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Social Connection and Kama Muta:

The Psychosocial Consequences of Feeling Emotionally Moved or Touched

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…Tho' much is taken, much abides; and tho'
We are not now that strength which in old days
Moved earth and heaven, that which we are, we are;
One equal temper of heroic hearts,
Made weak by time and fate, but strong in will
To strive, to seek, to find, and not to yield.

— Alfred Lord Tennyson, Ulysses

Lay Summary

Recently, psychologists have organized the emotion that English-speakers often describe as feeling "moved" or "touched." This emotion—when people get choked up, teary eyes, a positive warmth in their chest— has been found around the world, across a wide variety of different cultures so, to avoid confusion between different languages, psychologists have called the emotion *kama muta* (the Sanskrit phrase translating to "moved by love"). Kama muta is most often felt when people observe, or experience for themselves, an intense strengthening of relational care and belonging—like lovers reunited, holding a newborn for the first time, vows read aloud at a wedding, or other such experiences. Kama muta is thought to be a crucial social emotion that viscerally reminds us how important our close relationships are, "moving" us to devote and commit ourselves to deeper closeness with our current relationships or cultivate new bonds with others. That so many rituals (e.g., weddings, funerals), narratives (e.g., romantic tragicomedies like *Orpheus and Eurydice*, *Titanic*), arts and media (e.g., Disney Pixar movies, TikToks that "restore faith in humanity") across human history have been seemingly tailored and favored toward creating this "moving" feeling is a testament to how important kama muta is. However, so far, little research has investigated whether kama muta has any such prosocial consequences; that is, we do not know if and how kama muta actually affects how we feel connected to each other.

We performed four studies to examine this question. Our first two studies were online experiments that showed that kama muta feels very positive and said positivity, more than anything unique to "feeling moved" (e.g., hands on chest, feeling goosebumps, saying they "felt touched"), satisfies the basic psychological need for relatedness. Our third and fourth studies were daily experience studies, where people in romantic relationships reported their feelings and experiences across several days in a row. People reported that their partners, family, and friends were their most common sources of kama muta, and said they felt a little kama muta once every few days, and strong kama muta about once every 10 days. We found that on days when people felt more kama muta than usual, they also felt more understood, validated, and cared for than usual by their partner. We also found that when someone felt more kama muta than usual one day, *their partner* felt more understood, validated, and cared for than usual the *next day*. Overall, our findings suggest that feeling kama muta not only makes people feel better about their relationships, but it may also spur them to make their relational partners feel better about their relationships as well.

Abstract

Only recently have psychologists codified the emotion that English speakers often label as feeling "moved" or "touched." This emotion, called *kama muta* (Sanskrit for "moved by love"), is commonly experienced as feeling choked up, teary eyes, and/or a warm pleasant swelling in the chest. People feel kama muta when they perceive the rapid strengthening or creation of a communal relationship (relationships characterized by mutual care, compassion, and belonging) with another person or entity, or observe it happen to others. This characterization of kama muta has been observed across the world, in a wide variety of different languages and cultures. Psychologists have theorized that kama muta is a crucial social emotion that affectively (re)directs and motivates individuals to devote, commit, and attend to their own communal relationships. However, to date, there is little empirical evidence of kama muta leading to such downstream prosocial effects. We present four studies, utilizing multiple designs (cross-sectional, longitudinal), methods (experimental, observational), and levels of analysis (individual, dyad) to assess which psychosocial consequences can be uniquely attributed to this kama muta emotion. Studies 1-2 drew on self-determination theory to investigate whether experimentally manipulating kama muta affects basic psychological needs. We found that kama muta manipulations were associated with small, immediate increases in basic needs for autonomy, relatedness, and competence. Crucially, however, the experimental manipulations only had such effects via positive affect, rather than self-reported kama muta feelings. These findings suggest kama muta, outside of its (potent, but general) feel-good qualities, is not uniquely associated with driving immediate changes to theoretically fundamental elements of individuals' motivation and behavior. Studies 3-4 took a more naturalistic perspective in the form of daily diary studies, examining how kama muta was experienced in daily life and whether kama muta experiences were associated with a core communal relationship appraisal, perceived partner responsiveness (PPR; how much one feels cared for, understood, and validated by one's partner). We found participants consistently reported close others as the most common cause of their kama muta experiences, with romantic partners, family, and friends accounting for ~50% of all evokers. Participants also reported that they felt mild kama muta at least every few days, and more pronounced kama muta roughly every 10 days. Kama muta and PPR covaried on the day (i.e., feeling more kama muta than usual one day coincided with feeling more PPR than usual that same day). However, we found no cross-lagged links between one's own kama muta and one's own PPR (i.e., feeling more kama muta than usual one day was not associated with feeling more PPR than usual the following day, nor vice versa). In Study 4, we found partner cross-lagged effects within couples such that (a) one partner feeling more kama muta than usual one day was associated with *the other partner* feeling more PPR than usual the following day and (b) one partner feeling more PPR than usual one day was associated with *the other partner* feeling more kama muta than usual the following day. These findings point to kama muta as an interpersonal emotion that is associated with feeling communally fulfilled and directs individuals towards making *others* feel more communally

fulfilled. Overall, our results support an account of kama muta as a common, recurrent socioemotional experience that contributes to communality in close relationships.

1 Chapter 1: Overview of Thesis

This thesis aims to evaluate the psychosocial consequences of *kama muta* (Sanskrit for "moved by love"), the emotion English speakers label as feeling "moved" or "touched." We approach this topic from several theoretical perspectives, conducting four studies with varied methods and designs to identify the effects kama muta has on outcomes relevant for communal relationships. We begin in Chapter 2 by providing a review of foundational theories and research that underlie this topic, reviewing the nature and regulation of emotions, theoretical models of human relationships, and the current state of kama muta theory. We finish our review of literature by describing the two outcomes in which we evaluated kama muta's effects: basic psychological needs and responsiveness.

Chapters 3-7 detail the four empirical studies that form the bulk of this thesis, split by an intermission to bridge, and detail changes in technical approaches between, Studies 1-2 to Studies 3-4. Chapter 3 introduces a pilot and Study 1 examining how experimentally manipulating kama muta affects the basic psychological need for relatedness. Chapter 4 presents Study 2, which builds off the previous experimental paradigm to gain more precise understanding of kama muta's effects in two ways: (a) evaluating kama muta against all basic psychological needs, beyond just relatedness and (b) teasing apart differences between effects attributable to kama muta rather than to general positive affect. The following Technical Interlude of Chapter 5 details broad technical changes that inform design and method developments carried into Studies 3-4. Shifting in sampling population and focal outcome, Chapter 6 presents a daily diary study (Study 3) that documents kama muta in daily life, identifying how often it occurs and what typically causes it. Study 3 also directly joins kama muta to relationship science, investigating the extent to which kama muta is associated with perceived partner responsiveness at the daily and lagged-daily level. Chapter 7 extends on this daily diary paradigm with a new, larger sample of romantic couples that serves as replication and extension of Study 3's findings, adding the consideration of both partners' kama muta and communal experiences influencing each other at the daily and lagged-daily level. Finally, Chapter 8 concludes the research of this thesis by exploring contributions and limitations of this body of work, before discussing how kama muta research might build on and extend from these findings.

2 Chapter 2: Literature Review

2.1 Chapter Overview

This chapter begins with a review of emotion literature. We review the predominant perspectives from which psychologists think of and study emotion, explaining their differences, and what shared insights they have that are relevant for this thesis. We then introduce relational models theory, an overarching theory describing fundamental modes of human relationships that includes communal sharing relationships, the relational type most relevant for kama muta. From this theoretical foundation, we then explain kama muta theory—what the kama muta emotion is, how it is thought to function, and the current state of its empirical research. Finally, building off gaps in empirical research, we present an overview of the two primary outcome measures we examine in this thesis: basic psychological needs and responsiveness.

2.2 Emotion and Social Relationships

2.2.1 Defining an Emotion is Difficult

Defining "emotion" has been a challenge for psychologists for the better part of a century. Many psychologists have attributed Darwin's (1872) *The Expression of the Emotions in Man and Animals* as the beginning of the most historically pervasive concept of emotions as discrete and, ultimately, "basic" (Colombetti, 2009; Hess & Thibault, 2009; Keltner et al., 2019; Ortony, 2022). While some have pointed out the historical inaccuracy in invoking Darwin in this manner (e.g., Barrett, 2011), Darwin's observations of widely recognizable facial features nonetheless thematically began a longstanding psychological tradition focusing on universals of emotional facial behavior (e.g., Allport 1924; Tomkins, 1962; Ekman, 1979). This perspective rests on a biological, evolutionarily informed assumption that emotional facial and bodily expressions are vestigial "serviceable habits" (to use the Darwinian phrasing) naturally selected to convey information relevant for navigating daily challenges (Darwin, 1872; Lench & Carpenter, 2018; Ortony, 2022). Studies in remote cultures (e.g., Ekman, 1971), online experiments (e.g., Horstmann, 2003), and meta-analyses (e.g., Elfenbein & Ambady, 2002, Lench et al., 2011), as well as some machine learning deep neural networks (Cowen et al., 2021) support this view that there are core, biologically-informed and externally recognizable emotion components. This body of work has largely coalesced into a singular perspective known as basic emotion theory (BET). BET considers emotions as distinct, (often but not always) brief states of physiological, subjective, and expressive components that allow humans to adapt to evolutionary significant challenges in their environment (Keltner et al., 2019). Basic

emotions, the titular and most representative part of BET, are those emotions that are universally observable in humans, evolutionarily consistent (i.e., present in primates, have robust selection pressures), and have distinct physiology (Barrett, 2006; Ekman, 1992; Keltner et al., 2019). While criteria have varied slightly (Ekman, 1992; Ekman & Cordaro, 2011) and there have been a wide number of emotions considered to fit such criteria (Ortony & Turner, 1990), basic emotion theory has generally agreed on six basic emotions: anger, fear, sadness, enjoyment, disgust, and surprise (Ekman, 1992; Keltner et al., 2019). An unofficial survey of 250 emotion researchers in 2014 showed about half (49%) of psychologists endorsed the discrete emotion paradigm and of those over 75% agreed upon anger, fear, disgust, sadness, and happiness as being empirically established (Ekman, 2016). This discrete, "basic" paradigm of emotion—where there are many distinct emotions surrounding a core few—has constituted the bulk of psychological consideration and research of emotions over the past century.

However, new emotion perspectives, especially over the past two decades, have called into question such clear-cut, biologically encoded emotion categories. Early work of basic emotions entertained the idea that numerous other emotions like shame, contempt, guilt, and embarrassment could constitute basic emotions (Ekman, 1992) while a shortlist of nearly a dozen others, almost entirely using English lexemes, have been floated as well (e.g., relief, wonder; Eckman & Cordaro, 2011). Ortony (2022) has cautioned that the everchanging expanding and contracting list of basic emotions calls into question the importance of, need for, and ability to distinguish basic emotions in the first place. Russell (2021) has challenged the discrete paradigm in a different way by claiming the term emotion is so variable across cultures, history, and language that it remains unclear whether categories like fear, sadness, and joy refer to the pattern of components, the cause of that pattern, and/or the subjective experience of said pattern or cause. Other researchers have directly countered BET findings. For example, Barrett et al. (2011) has challenged the universality of facial expressions as accurately reflecting emotion by showing that contextual information like cultural orientation, bodies, other faces, and words can drastically change perception of facial emotion expression. Others have called into question BET interpretation. For example, Lench et al. (2011) conclude that their meta-analysis of emotion elicitations supports a discrete view of emotion. However, Lindquist et al. (2013) disagree, contending Lench et al.'s (2011) findings do not demonstrate consistent, specific response patterns for each emotion category as theorized by BET. As an alternative, some have instead turned to different emotion questions; for example, rather than "Is X an emotion? How many emotions are there?" they focus on "What causes feelings and behavior?" (Barrett, 2006). This perspective reflects an opposing perspective of emotions called constructionism.

