.

4. I get filled with sorrow when people talk about the death of their loved ones.

4 = *Always*. Always true for me.
3 = *Often*. Often true for me.
2 = *Rarely*. Rarely true for me.
1 = *Never*. Never true for me.

5. I clench my jaws and my shoulders get tight when I see the angry faces on the news.

4 = *Always*. Always true for me.
3 = *Often*. Often true for me.
2 = *Rarely*. Rarely true for me.
1 = *Never*. Never true for me.

6. When I look into the eyes of the one I love, my mind is filled with thoughts of romance.

4 = *Always*. Always true for me.
3 = *Often*. Often true for me.
2 = *Rarely*. Rarely true for me.
1 = *Never*. Never true for me.

7. It irritates me to be around angry people.

4 = *Always*. Always true for me.
3 = *Often*. Often true for me.
2 = *Rarely*. Rarely true for me.
1 = *Never*. Never true for me.

8. Watching the fearful faces of victims on the news makes me try to imagine how they might be feeling.

4 = *Always*. Always true for me.
3 = *Often*. Often true for me.
2 = *Rarely*. Rarely true for me.
1 = *Never*. Never true for me.

9. I melt when the one I love holds me close.

4 = *Always*. Always true for me.
3 = *Often*. Often true for me.
2 = *Rarely*. Rarely true for me.
1 = *Never*. Never true for me.

10. I tense when overhearing an angry quarrel

4 = *Always*. Always true for me.
3 = *Often*. Often true for me.
2 = *Rarely*. Rarely true for me.
1 = *Never*. Never true for me.

11. Being around happy people fills my mind with happy thoughts.

4 = *Always*. Always true for me.
3 = *Often*. Often true for me.
2 = *Rarely*. Rarely true for me.
1 = *Never*. Never true for me.

12. I sense my body responding when the one I love touches me.

4 = *Always*. Always true for me.
3 = *Often*. Often true for me.
2 = *Rarely*. Rarely true for me.
1 = *Never*. Never true for me.

13. I notice myself getting tense when I'm around people who are stressed out.

4 = *Always*. Always true for me.
3 = *Often*. Often true for me.
2 = *Rarely*. Rarely true for me.
1 = *Never*. Never true for me.

14. I cry at sad movies.

4 = *Always*. Always true for me.
3 = *Often*. Often true for me.
2 = *Rarely*. Rarely true for me.
1 = *Never*. Never true for me.

15. Listening to the shrill screams of a terrified child in a dentist's waiting room makes me feel nervous.

4 = *Always*. Always true for me.
3 = *Often*. Often true for me.
2 = *Rarely*. Rarely true for me.
1 = *Never*. Never true for me.

Scoring: Happiness items – 2, 3, & 11; Love items = 6, 9, & 12; Fear items = 8, 13, & 15; Anger items 5, 7, & 10; Sadness items = 1, 4, &14. Total score = all items.

Interpretation: The higher the score, the more susceptible to emotional contagion a person would be said to be.

APPENDIX D

LIFE ORIENTATION TEST – REVISED

Please be as honest and accurate as you can throughout. Try not to let your response to one statement influence your responses to other statements. There are no "correct" or "incorrect" answers. Answer according to your own feelings, rather than how you think "most people" would answer.

1. In uncertain times, I usually expect the best.

4 = I agree a lot
3 = I agree a little
2 = I neither agree nor disagree
1 = I disagree a little
0 = I disagree a lot

2. It's easy for me to relax.

4 = I agree a lot
3 = I agree a little
2 = I neither agree nor disagree
1 = I disagree a little
0 = I disagree a lot

3. If something can go wrong for me, it will.

4 = I agree a lot
3 = I agree a little
2 = I neither agree nor disagree
1 = I disagree a little
0 = I disagree a lot

4. I'm always optimistic about my future.

4 = I agree a lot
3 = I agree a little
2 = I neither agree nor disagree
1 = I disagree a little
0 = I disagree a lot

5. I enjoy my friends a lot.

4 = I agree a lot
3 = I agree a little
2 = I neither agree nor disagree
1 = I disagree a little
0 = I disagree a lot

6. It's important for me to keep busy.

4 = I agree a lot
3 = I agree a little
2 = I neither agree nor disagree
1 = I disagree a little
0 = I disagree a lot

7. I hardly ever expect things to go my way.

4 = I agree a lot
3 = I agree a little
2 = I neither agree nor disagree
1 = I disagree a little
0 = I disagree a lot

8. I don't get upset too easily.

4 = I agree a lot
3 = I agree a little
2 = I neither agree nor disagree
1 = I disagree a little
0 = I disagree a lot

9. I rarely count on good things happening to me.

4 = I agree a lot
3 = I agree a little
2 = I neither agree nor disagree
1 = I disagree a little
0 = I disagree a lot

10. Overall, I expect more good things to happen to me than bad.

4 = I agree a lot
3 = I agree a little
2 = I neither agree nor disagree
1 = I disagree a little
0 = I disagree a lot

Scoring: Items 2, 5, 6, and 8 are fillers and therefore should be excluded. Add the scores for the remaining items to calculate the final score.

Interpretation: There are no 'cut-offs' for optimism or pessimism. Higher scores reflect higher levels of optimism.

APPENDIX E

POSITIVE AND NEGATIVE AFFECT SCHEDULE – EXPANDED FORM

This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you have felt this way right now, at this present moment.

Use the following scale to record your answers:

1	2	3	4	5
Very slightly or not at all	A little	Moderately	Quite a bit	Extremely

Positive Affect (PA) Scale	active, alert, attentive, determined, enthusiastic, excited, inspired, interested, proud, strong
Negative Affect (NA) Scale	afraid, scared, nervous, jittery, irritable, hostile, guilty, ashamed, upset, distressed
Joviality Scale[13]	happy, joyful, ~~delighted~~, cheerful, excited, enthusiastic, ~~lively, energetic~~
Sadness Scale	sad, blue, downhearted, alone, lonely

Scoring: To calculate positive affect (PA), add the scores for the ten items: active, alert, attentive, determined, enthusiastic, excited, inspired, interested, proud, and strong. The total score can vary from 10 to 50.

To calculate negative affect (NA), add the scores for the following ten items: afraid, scared, nervous, jittery, irritable, hostile, guilty, ashamed, upset, and distressed. The total score can vary from 10 to 50.

To calculate the Joviality score, add the scores for the following five items: happy, joyful, cheerful, excited, and enthusiastic. The total score can vary from 5 to 25.

To calculate the Sadness score, add the scores for the following five items: sad, blue, downhearted, alone, and lonely. The total score can vary from 5 to 25.

Interpretation: There are no 'cut-offs'; higher scores reflect higher levels of the construct in question, i.e., positive affect, negative affect, joviality, or sadness.

[13] As noted in the discussion of the Joviality Scale in Chapter 3, the three weakest items (delighted, lively, energetic) were excluded to form a five-item measure commensurate with the Sadness Scale.

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