Unlike discrete BET, the theory of constructed emotion (Barrett, 2017b) is a descriptive model that focuses on the content that constitutes the subjective experience of emotion (Barrett et al., 2007). The constructionist (or constructivist) view of emotion starts with the brain as a dynamic generator of internal models of the self in the world that continually identifies sensory inputs, constructs causal explanations of those inputs, and directs

corresponding action (Barrett, 2017b). In this view, in contrast to BET, emotions are not biologically privileged (Barrett et al., 2009; Ortony & Turner, 1990) but rather socially constructed and biologically evident (Barrett, 2012). In other words, an emotional experience is about the meaning-making one undergoes from their subjective experience of biological markers (Barrett, 2006). By this account, people do not "have", "display", or "recognize" emotions since emotions are constructed experiences or perceptions (Barrett, 2017a). Discrete emotion categories are real, but only to the extent that other human constructed categories are real (like money; Barrett, 2012) and without neural essence (Barrett, 2017b). Context and culture are thus considered critical aspects of emotional experience because they provide the overarching umbrella of categories and knowledge from which to construct meaning (Barrett, 2012; Russell, 1991). For example, Tahitians do not have a word for *sadness* (Levy, 1973). Tahitians likely experience some form of sadness, but sadness is not culturally salient for Tahitians to motivate lexicalization (Ortony, 2022). Furthermore, it would be ethnocentric to suggest a foreign category like sadness is more "true" of Tahitian emotional experience than their own categories and lexemes (Wierzbicka, 1999). Constructionism considers emotional labels like fear and anger as folk concepts inappropriate for scientific study (Russell, 2021), instead insisting on investigating psychological elements like appraisals, affect, and the underlying brain systems responsible (Barrett, 2017b). In other words, constructionists insist that emotional experiences are better described by low-dimensional features like affect or arousal than prescribed by a discrete organized model as suggested by BET (Barrett, 2017a; Russell & Barrett, 1999).

Research has yet to settle the longstanding disagreements of basic and constructionist theories about the nature of emotions, though there is some consolidation. New quantitatively advanced techniques have relied on semantic spatial clusters (Cowen & Keltner, 2021), the findings of which reject and support elements of both theories. For example, new work (Cowen & Keltner, 2020, 2021; Keltner et al., 2023) suggests emotions encompass numerous, separable yet highly overlapping boundaries (contrary to BET) that are too complex to be summarized by low-dimensions such as valence and arousal (contrary to constructionism). There may be new conceptual and measurement developments over the coming years that bridge these two predominant factions in emotion literature (e.g., Harmon-Jones et al., 2017). But for now, defining an emotion remains challenging and contentious (Izard, 2007; Mulligan & Scherer, 2012; Scarantino, 2012). Nevertheless, some overlapping features have emerged. Commonly, emotions tend to involve intention (i.e., an emotion is about something) and valence (i.e., an emotion cannot be indifferent, it must feel positive or negative in some fashion; Clark et al., 2017; Lench & Carpenter, 2018; Ortony, 2022; Ortony & Russell, 2023). Most emotion research also agrees upon some influence of culture (Russell, 2014), and all research agrees upon an evolutionary, naturally selected basis of emotions that belies their functionality for (especially social) fitness (Bradley & Lang, 2002; Keltner & Gross, 1999; Levenson, 1999). Emotion researchers have become increasingly mindful of the intrapsychic nature of most emotion literature, thus generating renewed interest in more naturalistic, dynamic, and multi-modal

perspectives on emotions that focus on social (rather than individual) survival and challenges (Fischer et al., 2016; Keltner et al., 2019; Parkinson & Manstead, 2015).

2.2.2 Emotions Have Social Function

Emotions, but especially positive and outwardly directed ones, are highly social because they help coordinate social life. In their attempts to define an emotion (partly via functionality), both basic and constructed theorists have suggested a link between individuals' emotions and social interactions or settings (Barrett, 2012; Ekman, 1992). However, emotion research has since become more explicit in considering the social effects of emotions beyond a given individual, but rather how individuals' emotions influence each other (for review, see van Kleef & Côté, 2022). Emotions are neurologically linked to perception and reasoning (Phelps, 2006; Phelps et al., 2006), which underscores how emotions provide social information about a given situation, including about oneself and others, and in turn shapes social decision-making (van Kleef, 2016; Van Kleef et al., 2010). Because emotions direct attention in this manner, emotions take on two predominant social functions: affiliation (i.e., forming and maintaining of relationships) and distancing (i.e., establishing and maintaining positions and the self-concept/self-esteem; Fischer & Manstead, 2016). Positive emotionality seems affiliative and especially potent (Fischer et al., 2003), in part because positive emotions broaden momentary scope of attention and action-tendencies conducive to identifying, and investing in, lasting social resources (Fredrickson, 2001; Fredrickson & Branigan, 2005). Furthermore, so-called *self-transcendent* emotions (e.g., compassion, awe, kama muta) are also affiliative because they are characterized by reduced self-salience and an elevated sense of connection to others and things outside the self (Pizarro et al., 2021; Yaden et al., 2017). Self-transcendent emotions promote prosocial behavior and social bonding (van Kleef & Lelieveld, 2022), leading some to consider them foundational for the development of humans as a social species (Stellar et al., 2017). Self-transcendent emotions are often but not necessarily positive (e.g., awe being both positive and negative; Gordon et al., 2017; Nakayama et al., 2020), which suggests that positive self-transcendent emotions may be especially affiliative. However, research on the effects of self-transcendent emotions is relatively new and largely focused on intrapersonal and not interpersonal outcomes (van Kleef & Lelieveld, 2022). In short, seemingly all emotions have social function, with some like positive, self-transcendent emotions perhaps being more social than others.

An additional complex layer atop the social effects of emotions is the regulation of emotions, particularly with and amongst others. Emotion regulation is a deep, complex literature that is somewhat beyond the scope of the studies presented in this thesis, though we will highlight several relevant considerations. Emotion regulation is most commonly thought of as the process by which individuals try to affect what emotions they experience, and when and how they experience them (Gross, 1998). In short, individuals have certain emotion goals (e.g., "I want to feel happy or at least not sad"; Mauss & Tamir, 2013) which, based on their appraisals of the world around them, leads individuals to activate different strategies (e.g.,

acceptance, distraction, expressive suppression; Naragon-Gainey et al., 2017) to influence their emotion trajectory in service of said goals (Gross, 2015b). In this view, individuals cyclically encounter situations, deploy attention, then make appraisals and responses over time (Gross, 2015a). Where basic emotion and constructionist theories gesture at context as important for what emotions are and do, emotion regulation brings context to forefront consideration. For example, depending on how individuals appraise their relationships and goals in a situation, the same emotion may facilitate unifying behavior in cooperative contexts (e.g., contentment as signal of affiliation), or exploitive behavior in competitive contexts (e.g., contentment as signal of increased competition; Van Kleef et al., 2010). Historically, research has focused on what is sometimes called intrinsic emotion regulation (i.e., the goal is to regulate one's own emotions) but has more recently extended to extrinsic regulation (i.e., the goal is to regulate another's emotions; Gross, 2015a). Newer emotion regulation theories have pointed to how deeply embedded emotions are into social interactivity, which implicates how humans experience, express, and regulate emotions with and through each other (Barthel et al., 2018; Coan & Sbarra, 2015; Hofmann, 2014; Zaki & Williams, 2013). Close others are thought to be particularly important for social emotion regulation, or even coregulation (i.e., emotion regulation for a dyad), not least because of the vast breadth and depth of emotional and physical connectedness in close relationships (Barthel et al., 2018; Butler, 2011; Butler & Randall, 2012). These ideas from emotion regulation dovetail with a longstanding acknowledgement in relationship science that qualities of one partner influence qualities of the other, a process known as interdependence (Kelley & Thibaut, 1978; Kenny, 1996; Rusbult & Van Lange, 2003). Put together, the emotion regulation literature suggests that emotions are not just socially functional, but socially functional in a variety of ways depending on complex, dynamic appraisals one makes of their social context.

In summary, the emotion literature has many fundamental unresolved questions, although research continues to find some overlap amidst deep complexity. A crucial consensus is that emotions have social function, particularly insofar as they shape how people interpret, allocate attention, and thus behave in, their social worlds. Positive, self-transcendent emotions seem particularly liable to enhance social connectivity and bonding, though the qualities and effects of an emotion are liable to vary depending on a complex array of social context appraisals. If emotions are about how people interpret and find what matters in the world (Dukes et al., 2021), seeing as humans are deeply social creatures (Adolphs, 2003; Dunbar & Shultz, 2007), it may not be surprising that relationships tend to matter most.

2.3 Relational Models Theory and Communal Relationships

As will be described more in depth later, kama muta theory rests upon a theoretical model of sociality called relational models theory, particularly the relational model called *communal sharing relationships*. Relational models theory (Fiske, 1992) argues that humans are

fundamentally social and have organized themselves into consistent relational models that govern social interactions, appraisals, and affect. In this paradigm, social life is the process of seeking, making, sustaining, perceiving, and adjusting relationships along four central forms or principles of literal and figurative resource interplay. The authority ranking structure reflects a linear ordering where individuals each have a place within a hierarchy and interactions are governed by privileging higher ranks (Fiske, 1992). The equality matching structure describes exact matching of one-for-one exchanges (e.g., where two favors are repaid by two favors, irrespective of what the favors are). Market pricing relationships are governed by comparable exchange (e.g., a favor must be repaid by a favor of equal value, or some combination of less valuable favors; Fiske, 1992). This latter form is sometimes also known as an *exchange relationship* (Clark & Mills, 1979), where benefits are given with the expectation of comparable benefit in return or repayment. Belying a more anthropological perspective, Fiske (1992) contends that Clark and Mills' (1979) exchange relationship frame erroneously combines market pricing and equality matching forms (however, later factor analyses of all four relational models would show only modest differentiation between market and equality forms; Haslam & Fiske, 1999). Nevertheless, these scholars ultimately agree on distinguishing those relationships that negotiate literal and figurative resources on some notion of fairness. We use the term *exchange relationships* for summarizing this point in the remainder of this thesis. Importantly, both Fiske (1992) and Clark and Mills (1979) use these models of exchange relationships as a foil to what they convergently contend are the most important relationships for human sociality: communal (sharing) relationships.

Communal sharing relationships are those relationships predicated on the notion that members of the dyad or group are essentially socially equivalent. By viewing each other as equivalent and undifferentiated, under a sense of what is mine is also yours (Fiske et al., 2019), members in the dyad or group psychologically merge (e.g., Aron et al., 1992) and do not make long-term record keeping of material and immaterial resource exchanges to balance debts or obligations. Fiske (1992, 2004) claims that these relationships are defined by commonality, kindness, compassion and belonging, and are often built and expressed by physical connectivity (e.g., nursing, kissing, hugging, cuddling, touching hands, dancing). Communal sharing relationships bind people together and thus are thought to constitute the basis of all social (but especially close) dyads (e.g., friendships, romantic partners) and groups (e.g., family ties, religious and spiritual groups; Fiske, 1992). Communal sharing is perhaps the most important relational model, not least because they encompass the relationships people self-report as most important, but also because it is thought to describe the human need for belonging, joining, and sharing with others and therefore is the essential form for human social life (Baumeister & Leary, 1995; Fiske, 1992). People can apply the communal sharing model differently depending on the equivalence at hand (Fiske, 1992). For example, two friends may produce, understand, and coordinate with each other on the basis of communal sharing as default in most situations, though will split the price of gas on a road trip (Rai & Fiske, 2011). The communal sharing relational model is also thought to reflect a moral obligation of unity,

whereby individuals ascribe moral obligation of care and support because they perceive collective responsibility and common fate with and for each other (Rai & Fiske, 2011). Members of a dyad or group are thus morally motivated to protect and provide, and the entire group bears responsibility for transgressions or violations (Rai & Fiske, 2011). In this sense, communal sharing relationships encompass very important social bonds upon the basis of equivalence and self-regulated by core internal motives for belonging and support in relationships.

Fiske's (1992) communal sharing approach is a more anthropological interest in describing basic structures for how people make sense of themselves and others across all social-relational interactions. Clark and Mills' (1979) perspective on *communal relationships* is more psychologically focused. Unlike relational models theory, Clark and Mills do not purport nor intend to describe all human relationships in their delineation of communal (vs. exchange) relationships (Clark & Mills, 2011). To Clark and Mills (1979), communal relational partners operate under the assumption of non-contingent concern for each other's welfare without debt or obligation of reciprocal benefit. In this way, some communal relationships can be asymmetrical, such as parent-child relationships, where one partner takes more responsibility than the other. However, most close adult communal relationships are thought to operate under mutual norms, though they can vary in communal strength (Clark & Mills, 1993; Mills & Clark, 2001; Mills et al., 2004). For instance, people tend to seek and expect support from a select few close relational partners more than others, such as with romantic partners, family, and friends (Clark & Aragón, 2013). For clarification, communal relationships are not long-term exchange relationships (e.g., benefits given with the long-form expectation of eventual reciprocation), nor does communality distinguish relationships formed under selfish versus altruistic motives (Clark & Mills, 1993; Clark & Mills, 2011). For example, people moving to a new city may selfishly want to establish communal norms with people to start new friendships or care for elderly relatives in part to ameliorate guilt (Clark & Mills, 2011). However they become established, Clark and Mills contend that all relationships with this underlying norm of non-contingent benefits promotes each person's welfare and sense of security (Clark & Aragón, 2013).

While approaching relationships from differing angles, both perspectives converge on the core qualities and importance of what makes a relationship communal, claiming non-contingency as the core element of communality. For Fiske (1992), when not engaging on the basis of market pricing (e.g., payment), equality matching (e.g. "owing someone a favor" or balance), or authority (e.g., social expectation), people can relate to each other in deeper, more fulfilling ways (i.e., communally). For Clark and Mills (1979, 1993), communal relationships reflect a concern for another's welfare without expectation or need for repayment. Both perspectives highlight the importance of the communal norms underlying the relationship, whereby it is less about the literal instances or value of transacted (im)material benefits, resources, or favors, but rather the underlying understanding of how such transactions are made. Both perspectives contend a naturally selected-for importance of communal relationships (e.g., mothers and babies; Clark & Mills, 2011; Fiske, 1992). Similarly, both

perspectives contend communal relationships as having special, if not ultimate, importance in social life since they both reflect self-reportedly important relationships (e.g., romantic partners, family) but also because communal relationships most directly fulfill human social needs (e.g., belonging, intimacy, responsiveness). We therefore use the terms *communal* and *communal sharing* interchangeably throughout this thesis.

2.4 The Kama Muta Emotion: "Moved by Love"

From this basis of communal relationships, we can now present the development and organization of kama muta theory. Formalizing the emotion underlying *being moved* and *feeling touched* into a unified construct has proven difficult partly due to different conceptions and lexical variations. While loosely connected to writings about lachrymation from Darwin (1872) and James (1890), or to Durkheim's (1991) "collective effervescence," psychological attendance to *being moved* as an emotion first emerged from McDougall (1919) who described a "tender emotion." A vast array of concepts, distinctions, and categories have since used the term *being moved* (see Zickfeld, Schubert, Seibt, & Fiske, 2019 for a historical review). Sometimes used to describe awe (Keltner & Haidt, 2003), nostalgia (Sedikides et al., 2016), or empathy (Batson et al., 1987), among others, many have used the phrase *being moved* to reflect emotional content but the phrase alone proved variable and subjective in formal study (Zickfeld, Schubert, Seibt, & Fiske, 2019). While most conceptions of *being moved* have generally converged on major elements (e.g., the emotion feels positive, evokes moist eyes or chills or warmth in chest physiology, leads to approach action tendencies), there has been greater disagreement what elicits it (Cullhed, 2019; Zickfeld, Schubert, Seibt, & Fiske, 2019). Some have posited the emotion is evoked by positive core values (Cova & Deonna, 2013) or tied to significant relationship or life events (Menninghaus et al., 2015). The most researched emotional framework describing *being moved* is elevation, which is thought to arise from observing morally beautiful or virtuous acts (Haidt, 2000). While considerable research on elevation suggests some merit to this moral focus (for a full review, see Pohling & Diessner, 2016) elevation's observational focus implies the feeling cannot be experienced in the first-person (i.e., elevation only describes *feeling moved* via observation but not by something one does by or for herself; Fiske et al., 2019; Zickfeld, Schubert, Seibt, & Fiske, 2019). Furthermore, elevation's moral focus has proved too narrow to easily encompass common accompanying sensations to *being moved* (e.g., positive tears or warmth in chest) that people have reported from ostensibly morally insignificant acts like trick-or-treating with their child or interacting with cute animals (Fiske, 2020; Steinnes et al., 2019).

A related, common issue emerging from these different approaches to understanding *being moved* has been an overreliance on vernacular words or phrases as direct one-to-one reflections of affective states. Emotion research has frequently committed the fallacy of attributing emotional labels, such as *being moved*, as having definite and stable meanings,

which also belies an overreliance on English lexemes and taxonomies for reflecting the world (i.e., as if language, and especially the English language, carves nature at its joints; Barrett, 2006, Fiske, 2020; Wierzbicka, 2014). This may be one reason why emotion research, especially research examining relatively new or understudied emotions (e.g., those outside the "big six"), has historically struggled with cross-cultural consistency (Fiske, 2020; Russell, 1991; Zickfeld, Schubert, Seibt, Blomster, et al., 2019). Scholars have noted that the English translation of *being moved* mostly overlaps with French *être ému* and German *bewegt* or *gerührt* (Claparède, 1930), somewhat less so with Norwegian (*rørt*) or Portuguese (*comovido*), while other languages like Arabic have corresponding labels but in variable contexts (Seibt et al., 2018; Zickfeld, Schubert, Seibt, Blomster, et al., 2019). The Spanish word *emocionado,* for example, literally translates to "to be emotional" though Spanish speakers often represent it as a passionately excited or emotionally moving, unspecific state (Casado, 2006). In summary, many different scholars have circled around a singular concept of *being moved* under different names and foci, though a unified model that attends to both the emotion's theoretical universality and cultural distinctiveness has proved elusive (Fiske, 2020; Lawson & Robins, 2021; Zickfeld, Schubert, Seibt, Blomster, et al., 2019).

In response to these challenges and the state of the literature, Fiske et al. (2019) proposed a new frame to encapsulate and organize these variations of *being moved* that they call *kama muta*. Kama muta is a word from Sanskrit, literally translating to "moved by love." The researchers chose a name from a dead language (not intending to invoke what Sanskrit speakers originally meant by the word) to minimize using a vernacular lexeme that meant different things to different people and in different historical or social contexts (Fiske et al., 2019). The label kama muta thus avoids many pitfalls from overreliance on the English phrase *being moved* (Zickfeld, Schubert, Seibt, & Fiske, 2019). Kama muta is thought to overlap many previous definitions of *being moved* and with aspects of other emotional concepts such as awe, joy, or sympathy (Fiske et al., 2019; Pizarro et al., 2021). While the quantitative weighing and exact sufficient conditions to qualify a kama muta experience are yet unknown (Fiske, 2020), kama muta as a formal emotional category is thought to be defined by five sets of features: (1) it is evoked by the sudden intensification (e.g., strengthening or creation) of communal sharing relationships; (2) it feels positive to the extent that people enjoy it and seek to re-experience it for themselves and for/with others; (3) it has a common physiological profile of one or more sensations such as a pleasant warm feeling in the chest, moist teary eyes, goosebumps, hand on heart, choked up lump in throat etc.; (4) people are motivated to attend to (i.e., strengthen, repair, sustain) the focal intensifying relationship or their other communal sharing relationships; and (5) they label it in a common way per their language, at least in English with lexemes like *being moved, touched,* or having a *heartwarming* or *poignant experience* (Fiske et al., 2019). Kama muta is thus thought to lie at the heart of these five subcomponent features.

There are several elements of this theory of kama muta worth noting. Firstly, the evocation of kama muta from communal sharing intensification is an important claim for distinguishing kama muta from other emotional concepts (e.g., moral elevation; Fiske et al.,

2019; Haidt, 2000). This evocation also serves as a falsifiable boundary point for the construct, where consistent evidence of the remaining four features occurring *without* a communal sharing intensification would reject the theory (cf. Cullhed, 2021; Fiske, 2020). In other words, any communal sharing intensification appraisal, whether personally experienced (first-person) or observed (third-person), should evoke kama muta in some fashion (Scheel et al., 2021). Secondly, kama muta itself is thought to occur on the order of minutes though can reoccur successively within an experience. Thirdly, kama muta may feel positive but can emerge from net negative experiences (perhaps amplified by or emerging from juxtaposed negativity, similar to a hedonic reversal; Rozin et al., 2013), such as positive memories of a dead family member at a wake or the mixture of comedy amidst tragedy as in the ending of *Titanic* or the opening of Pixar's *Up* (Fiske et al., 2019).

Lastly, kama muta theory somewhat sidesteps the discrete and constructionist debates on the definition of emotions (Zickfeld, Schubert, Seibt, & Fiske, 2019), though leans towards the tradition of discrete basic emotions. Kama muta theory's working definition of emotion is that emotions are assemblies of evolutionarily and culturally prepared mechanisms to address environmental challenges (Fiske et al., 2019). As evident in its five subcomponent features, kama muta theory posits the existence of a singularly labeled and conceptualized emotion as commonly held in the BET tradition (i.e., rather than across dimension spaces like arousal and valence; Fiske et al., 2019). Furthermore, at least one of the primary authors of kama muta theory frames it against some core aspects of constructionism, claiming that people can have emotions without knowing them and that kama muta is a natural kind emotion (Fiske, 2020). In the philosophy of science, natural kinds reflect the actual, "real" groupings of things that naturally exist in the world (Bird & Tobin, 2008). Natural kind emotions are thus the philosophical angle of the separable, discrete perspective taken by basic emotion psychologists (i.e., arguing certain emotion categories exist naturally in the world and thus emotions are "discovered" by the human mind). In short, constructionists reject natural kind emotions (i.e., arguing emotions are instead "constructed" by the human mind; for a full review of emotion and natural kinds, see Barrett, 2006). However, kama muta theory aligns with one of constructionists' central themes; namely, that one's internal understanding and formulation of concepts (as informed by culturally transmitted norms, language, and practices) is vital to both the initial appraisal of communal sharing and the downstream enactment of communal devotion and commitment. In other words, kama muta theory attempts to integrate both basic and constructed views on emotion, arguing for the validity of universal assemblies of correlated features (i.e., a discrete view of emotions as separable, individually approachable natural kinds), as well as championing the importance of social influences like culturally informed variation that determine an emotion's antecedents and consequences.

The theorized function of kama muta claims to bring together biological, evolutionary adaptivity with culturally informed indices. Kama muta's functional account relies on the premise that humans have an evolved disposition to be sensitive to (culturally informed) communality, where kama muta affectively maps and redirects energy towards culturally

fruitful prosocial orientation and behavior (Fiske et al., 2019). Kama muta's primary function is to instantly drive updates in devotion and commitment to communal sharing relationships, thus enhancing social fitness (Fiske et al., 2019). Furthermore, kama muta should be fitness-enhancing only to the extent that such devotion and commitment enhances communal relationships that are important in one's community (Fiske et al., 2019). While beyond the scope of this thesis, kama muta theory goes so far as to claim many human practices (e.g., national holidays), institutions (e.g., world religions), narratives (e.g., romantic-tragi-comedies like *Romeo and Juliet*; Booker, 2004; Fiske et al., 2017), media (e.g., emotional videos on Facebook; Dale et al., 2019; Oliver et al., 2018), and other cultural artifacts around the world owe their existence and continued societal functionality to their kama muta-inducing abilities (Fiske et al., 2019). When personally experiencing the communal intensification (i.e., first-party kama muta), the resulting devotion and commitment is thought to be more intense for those current relational partners. Meanwhile, being a third-party to a communal intensification should lead to more diffuse communal devotion and commitment (Fiske et al., 2019). Kama muta theory thus describes devotion and commitment in two different but overlapping terms—that of local priority (i.e., primarily focuses on current or otherwise available relationships) and communal importance (i.e., to important relationships in a given community). In short, kama muta is an emotion of culturally informed communal salience—emerging from especially salient communal appraisals and affectively redirecting resources to attend to and cultivate such communality.

Empirical research has largely borne out the theorizing on kama muta's emotional structure. Early research by Seibt et al. (2017) found that in recalled episodes, positive tears (relative to negative tears) were more associated with *being moved* labels, physiological sensations (e.g., goosebumps, heart on chest, warmth etc.), and appraisals of interpersonal closeness or moral acts. The authors experimentally replicated this pattern across seven samples in Norway, China, Israel, Portugal, and the United States (Seibt et al., 2018). They also concluded that the morality appraisal that predicted kama muta was encompassed by the communal sharing relational appraisal. In this case, appraising a moral act is defined by the fulfillment of communal sharing expectations and values, where ideals like compassion and responsiveness to needs are deemed morally correct (Rai & Fiske, 2011; Seibt et al., 2018). In another line of work, Steinnes et al. (2019) showed that cute targets (e.g., babies, bunnies etc.) seem especially good at evoking kama muta, theoretically explained by the evolutionarily selective premium on infantile characteristics for generating communal, maternal-style bonding. Zickfeld, Schubert, Seibt, Blomster, et al. (2019) provide perhaps the most comprehensive research supporting this five-feature kama muta model to date. They tested whether the same communal sharing intensifications would elicit similar emotional responses in 19 different countries across 15 different languages. They found strong, consistent correlations between these five aspects of kama muta, suggesting some universality to the kama muta experience. However, they also found variation across cultures, particularly (and expectedly, as per kama muta theory) stemming from the associations from a given label for

describing the emotion. For instance, while kama muta labels had positive connotations across all countries, some countries (e.g., Hungary, Japan) had much stronger correlations than others (e.g., the Netherlands, Serbia). More intensive, continuous self-report work further showed that self-reports of feeling moved or touched co-occurred moment-to-moment with the same physiological markers and appraisals of communal closeness (Schubert et al., 2018). Beyond self-report, physiological work has also showed kama muta differentiates from self-transcendent, prosocial emotions like awe (Stellar et al., 2017). For example, kama muta's physiological profile of reduced heart rate, skin conductance, and respiration rate is consistent with greater parasympathetic activity, which is near opposite to the largely sympathetic profile of awe (Zickfeld et al., 2020). Put together, the antecedents and qualities of kama muta as hypothesized by theory have generally held together under empirical scrutiny.

However, empirical work on kama muta's proposed social consequences (i.e., encouraging the strength or creation of communal relationships) has been scarcer and more scattered by comparison. So far, most work has focused on kama muta laying the groundwork for prosocial behaviors (e.g., intentions and efficacy beliefs) or mitigating divisions between groups. For example, kama muta manipulations are positively associated with feelings of collective efficacy in reducing racial inequality (Lizarazo Pereira et al., 2022) and intentions to carry out collective actions on behalf of humanitarian issues (Pizarro et al., 2021) or climate issues (Seibt et al., 2023). Group-focused research suggests that kama muta affects appraisals of potential communal relationships. For example, work with immigrants to Norway suggested that the frequency and intensity of kama muta tied to their emotional acculturation experiences (e.g., feeling individually and culturally welcomed by Norwegians, taking part in Norwegian traditions and celebrations) was associated with their motivation to adopt Norwegian culture and lower acculturation stress (Blomster Lyshol, Pich, et al., 2022). Furthermore, Blomster Lyshol and colleagues (2020) have shown that feeling kama muta from observing racial outgroup members experience communal intensifications makes those protagonists seem more human and also reduces blatant dehumanization of the entire outgroup. Researchers have shown a similar trend in politics, whereby Americans' kama muta experience from moving videos increased feelings of closeness, trust, and warmth with members of an opposing political party by making participants feel like they were part of single American group (Blomster Lyshol, Seibt, et al., 2022). However, some research has also pointed to the limits of kama muta as a unifying, social feeling whereby party members feel much more kama muta in response to their own party's ads than of a candidate they did not support (Seibt et al., 2019). All told, most empirical work has shown trends in the direction of prosocial, potentially even communal, outcomes. However, it remains unclear how strongly kama muta is tied to elements underlying communal motivation and behavior or to contributing to communal qualities in interpersonal relationships.

2.5 Kama Muta's Communal Consequences

Up to this point we have reviewed the literature on emotions and how they contribute to social fitness. We have also presented the new emotion theory of kama muta, the feeling English speakers often describe as feeling "moved" or "touched." Kama muta is thought to cause internal changes that motivate and map devotion and commitment towards culturally appropriate behaviors that strengthen communal sharing relationships (Fiske et al., 2019). However, kama muta research yet has little empirical evidence tying the emotion to the development of communal relationships. The studies presented in this thesis draw on two different perspectives to evaluate kama muta's theoretical pathway to psychosocial consequences. Firstly, we turn to basic psychological needs theory, a mini-theory within self-determination theory, to evaluate to what extent kama muta affects theoretically fundamental building blocks of individuals' motivation, behavior, and ultimately their wellbeing. Secondly, we present responsiveness theory, paying special attention to perceived partner responsiveness, as a key communal indicator within close relationships. We review literature on each of these two perspectives in more detail below.

2.5.1 Basic Psychological Needs: Building Blocks of Motivation and Behavior

Self-Determination Theory and Basic Psychological Needs Theory

Basic psychological needs theory (BPNT) emerged from a larger, highly influential theory known as self-determination (SDT). SDT is among the most generative and referenced bodies of work in psychological science over the past four decades. Part of this prevalence has been due to the application of SDT ideas about motivation and behavior to a wide variety of domains ranging from work (Coxen et al., 2021; Van den Broeck et al., 2016), to health (Ng et al., 2012), and education (Reeve, 2002) and touching on a slew of topics such as mental health (Schutte & Malouff, 2018), technological learning (Huang et al., 2018; Nikou & Economides, 2017), wellbeing (Sakan et al., 2020; Sheldon & Bettencourt, 2002), unhealthy eating (Verstuyf et al., 2013), and physical exercise (Gunnell et al., 2013; Teixeira et al., 2017) among others. SDT originated as a theory of motivation (Deci & Ryan, 1985b), but has since encompassed development, wellbeing, and ultimately human flourishing (Ryan & Deci, 2000, 2019). The theory is now a so-called "macro theory" encompassing a set of mini-theories that iteratively build upon each other from a common assumption; that humans have intrinsic motivations (Deci, 1975) and are naturally curious challenge-solvers who adapt to the world in ways that optimize their wellbeing without need of extraneous incentives (Ryan & Deci, 2000). This "organismic perspective" is predicated upon the existence and distinction of intrinsic (vs. extrinsic) motives and behaviors—behaviors experienced as inherently satisfying for their own sake rather than, for example, operantly conditioned (Skinner, 1971). An implication of this intrinsic bias is that SDT highlights an internal perceived locus of causality, wherein that which is

perceived to emerge from within the individual gains special importance and potency (Ryan & Connell, 1989). The first three mini-theories of SDT concern themselves with (1) establishing this intrinsic/extrinsic distinction (cognitive evaluation theory), (2) how the extrinsic can turn into, or become "internalized", as intrinsic (organismic integration theory), and (3) how individual differences affect intrinsic and extrinsic motivations (causality orientations theory; Deci & Ryan, 1985a, 1985b). It is upon this iterative platform of mini-theories and assumptions that basic psychological needs theory (BPNT) rests.

BPNT (Ryan, 1995; Ryan & Deci, 2002) specifies fundamental psychological needs necessary for human psychological, physical, and social health and wellbeing (Vansteenkiste et al., 2010). Self-determination theorists have argued that satisfying these needs is critical for facilitating intrinsic motives and internalizing extrinsic motives into intrinsic. A basic need demonstrates six key criteria (Ryan & Deci, 2017b), though we will elaborate only on the three most important and distinguishable criteria here. Firstly, the satisfaction of a need must be uniquely and strongly associated with psychological integrity, health, and wellbeing (Ryan & Deci, 2017b). Secondly, its frustration should likewise be associated with worse functioning (Martela & Ryan, 2019; Ryan & Deci, 2017b). Self-determination theorists pay special attention in distinguishing that need frustration is more than the mere lack of fulfillment but rather the stronger, threatening experience of need thwarting (Ryan & Deci, 2019; Vansteenkiste et al., 2020). Thirdly, as befitting something fundamental to all people, a basic need must operate across the lifespan and all cultures, irrespective of whether said need is expressly valued by said individuals or cultures (Ryan & Deci, 2017b). These three criteria (alongside other criteria such as broad phenomena explanation, specific to psychosocial predictors rather than indicators, and growth rather than deficit orientation; Martela & Ryan, 2019; Ryan & Deci, 2017) together create an exclusive shortlist of three basic needs: autonomy, relatedness, and competency.

The Three Basic Psychological Needs

The three basic psychological needs (BPNs), sometimes known as the ARC needs (autonomy, relatedness, competence), theoretically constitute essential elements for human flourishing. Autonomy captures the experience of feeling volition, willingness, and a sense that one self-endorses their own activity (Ryan et al., 2006; Vansteenkiste et al., 2020). Relatedness reflects the experience of bonding and care by others; that is, a sense of connection and importance to, and belonging with, others (Baumeister & Leary, 1995; Vansteenkiste et al., 2020). Finally, competence concerns mastery and the feeling that one can engage with their environment effectively (Vansteenkiste & Ryan, 2013; Vansteenkiste et al., 2020). These needs are not goals in and of themselves, nor are they distinct categories of goals (e.g., a goal for a promotion at work is not directly a goal for autonomy or competence). Rather, fulfilling these needs strongly implicate the persistence, motivation, and experience of wellness derived from said goals and their pursuits (Ryan & Deci, 2019). As alluded to in the basic need criteria, the past decade of research has increasingly highlighted distinguishing need *satisfaction* from need

frustration (Ryan & Deci, 2019; Vansteenkiste et al., 2020). Need frustration is posited to have unique effects from need satisfaction (Bartholomew et al., 2011). More technically, there appears to be an asymmetric relation such that low need satisfaction does not necessitate need frustration, but need frustration *does* implicate low satisfaction (Vansteenkiste & Ryan, 2013). For example, there is a difference between feeling little connection with colleagues (low relatedness satisfaction) and feeling actively rejected by them (relatedness frustration, which also implies low relatedness satisfaction; Vansteenkiste & Ryan, 2013).

The two dimensions of satisfaction and frustration have become an important part of BPNT's place in SDT in part because they have provided a robust psychological model for empirically evaluating SDT. In short, BPNs have become the primary way of studying SDT. For example, a meta-analysis of over 180 datasets found BPNs were associated with greater patient welfare and healthier behaviors across the biopsychosocial continuum of health (Ng et al., 2012). Other meta-analyses have shown similar patterns of these three needs positively associating with various positive wellbeing indicators (e.g. life satisfaction, positive affect, self-esteem, meaning in life etc.) and negatively associating with illbeing (depression, anxiety etc.) in geriatric populations (Tang et al., 2020). Children have higher engagement and academic achievement, and regulate stress more effectively, when in environments that support their basic needs (Zimmer-Gembeck et al., 2006; Zimmer-Gembeck & Locke, 2007). In the workplace, analyzing nearly 100 studies with 119 different samples, Van den Broeck et al. (2016) found need satisfaction was associated with wellbeing and work engagement. On the negative side, low need satisfaction and need frustration have been associated with illbeing indicators such as depression symptoms (Cordeiro et al., 2016), stress and poorer sleep (Campbell et al., 2017), and even suicidal ideation (Tucker & Wingate, 2014). These theoretically consistent patterns of satisfaction to wellbeing, and thwarting to illbeing, also appear cross-culturally (Yu et al., 2017) and across time (Vandenkerckhove et al., 2019). This large base of literature, in addition to concisely summarizing crucial intrinsic and organismic considerations, has led some to suggest BPNT is the crux of SDT at large (Vansteenkiste et al., 2010; Vansteenkiste & Ryan, 2013).

Basic Psychological Needs and Kama Muta

BPNs pose an interesting perspective for evaluating kama muta's prosocial consequences. Firstly, like kama muta, BPNs are theoretically universal and have supportive cross-cultural evidence (Jiang et al., 2018; Seibt et al., 2018; Yu et al., 2017; Zickfeld, Schubert, Seibt, Blomster, et al., 2019). Secondly, unlike other motivation theories, BPNT posits that BPNs are important for not just the direction, but also the energization, of behavior (Vansteenkiste et al., 2010). For example, relatedness, the most socially relevant BPN and thus ostensibly most important for kama muta, increases intrinsic motivation towards relationships, and is associated with relational functioning and quality (Patrick et al., 2007) and other prosocial behaviors like charitable giving and intentions to volunteer (Jiang et al., 2018; Pavey et al., 2011). As per them their name, this need for relatedness (as with all BPNs) is thought to be

essential for wellbeing, acting like a psychological nutrient underlying psychological and behavioral adaptivity and growth (Vansteenkiste et al., 2020). As part of its theoretical devotion and commitment consequences, kama muta may fulfill the basic need for relatedness both in terms of sheer need satisfaction (i.e., feeling socially connected), but perhaps also as the first step towards downstream prosocial behaviors. Thirdly, BPNT's emphasis on intrinsic (vs. extrinsic) motives dovetails well with the communal notions thought to underlie kama muta. This latter connection between BPNT and communal relationships is further underlined by the most recent micro-theory addition to the SDT framework: relationships motivation theory (Ryan & Deci, 2017a).

Relationships motivation theory builds on BPNT by emphasizing the importance of autonomously created relationships. BPNT already claims (most clearly in the form of relatedness) humans intrinsically want, orient to, and thrive best in relationships that recognize, accept and support their authentic selves (Deci & Ryan, 1991; Ryan & Deci, 2017a). This claim is supported by evidence that need fulfillment predicts better relational outcomes like relationship quality (Kanat-Maymon et al., 2016) and emotional disclosure (Ryan et al., 2005). However, relationships motivation theory takes this a step further by proposing that high-quality relational bonds largely originate from the conjunction of relatedness and other needs, autonomy in particular. In addition to feelings of warmth and connection, people must *also* feel that said connection has been created authentically under their own volition and will (Ryan & Deci, 2017a). This autonomy aspect is thought to explain why relational quality worsens with friends, family members, and romantic partners when those relationships are felt to be inauthentic or conditional (e.g., Don & Hammond, 2017; Kanat-Maymon et al., 2016). In other words, according to this newer SDT perspective on BPNs, unconditional and authentic acceptance and support of the self are the most fulfilling relational experiences (Ryan & Deci, 2017a). This perspective where relationships are (broadly) better when they fulfill BPNs dovetails with the idea that communal relationships are those of equivalence without expectation of market reciprocity (Clark & Mills, 1993; Fiske, 1992). Both SDT and communal theories converge on the notion that the most fulfilling, salient, and rewarding relationships are those in which individuals can relate to each other upon the basis of their authentic selves, and that those selves are sufficient in and of themselves. Since they have similar theoretical understandings of relationships, kama muta may play a part in fulfilling basic psychological needs.

2.5.2 Communal Close Relationships: Perceived Partner Responsiveness is Key

Responsiveness is a core principle in relationship science. Responsiveness is the interactive process by which both partners attend to and support each other's needs, goals, and wishes (Reis & Clark, 2013; Reis et al., 2004). Drawing a line from what Pruitt (1972) termed "mutual responsiveness" to Clark and Mills (1979) distinction of communal relationships in terms of mutual non-contingent concern for each other's welfare, modern conceptions of

responsiveness originate from theories of intimacy. The intimacy process model, which emphasizes an interactive sequence of self-disclosure paired with the response from a relational partner, forms the core of responsiveness (Reis & Shaver, 1988). Self-disclosure in this case is broadly thought of as any verbal or nonverbal expression that reveals core aspects of the self. Relational partners frequently disclose and respond to each other, referring to their own needs and goals and how they perceive their partners' needs and goals (Reis & Shaver, 1988): where one partner expresses a need or desire that is fulfilled by the other; where one expresses success that the other helps celebrate; where one self-discloses a vulnerability that the other supports (Reis & Clark, 2013). Not all interactions between partners are thought to be intimate, but rather the frequency and quality of such interactions develop and define an intimate relationship (Reis & Shaver, 1988). This interpersonal, interactive process continues to be a crucial, core part of responsiveness, where these intimate disclosure-response sequences build up perceptions of responsiveness in one or both partners (Reis & Clark, 2013). Responsiveness expands upon this intimacy process model foundation largely in terms of explicating the personal and relationship outcomes thought to result from such responsive interactions and beliefs. Today, responsiveness is considered fundamentally important for close relationships because it explains how and why close social relationships so strongly implicate health and wellbeing (Farrell et al., 2023; Reis & Clark, 2013; Slatcher & Selcuk, 2017; Stanton, Slatcher, et al., 2019).

Responsiveness is thought to largely operate in terms of *perceived* partner responsiveness (PPR), which is perhaps the most important construct for responsiveness (Reis et al., 2004). Perceived partner responsiveness is typically comprised of three evaluations: feeling that a partner understands, validates, and cares for oneself (Reis & Shaver, 1988; Reis & Clark, 2013). Unsurprisingly, PPR is positively associated with common global relationship assessments like couple satisfaction (e.g., Candel & Turliuc, 2021) and commitment (e.g., Bar-Kalifa et al., 2015). However, more importantly, PPR features prominently in theoretical models of close relationships and health and wellbeing (Reis, 2012; Slatcher & Selcuk, 2017; Stanton, Slatcher, et al., 2019). Empirical findings have borne this theorizing out, showing that PPR has robust links with important health and wellbeing outcomes. PPR is associated with lower feelings of anxiety and depression, which in turn is associated with less sleep problems (Selcuk et al., 2016). PPR is also prospectively associated with improved biological patterns of stress (i.e., steepening diurnal cortisol slopes; Slatcher et al., 2015) and with momentary and longitudinal smoking cessation (Britton et al., 2019; Derrick et al., 2013). On the negative side, Stanton, Selcuk, et al. (2019) found that reductions in PPR were associated with greater reactivity to negative stressors in daily life, which in turn was associated with mortality risk. In this sense, PPR wholistically organizes not just why relationships are important, but how various beneficial behaviors and appraisals (e.g., intentional listening, intimate touch, relationship mindfulness, forgiveness, relational sacrifices; Itzchakov et al., 2021; Jolink et al., 2022, Pansera & La Guardia, 2011; Stanton et al., 2021; Visserman et al., 2022) contribute to better-quality close relationships. The premium on *perception* in responsiveness is at least in part due to

biases, for example, “mean-level biases” (Fletcher & Kerr, 2010) and varying abilities to accurately track responsive markers, such as how low self-esteem individuals underestimate how positively their partners view them (Murray et al., 2000). These perceptions overlay atop “objective” relational reality (e.g., tracking accuracy and directional biases) which in turn shapes how relational partners operate (Fletcher, 2015). As a result, enacted responsive behaviors (i.e., actual understanding and care), largely affect close relational qualities the extent to which those behaviors are perceived to be responsive (Debrot et al., 2012). In summary, it is through *felt* understanding, validation, and care that relational partners convey that they have each other’s needs, wishes, concerns, and goals at heart.

This idea—that one perceives someone else cares for them, “gets” them, and has their interests at heart—is foundational to communal relationships, the relational model underpinning kama muta’s evocation and function. *Mutual* responsiveness distinguishes communal relationships from other relational models (Clark & Mills, 2011; Reis et al., 2004). PPR is necessary for communal relationships because these relationships are defined by mutual non-contingent concern for each other (Clark & Mills, 1993; Clark & Mills, 2011; Fiske, 1992). In other words, communal relationships and responsiveness are tied by overlapping appraisals—perceiving one’s partner truly has one’s best interests at heart is tied to the notion that they care because they want to, not because they have to. The extent to which individuals perceive their relationships as responsive has even been thought to reflect how communal a relationship is and how central another’s goals and needs are to one’s own (Aron et al., 1992; Clark & Mills, 1993; Reis et al., 2004). Put more simply, responsiveness amongst partners is the process by which communal relationships are defined and operate. Feeling kama muta should make people feel more devoted and committed to their relationships, perhaps including changing how people feel cared for, validated, and understood by their partners. The communal sharing intensifications that elicit kama muta could perhaps themselves be understood as intense perceptions of responsiveness, thus PPR may even lead people to feel kama muta. In summary, PPR provides an important and bidirectional angle from which to consider kama muta as communal.

2.6 The Present Research

This thesis presents four studies that empirically investigate a range of kama muta’s psychosocial consequences. Studies 1-2 relied on BPNT, where we examined the extent to which kama muta fulfills basic psychological needs. We paid special attention to relatedness seeing as kama muta, which theoretically produces devotion and commitment towards strengthening or creating communal bonds, may be particularly likely to affect how people feel connected to others in the moment. Study 1 introduced an experimental paradigm in which we evaluated changes in relatedness needs from before and after a kama muta manipulation against a control. To address whether kama muta differentiates itself from general positive

affect, and to evaluate all three basic psychological needs, we extended the original study design in Study 2. We added an amusement condition comparison and separated out positive affect as its own parallel mediator. If kama muta is largely driven by simply feeling positive, rather than anything unique to its remaining emotional features, we would expect any kama muta effects on basic psychological needs change to contract when accounting for the separate positive affect pathway. Studies 3-4 pivoted towards a more explicitly communal lens, investigating whether kama muta affects PPR (and vice versa) in intimate relationships. Study 3 analyzed the daily diary reports of romantically involved individuals across six days. These daily reports presented a novel opportunity to catalogue kama muta in everyday life, documenting how often people experience the emotion and what most commonly causes it. We also investigated whether within-person variability in kama muta were associated with within-person variability in PPR, both at the daily and lagged level. In Study 4, we extended this daily diary paradigm with a larger sample size, longer diary period, and the inclusion of reports from both romantic partners. Study 4 thus served as a replication of Study 3's documented pattern of kama muta in daily life and covariance with PPR. Furthermore, with the inclusion of both partners' data, Study 4 also considered to what extent the variability of kama muta and PPR in one partner could affect the respective variability in the *other* partner. We discuss individual findings, patterns, and considerations within each study chapter, and return to a broader discussion of research contributions, limitations, and future directions in the general discussion.

3 Chapter 3: Kama Muta and Relatedness

3.0 Study 1 Background

So far, we have presented how kama muta is theoretically an adaptive prosocial emotion that has downstream communally-oriented prosocial consequences (Fiske et al., 2019). We have also reviewed the functional role of emotions, particularly how they help individuals navigate and attend to the environment (Fischer et al., 2016; van Kleef, 2016). To the extent that kama muta is evolutionarily adaptive in promoting communal fitness—for example, cultural selectivity of institutions, narratives, roles that evoke kama muta for strengthening culturally relevant communal relationships (Fiske et al., 2019)—kama muta should first emerge, drive, or otherwise influence the individuals who make up those larger social collectives. One reason why kama muta is thought to eventuate in communal outcomes is because kama muta evokes adaptive motives towards communal devotion and commitment (Fiske et al., 2019), which implies that kama muta affects appraisals relevant to motivational processes.

One potentially fruitful way to examine this intra-individual, socially-tinged motivational account comes from basic psychological needs theory (Ryan, 1995; Ryan & Deci, 2002). BPNT posits that the essential, universal elements of human flourishing derive from three core needs—autonomy, relatedness, and competence—the satisfaction or frustration of which drive psychological and social wellbeing (Vansteenkiste et al., 2010) because they determine the persistence, motivation, and experience of wellness individuals derive from their goals (Ryan & Deci, 2019). The need for relatedness—how people experience warmth and bonding by feeling connected and important to others (Baumeister & Leary, 1995; Vansteenkiste et al., 2020)—is relevant because it is the most socially-targeted need (thus most related to kama muta). Relatedness is also relevant because research suggests relatedness needs downstream into a wide swath of prosocial outcomes ranging from relational quality and function (Patrick et al., 2007) to various prosocial behaviors (Jiang et al., 2018; Pavey et al., 2011). If kama muta is to motivate relational attendance and ultimately create prosocial effects, we may first see its effects on the experience of relatedness.

3.1 Study 1

We preregistered our research questions and analysis plan on OSF (https://osf.io/wpgdu, which is a direct replication with a larger sample of an earlier preregistered pilot study; https://osf.io/9cwum). Study 1's primary objective was to investigate if kama muta influences relatedness needs, either in terms of relatedness satisfaction or

frustration. There are at least two ways to consider kama muta as prosocial from this relatedness needs lens. One option is that kama muta may increase relatedness satisfaction (i.e., increasing perceived connectedness to others) and/or reduce frustration (i.e., reduces threats to connectedness). This pattern would mirror how other self-transcendent emotions, for example awe, increase feelings of connectivity with others (Nelson-Coffey et al., 2019; Stellar et al., 2017). Alternatively, kama muta may reduce relatedness satisfaction (and/or increase frustration), presumably by increasing the salience of current unfulfilled social connectedness needs. While less directly prosocial (e.g., "I feel socially unfulfilled, thus I should do something about it"), this pattern would be in line with upward social comparison motivation accounts, such as envy and admiration (van de Ven, 2017). With multiple plausible pathways for this first examination, we took an exploratory approach with no firm a priori predictions.

3.1.1 Method

Participants

Participants were 314 online Prolific users, reimbursed £1.25 for a roughly 12-minute survey. Two participants were removed for completing the study in less than five minutes (which we deemed suggestive of inattentive participation considering the videos themselves were three minutes long), seven for technical issues with the video manipulations, and 21 due to failing at least one of the two attention checks. The final sample consisted of 284 participants, ranging in age from 18-68 years (M = 29.3, SD = 9.3). See Table 3.1 for full sample demographics.

Table 3.1

Demographics of Study 1 Participant Sample

Characteristic	*n*	*% of Sample*
Sex & Gender*		
Female	147	51.8
Male	137	48.2
Trans Female	0	0.0
Trans Male	0	0.0
Nonbinary, Genderqueer	0	0.0
Bigender, Genderfluid	0	0.0
Agender, Genderless	0	0.0
Write-In	0	0.0
Race		
White, Caucasian, Anglo	248	87.3
East Asian	10	3.5

Black, African, Caribbean	8	2.8
Hispanic, Latino, Chicano	3	1.1
South Asian	3	1.1
Aboriginal, Indigenous, Native	3	1.1
Southeast Asian	2	0.7
West Asian	1	0.4
Middle Eastern, Arab	1	0.4
Mixed or Multiple Ethnic Group	0	0.0
Other	5	1.8
Education		
GCSE, O-Levels, or Standard Grades	26	9.2
A-Levels or Highers/Advanced Highers	52	18.3
Vocational degree (e.g., SVQ, HNC, HND)	22	7.8
Undergraduate degree (e.g., BSc, BA)	113	39.8
Master's degree (e.g., MSc, MPhil)	61	21.5
PhD, PsyD	9	3.2
Other Advanced or professional degree (e.g., MD, JD)	1	0.4
Employed		
No	105	37.0
Yes, part-time	58	20.4
Yes, full-time	121	42.6
Income		
£0-£12,500	67	23.6
£12,501-£14,549	40	14.1
£14,550-£24,944	64	22.5
£24,945-£43,430	61	21.5
£43,431-£150,000	47	16.6
£150,001+	5	1.8
Sexual Orientation		
Heterosexual, Straight	236	83.1
Bisexual, Pansexual	27	9.5
Gay	5	1.8
Lesbian	5	1.8
Demisexual	4	1.4
Asexual	2	0.7
Queer	2	0.7
Other	3	1.1
Student Status		
Yes	124	43.7
No	160	56.3

Note. N = 284. *Sex and Gender was unintentionally gated to male and female via online panel quota partitioning.

Procedure

Participants on Prolific accessed the online Qualtrics survey and were told they were taking part in a study examining how individual differences are affected by different video viewing experiences. After confirming consent, participants completed scales for pre-test relatedness needs. Participants were then instructed to check their device audio settings before being shown the video. Each participant was randomly assigned to either an experimental (kama muta video) or control (neutral video) condition. The videos played automatically when participants arrived on the page. Following their respective video, all participants recorded their kama muta experience and post-test relatedness needs. Finally, before completing demographic information, participants reported whether they had previously seen their video before or had other technical issues with the media (e.g., no audio in the video, video clip not playing etc.). The study procedure and materials mirrored those used in the pilot (which used a smaller convenience sample of university students; see Table 11.1 in Appendix 1 for pilot sample demographics).

Measures and Materials

Video Manipulation

Participants were randomly assigned to view one of two, roughly 3-minute-long videos: a neutral clip or kama muta-inducing clip. Previous research has suggested videos are more evocative of emotional manipulations than writing tasks (Ferrer et al., 2015). The kama muta clip depicted a man showing kindness to a poor child, who grows up to be the doctor that saves him decades later and has been used in previous research to evoke kama muta (Seibt et al., 2018; Zickfeld, Schubert, Seibt, Blomster, et al., 2019). We chose this video over others because it was one of the most evocative kama muta videos out of 17 emotion clips tested across 5 different countries (Seibt et al., 2018). The neutral clip depicted a man instructing viewers how to clean a hardwood floor (Rivera et al., 2019). Neutral controls have not typically been used in kama muta literature before (Landmann et al., 2019), however such kinds of videos have been used as neutral control inductions with other prosocial emotions such as awe (Gordon et al., 2017; Piff et al., 2015).

Kama Muta

Participants responded to all five subscales of the KAMMUS Two (Zickfeld, Schubert, Seibt, Blomster, et al., 2019) to measure their experiences of each of the five indicators of kama muta ($\alpha = .94$). Subscales were rated on a 7-point scale (0 = *Not at all*, 6 = *A lot*). Physiological signs were measured across 12 items, in which participants indicated the extent to which they experienced a given physical sensation, feeling, or action (e.g., “moist eyes,” “choked up”). Appraisal of communal sharing was measured across 4 items, in which participants indicated the extent to which the following statements were true, using the stem “I felt/I observed…”

(e.g., "...an incredible bond", "…an exceptional sense of closeness appear"). Social motive was measured across 4 items, in which participants indicated the extent to which they had an array of socially-relevant feelings (e.g., "I wanted to hug someone," "I felt more strongly committed to a relationship"). Positive affect was measured with 1 item, in which participants indicated the extent to which the statement "I had positive feelings" was true. Finally, lexical labeling was measured across 3 items, in which participants indicated the extent to which a series of kama muta-specific statements were true for them (e.g., "I was moved", "I was touched").

Relationship Needs Satisfaction and Frustration

Participants responded to the 8-item Relationship Needs Satisfaction and Frustration questionnaire from the Basic Psychological Needs Satisfaction and Frustration Scales (BPNSFS; Chen et al., 2015). They were asked to rate the extent to which they agreed or disagreed with a set of statements, such as "I feel that the people I care about also care about me" (satisfaction; α_{T1} = .85, α_{T2} = .88) and "I feel excluded from the group I want to belong to" (frustration; α_{T1} = .83, α_{T2} = .87). Items were rated on a 5-point scale (1 = *Completely Disagree*, 5 = *Completely Agree*) and averaged together for satisfaction and frustration respectively.

Analytic Method

There are at least three notable elements of these analyses. Firstly, these analyses relied on a mediation framework to elaborate on the specific effects of kama muta (not just the wholesale effect of the video manipulation) on relatedness needs. We used dummy coding (Cohen et al., 2002) with the control as the reference group for this multicategorical mediation. For additional statistical information about mediation frameworks, see Appendix 1 (p. 132). Secondly, to more closely resemble the KAMMUS Two as a measure of the "likelihood" of a given psychological state being kama muta (Zickfeld, Schubert, Seibt, Blomster, et al., 2019), we transformed the assemblage of the KAMMUS Two subscales into a probability via a sigmoid function. The sigmoid function, also known as an S-curve or logistic function, describes logit (and probit) algorithms, the base of logistic regressions which model in terms of probability distributions (de Souza et al., 2015; Hilbe, 2009). In this sense, the technical construction of the variable used in this study reflects not how much kama muta occurred but rather how likely it was that a given person experienced it. We present the construct in terms of just "kama muta" for simplicity and readability. For more technical information on the sigmoid function and assembling kama muta as a singular construct, see Appendix 1 (p. 133).

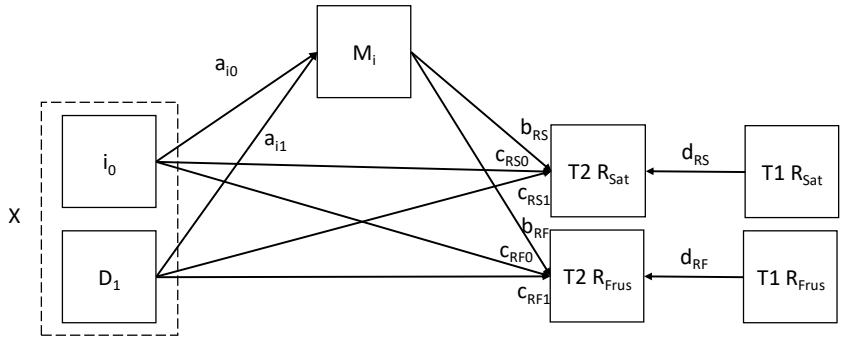
Thirdly, these analyses used a Bayesian statistical framework to leverage its ability to directly test the hypotheses in question (e.g., rather than the null hypothesis) and cumulatively expand upon previous study (i.e., pilot data). We summarize Bayesian estimation below for those less familiar with the method. Bayesian statistics explicitly include the quantified beliefs or prior knowledge (e.g., from a pilot study, previous research, intuition etc.) about a given parameter into a statistical model (Van Dongen, 2006). These *priors* are probability

distributions of a parameter that, as applied by Bayes Rule, are updated upon the collection and integration of new data (Gelman et al., 2017; van de Schoot et al., 2021). Priors skew parameter estimates into more realistic boundaries which increases estimate precision (Westbury, 2010; Yuan & MacKinnon, 2009) and results in more power than frequentist approaches with small sample sizes (Miocevic et al., 2017). Since Study 1 was a direct replication, we used the estimates of our pilot (see pilot in Appendix 1, p. 129) as priors for this study. The resulting "output" is known as a *posterior* which is like a "compromise" between the prior and the data, where the data exerts more control over that compromise as sample size increases (Gelman et al., 2020). Posteriors are summarized by a point estimate (e.g., the mean value of the distribution) alongside a highest density interval (HDI) reflecting 95% of the distribution (Gelman et al., 2020; Kruschke, 2021). Values within the HDI are essentially the 95% most credible values for the parameter (Kruschke, 2018). Bayesians can then use a Region of Practical Equivalence (ROPE)—i.e., a range of values so near to zero that an analyst a priori decides are, for most practical intents and purposes, zero— to decide whether an effect is *effectively* null (Kruschke, 2018). Depending on how much of the HDI is encompassed in the ROPE, an analyst makes the decision of whether an effect is effectively null or not. For these studies, we used a ROPE boundary of $\beta = \pm.05$, which considers standardized regression coefficients practically null if smaller than half a "small" effect size split across zero (Cohen, 1988; Kruschke, 2018). For more information on Bayesian theory in relation to frequentist NHST (e.g., philosophical differences, treatment of the null hypothesis etc.) see Appendix 1 (p. 136). For more information on the Bayesian analytic method (e.g., priors, posteriors, and ROPE) see Appendix 1 (p. 139).

Models were run using the R package blavaan (Merkle & Rosseel, 2018), the Bayesian version of the popular lavaan package (Rosseel, 2012) with four chains for model convergence in the Markov Chain Monte Carlo (MCMC) with a 5000 burn-in for model convergence with subsequent 10,000 samples for parameter estimation. The original preregistered analyses (for pilot; for Study 1) planned to run the above model MCMC simulation directly in JAGS using BUGS coding syntax (Spiegelhalter et al., 1996), however the author of this thesis found BUGS prohibitively unstable for specifying the mediation's indirect effects so instead used the newer blavaan package (which can also estimate via JAGS but with lavaan-style coding syntax) for model construction (Merkle & Rosseel, 2018). To represent change from pre-test to post-test, we used a residual change approach which regresses outcome *Y* at Time 2 by *Y* at Time 1 (for example, in contrast to a difference score) since residual change better represents within-person processes (Cronbach & Furby, 1970). For more information on residual versus difference change, see Appendix 1 (p. 147). The final model is presented in Figure 3.1.

Figure 3.1

Residualized Change Mediation Model



Note. X variable i_0 refers to the intercept of the model against a dummy coded categorical variable.

3.1.2 Results

Bayesian Model Diagnostics

The model was run and evaluated for initial diagnostics. Parameter chains converged as indicated by point scale reduction factors (all 1.00) and visual inspection of caterpillar plots (see Figures 11.4 through Figure 11.7 in Appendix 1, pp. 143-146). Posterior predictive model check fit statistics suggested moderate fit (CFI = .94, [.92, .95]; RMSEA = .23, [.21, .25]; SRMR = .06, [.05, .08]). For more information on Bayesian diagnostics (e.g., effective sample size, point scale reduction factors), see Appendix 1 (p. 141).

Table 3.2

Estimates and Model Diagnostic Metrics of Study 1

	Estimate	95% HDI	% in ROPE	ESS
Kama muta mediator (M)				
Model: X -> M				
Intercept	-2.16	**[-2.34, -1.98]**	0.00	30325
Kama Muta Condition	1.44	**[1.33, 1.56]**	0.00	30288
Full Relatedness Model				
Satisfaction Post-Test				
Intercept	-.24	[-.47, -.02]*	2.25	26745
Kama muta	.05	[-.03, .13]	47.53	33188
Kama Muta Video	.16	[.01, .31]*	4.79	26567
Pre-test	.74	**[.68, .80]**	0.00	46761
IE Kama Muta Condition via *M*.	.07	[-.04, .19]	-	-
IE Control Condition via *M*.	-.11	[-.29, .06]	-	-
Frustration Post-Test				
Intercept	.18	[.01, .36]	5.42	27566
Kama muta	-.01	[-.08, .05]	88.84	34708
Kama Muta Video	-.12	[-.24, -.01]	10.53	27246
Pre-test	.84	**[.79, .89]**	0.00	44949
IE Kama Muta Condition via *M*	-.02	[-.11, .07]	-	-
IE Control Condition via *M*	.03	[-.10, .17]	-	-

Note. Standardized estimates with 95% HDI reported by [lower, upper] limits. ESS = Effective Sample Size. IE = Indirect Effect. Bolded intervals do not overlap with ROPE. * denotes HDIs with 5% or less overlap with ROPE. On average, relatedness satisfaction scores were high (M_{T1} = 3.97, SD_{T1} = .73, M_{T2} = 4.01, SD_{T2} = .74), frustration scores were low (M_{T1} = 2.21, SD_{T1} = .89, M_{T2} = 2.11, SD_{T2} = .93), and kama muta scores were spread around the scale midpoint (M = 2.50, SD = 1.67) as expected due to high scores in the kama muta condition and low scores in the control.

Effect of the Kama Muta Experimental Manipulation

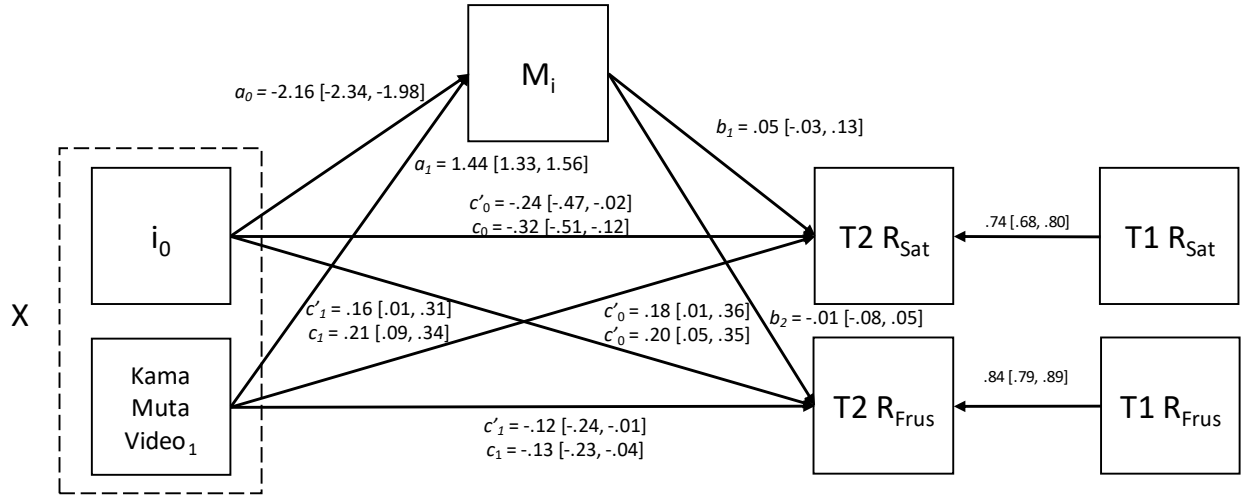
Participants were more likely to experience kama muta in the kama muta condition than the control, β = 1.44 [1.33, 1.56]. Furthermore, even after accounting for the kama muta mediator and pre-test scores, the kama muta condition continued to have a direct, positive effect on relatedness needs satisfaction, β =.16 [.01, .31], relative to the control condition. Even after accounting for the mediator and pre-test scores, the kama muta condition continued to have a direct, negative effect on relatedness needs frustration, β =-.12 [-.24, -.01], relative to the control condition.

Self-Report Kama Muta Mediator and Relatedness Satisfaction

After accounting for the conditions and the pre-test scores, we saw mixed evidence that the self-report kama muta mediator was associated with post-test relatedness needs, β =.05 [-.03, .13]. Just under half of the posterior overlapped with the ROPE, suggesting near equal evidence for a weakly positive or effectively null effect on relatedness needs satisfaction change. Similarly, the indirect effect from the kama muta condition to relatedness needs satisfaction via the self-report kama muta mediator was similarly split, with a point estimate outside the ROPE boundary though with a HDI spanning zero, β =.07 [-.04, .19], suggesting a weak positive to null indirect effect. Meanwhile, the indirect effect from the control condition to relatedness needs satisfaction had a point estimate outside the ROPE boundary and a HDI spanning zero, β =-.11 [-.29, .06], suggesting a weak negative to null indirect effect.

Figure 3.2

Mediation model of relatedness



Note. Effects are median standardized β coefficients of the posterior distribution with 95% HDIs for relatedness. T1 and T2 reflect pre- and post-test scores of relatedness needs. D_1 and i_0 are the kama muta dummy condition and the control reference group intercept respectively.

Self-Report Kama Muta Mediator and Relatedness Frustration

After accounting for the conditions and pre-test scores, the self-report kama muta mediator was not associated with post-test relatedness frustration needs, β =-.01 [-.08, .05]. Similarly, the indirect effect from the kama muta condition (β =-.02 [-.11, .07]) and the control condition (β =.03 [-.10, .17]) to relatedness needs frustration also had point estimates within the ROPE and a HDI nearly symmetrically split across zero, suggesting a null indirect effect. In sum, the kama muta condition was negatively associated with relatedness needs frustration residual change; however, seemingly none of that effect appeared to be mediated by kama muta itself.

Auxiliary Subscale Analyses

We performed some unregistered exploratory analyses to examine the effects of individual kama muta subscales. The only self-report kama muta subscale mediators with credible effects emerged for communal sharing appraisal (β =.12 [.03, .21]) and single-item positive affect β =-.13 [.05, .21] on relatedness satisfaction. No credible effects emerged on relatedness frustration. Thus, the only credible indirect effects from the kama muta condition to relatedness satisfaction emerged from these two subscale mediators, β_{CSR} =.16 [.04, .28]; β_{PA} =.13 [.04, .22] (see Table 11.2 in Appendix 1 for full subscale exploratory results).

3.1.3 Discussion

In this study, we examined whether kama muta affects relatedness need satisfaction and frustration. We found that people in the kama muta condition, relative to those in the control, reported higher relatedness satisfaction and lower relatedness frustration, even after considering pre-test satisfaction and frustration respectively. However, only a small portion of this satisfaction increase, and none of the frustration decrease, was attributable to participants' self-reported kama muta experience from watching the videos. In other words, the kama muta manipulation made people feel more connected to others, and reduced threats to such connectivity, but the amount of self-reported kama muta had little to no appreciable effect on either outcome.

The kama muta manipulation appears prosocial insofar as promoting feelings of connection and, to a lesser extent, by reducing feelings of social thwarting. Other manipulations like online social engagement (Sheldon et al., 2011) and writing tasks (Pavey et al., 2011) have also affected basic psychological needs like relatedness, but this is the first to our knowledge showing a kama muta video manipulation doing so. Kama muta theory has long argued that the emotion is social in nature, evoked by and ultimately facilitating communal bonds (Fiske et al., 2019). Previous empirical research has shown that kama muta is typified by an orientation towards, and concern for, others (Zickfeld et al., 2017) and highly associated with characteristics signaling affection and care (Steinnes et al., 2019). That our kama muta

manipulation increased relatedness satisfaction and reduced frustration dovetails with this previous work. Kama muta also appears relatively direct, positively affecting the dimension of relatedness (satisfaction) most closely linked to positive downstream outcomes. Alternatively, an effect on frustration would require a more complicated, indirect explanation for how kama muta could beget positive outcomes as theorized. While there is some evidence suggesting need frustrations can tap into restorative processes in some contexts (thus ultimately resulting in positive outcomes like enhanced motivation; Radel et al., 2013; Radel et al., 2011), BPN literature near unilaterally suggests frustrations are negative for individuals (Vansteenkiste et al., 2020). For example, frustrating upward comparison feelings (like envy) can have motivational effects (van de Ven, 2017), however the negative influence of need frustration typically undermines motivation and attention in the short and long-term (e.g. Fang, et al., 2020). In other words, it would be difficult to consider kama muta to have such positive downstream outcomes if it also engaged a typically negative-tinged appraisal like relatedness frustration. Furthermore, kama muta researchers have specified that kama muta is evoked by more than mere presence or appraisal of communal sharing relationships, but their *intensification* (Schubert et al., 2018; Steinnes et al., 2019). In other words, there must be some relational saliency threshold that must be encountered and/or surpassed. Considering the relatively stronger effect on satisfaction than frustration, kama muta may reach that threshold by engaging appraisals of connectedness more-so than buffering against feeling thwarted connectedness. In this sense, kama muta appears more approach oriented (i.e., directed *toward* positive outcomes) than avoidant (i.e., directed *away* from negative outcomes; Elliot et al., 2006; Gable, 2006).

However, a key point emerging from these data is that the kama muta mediator (self-reported kama muta after the video) had relatively little effect on relatedness needs. The kama muta manipulation retained an appreciably large residual effect on satisfaction and frustration even after accounting for the mediator, suggesting kama muta *at most* partially mediates this link and, in the case of frustration, does not mediate it at all. There are at least two plausible explanations. For one, our measure may not have appreciably captured kama muta, thus we saw a diminished effect (i.e., some of the variance from the manipulation direct effect *should* have been through the kama mediator but was missed due to measurement error). Some previous research that has used the KAMMUS Two disaggregated the construct into separate components rather than attempting a singular kama muta construct (e.g., Blomster Lyshol et al., 2020). While compromising our ability to make claims on the entire kama muta construct, we may have found stronger associations focusing on different components of kama muta in this study (e.g., certain items or subscales may have been more or less associated with relatedness, thus cancelling out when combined). Indeed, findings from unregistered exploratory analyses somewhat bears this notion out, showing that only two of the five subscales (positive affect and communal sharing appraisal) had appreciably non-zero indirect effects on relatedness satisfaction and mixed to null indirect effects on frustration (see Appendix 1, p. 148). Given their exploratory ad-hoc nature in addition to our main analyses, we

remain conservative in fully concluding upon these subscale effects. However, this pattern is in line with the idea that the combined kama muta effect on relatedness is muddled by the influence (or lack thereof) of different kama muta subcomponents.

An additional, and more theoretically interesting, explanation is that the kama muta manipulation video affects relatedness needs by some alternative mediator. Our exploratory subscale analyses hint that something like positive affect, an umbrella collection of many positive feelings that theoretically includes kama muta (Fiske et al., 2019; Zickfeld, Schubert, Seibt, Blomster, et al., 2019), may be complicating this current combined kama muta approach. Previous research has shown positive affect is potent and relevant to basic psychological needs. For example, meta-analyses have found that positive affect notably affects all basic psychological needs including relatedness (Stanley et al., 2021). This makes it unclear whether kama muta is merely a vessel of delivering positive affect (i.e., is kama muta just a potent packaging of positive feelings?) or delivering unique effects outwith its classification as a positive feeling. Put simply, maybe the experimental manipulation affected relatedness needs because it just made participants "feel good" and would be no different from another positive affect laced video. Furthermore, as per the KAMMUS Two scale, this study included a general, single-item of positive affect into the operationalization of kama muta, which could be improved upon with a more precise measure. In other words, a separated, more robust positive affect measure may help explain what is happening with this kama muta manipulation.

Furthermore, this study concerned itself with relatedness needs since it is the most directly social basic psychological need, and thus most theoretically relevant for kama muta's consequences. However, the focus on relatedness limits our visibility into how specifically social kama muta is. In other words, it is unclear whether kama muta's association with relatedness needs is unique relative to other basic psychological needs (autonomy and competence). For example, perhaps kama muta affects all basic psychological needs similarly, which would change how we think about kama muta delivering social consequences. Indeed, previous research has suggested that even relationship-focused manipulations can go beyond just relational needs and be associated with autonomy and competence needs (Pavey et al., 2011). Expanding to all three basic psychological needs also coincides with further examining positive affect since positive affect has robust connections to all three basic psychological needs (Schutte & Malouff, 2018; Stanley et al., 2021). In summary, this current study cannot explain whether the video manipulation affected relatedness uniquely due to kama muta (i.e., is kama muta or positive affect "doing the work?") nor can it claim that the manipulation is uniquely tied to something social (i.e., is the manipulation just as associated with other basic needs?). We explore these remaining questions—distinction from positive affect and from other needs—in Study 2.

4 Chapter 4: Kama Muta, Positive Affect, and Basic Psychological Needs

4.0 Study 2 Background

Study 1 presented mixed initial evidence that experimentally manipulating kama muta affects the basic psychological need for relatedness. More specifically, our data suggests that kama muta (as a self-reported mediator) has weak to null effects on relatedness need satisfaction, and little to no effect on relatedness frustration. However, it remains to be seen whether kama muta affects other basic psychological needs as well. Kama muta, as a highly social emotion (Fiske et al., 2019), may have particularly unique effects on relatedness relative to the other basic needs of autonomy and competence. Alternatively, perhaps kama muta's effects are wide ranging enough such that it affects some or all needs. We test those additional needs here in Study 2.

Secondly, there remains at least one plausible alternative explanation to the findings of Study 1 that should be attended to: positive affect[1]. Kama muta literature has argued that kama muta is in part indicated by positive affect (Fiske et al., 2019; Zickfeld, Schubert, Seibt, Blomster, et al., 2019; Zickfeld, Schubert, Seibt, & Fiske, 2019). Previous research has compared kama muta against sadness and other related emotional experiences such as awe to distinguish differing physiological profiles (Zickfeld et al., 2020). Other research has compared kama muta with amusement manipulations (Blomster Lyshol et al., 2020; Zickfeld, Schubert, Seibt, Blomster, et al., 2019) though these studies either did not assess positive affect directly or did not focus on differentiating kama muta from positive affect. It therefore remains unclear whether the effects thought to stem from kama muta are unique to kama muta and not attributable to the overarching positive affect that theoretically encompasses the emotion. Positive affect is conceptually a very broad umbrella of feeling (Watson et al., 1988), and has downstream effects on a wide array of biopsychosocial phenomena and outcomes, ranging from health (Pressman & Cohen, 2005; Pressman et al., 2019) to cognition (Ashby et al., 1999) and behavior (Shiota et al., 2021; Snippe et al., 2018) among many others (e.g., Hicks et al., 2010; Isen, 1987; Petrie et al., 2018; Zhang & Han, 2016). More to the topic of social emotionality, positive affect is also associated with prosocial efforts (Layous et al., 2016) and constructive interactions in both interpersonal (Berry & Hansen, 1996) and group settings

[1] While negative affect could be another plausible mediating pathway explaining kama muta's effects on BPNs (e.g., individuals may feel frustrated that they themselves would not expect such financial/social support as displayed in the kama muta video) we focused on positive affect because of its longstanding theoretical and empirical links with kama muta (Fiske et al., 2019; Zickfeld, Schubert, Seibt, & Fiske, 2019). Moreover, that what little kama muta effects we found in Study 1 largely targeted satisfaction rather than frustration suggested positive affect was the more relevant and plausible initial investigation.

(Peñalver et al., 2017). Self-determination theorists point to consistent literature demonstrating that all three basic psychological need satisfactions positively correlate with positive affect (and negatively correlate with negative affect) as evidence for the importance of basic psychological needs to human flourishing (Stanley et al., 2021). Put together, positive affect is demonstrably potent in many arenas, including those relevant to the study of a social emotion in a basic psychological need context. Teasing out what effects derive from this wide net of positive affect, compared to what is unique to kama muta, may help explain our findings in Study 1 and potentially (re)inform how we think about kama muta's effects on social life.

4.1 Study 2

We preregistered our research questions and analysis plan on OSF (https://osf.io/7c9bp). We sought to replicate our findings from Study 1 that self-reported kama muta would be weakly associated with relatedness need satisfaction. While the preregistered analyses in Study 1 found no effects on relatedness frustration, unregistered exploratory analyses showed that some individual kama muta subscales had weak negative associations with frustration (see Appendix 1 p. 148). This made us more unsure whether we would directly replicate the null effect, and thus kept predictions regarding relatedness frustration exploratory in Study 2. Furthermore, we expected to replicate previous literature that positive affect would be positively associated with all three basic psychological need satisfactions (Ng et al., 2012; Schutte & Malouff, 2018; Sheldon & Bettencourt, 2002; Stanley et al., 2021; Teixeira et al., 2017; Van den Broeck et al., 2016) and negatively with all three frustrations (Gunnell et al., 2013; Martela & Ryan, 2019).

We also had several new questions in Study 2, notably whether self-reported kama muta would have any effects outside of relatedness needs. Kama muta theory suggests that kama muta is largely interpersonal, instigated by social experiences/appraisals and resulting in downstream social outcomes (Fiske et al., 2019). If indeed the case, then kama muta should largely (if not solely) affect relatedness rather than autonomy or competence. However, research integrating self-determination theory and close relationships claims that basic psychological needs are important motivational components of relational behaviors and norms (La Guardia & Patrick, 2008). For example, the extent to which some pro-relational behaviors (e.g., willingness to sacrifice) beget beneficial relational outcomes depends in part on how volitional, or autonomously motivated, one perceives or expects their partner to be (La Guardia & Patrick, 2008; Ryan & Deci, 2017a). Similarly, communal relationships (e.g., supportive intimate relationships) can be a source of self-efficacy (Arriaga et al., 2017; Riggio et al., 2013). Communal relational experiences, like those involved in kama muta, may therefore engage these other psychological needs as well. Thus, we made no firm a priori predictions about whether self-reported kama muta would affect autonomy and competence need satisfaction or frustration.

Lastly, how do the effects of self-reported kama muta compare to positive affect? While we expected both to have some effect on relatedness needs, for example, we did not know which would be stronger. If kama muta effects are not subsumed by positive affect, the unique aspects of kama muta should retain effects on relatedness need satisfaction even after accounting for general positive affect. This pattern would suggest kama muta is not entirely reliant on positive affect for driving changes to basic psychological needs. In contrast, if the self-reported kama muta mediator has notably (or entirely) deflated effects compared to a positive affect mediator it would suggest that positive affect is the primary driver of kama muta's overall effects on basic psychological needs.

4.1.1 Method

The measures and procedure in Study 2 were similar to Study 1 (as previously described in Section 3.1.1). However, in Study 2 we added an amusement video condition, separated positive affect from the kama muta scale in favor of a full positive affect measure, and included all three basic psychological needs (where previously we only used relatedness). The personality measure, used as filler in Study 1 and its pilot, was removed to reduce the length of the survey and sampling costs. We describe the added or otherwise changed materials in more depth below.

Participants

Participants were 426 Prolific users, reimbursed £1.30 for the roughly 14-minute survey. Twenty-nine participants were excluded for failing at least one of the two attention checks, eight for encountering audio issues in their video, and seven for technical video issues. In this study, we added a timer to the video page of the survey, allowing us to check how long each participant stayed on the page. We excluded participants who spent less time on the page than their respective video, suggesting they did not watch the entire clip. Thirty participants were excluded based on this criterion. The final sample consisted of 352 participants, ranging in age from 18-61 years (*M* = 29.5 years, *SD* = 10.0). See Table 4.1 for full sample demographics.

Table 4.1

Demographics of Study 2 Participant Sample

Characteristic	*n*	*% of Sample*
Sex & Gender		
Female	178	50.6
Male	165	46.9
Trans Female	2	0.6
Trans Male	0	0.0
Nonbinary, Genderqueer	4	1.1

Bigender, Genderfluid	2	0.6
Agender, Genderless	1	0.3
Write-In	0	0.0
Race		
White, Caucasian, Anglo	284	80.7
East Asian	6	1.7
Black, African, Caribbean	16	4.6
Hispanic, Latino, Chicano	24	6.8
South Asian	9	2.6
Aboriginal, Indigenous, Native	0	0.0
Southeast Asian	2	0.6
West Asian	0	0.0
Middle Eastern, Arab	2	0.6
Mixed or Multiple Ethnic Group	6	1.7
Other	0	0.0
Education		
GCSE, O-Levels, or Standard Grades	31	8.8
A-Levels or Highers/Advanced Highers	80	22.7
Vocational degree (e.g., SVQ, HNC, HND)	21	6.00
Undergraduate degree (e.g., BSc, BA)	135	38.4
Master's degree (e.g., MSc, MPhil)	74	21.0
PhD, PsyD	4	1.1
Other Advanced or professional degree (e.g., MD, JD)	7	2.0
Employed		
No	154	43.8
Yes, part-time	77	21.9
Yes, full-time	121	34.4
Income		
£0-£12,500	83	23.6
£12,501-£14,549	55	15.6
£14,550-£24,944	64	18.2
£24,945-£43,430	94	26.7
£43,431-£150,000	53	15.1
£150,001+	3	0.9
Sexual Orientation		
Heterosexual, Straight	274	77.8
Bisexual, Pansexual	40	11.4
Gay	8	2.3
Lesbian	11	3.1
Demisexual	3	0.9
Asexual	2	0.6
Queer	4	1.1
Other	9	2.6

Student Status		
Yes	159	45.2
No	193	54.8

Note. N = 352.

Procedure

After confirming consent, participants completed scales for empathic concern, attachment and pre-test basic psychological needs presented in random order. The three basic psychological needs (autonomy, relatedness, and competence) were counterbalanced in the survey. Participants were then randomly assigned into one of three conditions: a kama muta condition, an amusement condition, or a control video condition. In Study 2, participants were asked to click on the video to start the clip to hopefully engage participants with the video more but also to better track time spent on the video page (e.g., to assess video completion more accurately). After the videos, participants completed scales for kama muta and positive affect before successively again reporting all three counterbalanced basic psychological needs. At the end of the study, participants viewed a debriefing screen and were compensated for their participation.

Measures and Materials

Video Manipulation

Study 2 used three video clips—the two used in Study 1 (neutral and kama muta-inducing clips) and an additional amusement video clip. The new amusement clip, a two and a half-minute clip from the Mr. Bean TV show depicting a comical and clumsy dentist appointment, has also been used in previous kama muta research as a comparison condition (Zickfeld, Schubert, Seibt, Blomster, et al., 2019).

Kama Muta

Unlike Study 1, participants in Study 2 responded to only four of the five subscales of the KAMMUS Two (α = .94; Zickfeld, Schubert, Seibt, Blomster, et al., 2019). Positive affect is typically measured in the KAMMUS Two via a single item; however, we removed it here in favor of using a full positive affect measure (described later) to separately measure positive affect. We continued to transform the kama muta scores into a combined probability as described in Study 1.

Basic Psychological Needs Satisfaction and Frustration (BPNSF)

Unlike Study 1, Study 2 used all three need subscales of the BPNSFS (Chen et al., 2015). State psychological needs satisfaction and frustration were measured using the three, 8-item subscales. Participants were asked to rate the extent to which they agreed or disagreed with a series of statements on a 5-point scale (1 = *Completely Disagree*, 5 = *Completely Disagree*) and

averaged together for satisfaction and frustration for each respective need. Autonomy satisfaction was measured across items such as, "I feel that my decisions reflect what I really want" (α_{T1} = .81, α_{T2} = .87), while autonomy frustration was measured on statements such as, "My daily activities feel like a chain of obligations" (α_{T1} = .82, α_{T2} = .87). Relatedness satisfaction was measured with the same items as in Study 1, including items such as, "I feel that the people I care about also care about me," (α_{T1} = .83, α_{T2} = .86) while relatedness frustration was measured on statements such as, "I feel excluded from the group I want to belong to" (α_{T1} = .80, α_{T2} = .83). Competence satisfaction was measured across items such as, "I feel capable at what I do" (α_{T1} = .90, α_{T2} = .92) while competence frustration was measured on statements such as, "I feel insecure about my abilities" (α_{T1} = .90, α_{T2} = .89).

Positive Affect

Positive affect was assessed using a collection of 10 items from the Positive and Negative Affect Schedule-Expanded Form (PANAS-X), five each for positive and negative affect (Watson & Clark, 1999), using instructions reflecting state-level affect. Positive items were; "cheerful", "proud", "interested", "strong", and "enthusiastic" (α = .87) while negative items were; "upset", "sad", "hostile", "ashamed", and "guilty." We selected items in part from the short-form distillation of the PANAS (Thompson, 2007), but also to balance different aspects of positive (joviality, attentiveness, self-assurance) and negative (fear, hostility, guilt, sadness) affects described in the PANAS-X (Watson & Clark, 1999) . Participants were asked to indicate the extent to which they felt at that moment any of the 10 items on a 5-point scale (1 = *Very slightly or not at all*, 5 = *Extremely*). We included the negative affect items to reduce affective demand characteristics (i.e., participants guessing a research bias towards positivity from their video) but did not include them in the current analyses, focusing only on positive affect items.

Analytic Method

We used a similar analysis plan as that from Study 1, now extending to a parallel dual-mediation (self-reported kama muta and positive affect) on multiple needs (autonomy, relatedness, and competence). Parallel mediation presents a model in which the effect of *X* affects *Y* directly as well as indirectly through *multiple* mediators (Hayes, 2017). There are thus six potential pathways, or indirect effects, to a given need outcome: the indirect effect of each of the three conditions (kama muta, amusement, and intercept) via the two mediators (kama muta and positive affect; see Appendix 2, Figure 12.1, p. 154 for full model visualization).

Models were run using similar parameters to those in Study 1, with some accommodations to the larger model design and new priors. We again used a ROPE (Kruschke, 2018) of ±.05 to evaluate posterior mean effects and their 95% HDIs. For relatedness needs, we specified priors in Study 2 using the posterior results from Study 1. For entirely novel effects, like the effect of kama muta on autonomy and competence needs (i.e., where we do not have previous data from which to draw priors from), we used weakly informative priors. Weakly

informative priors are a broad middle ground between strong priors (reflecting strong knowledge or expectation about an effect) and uninformative priors (effectively, "letting the data speak for themselves"; Gelman et al., 2020). Historically, uninformative priors have been used for novel investigations though research has shown they can introduce bias in estimates in part because the uniform distributions usually used to denote such "uninformed" expectations are themselves not necessarily uninformative (Du et al., 2019; Lemoine, 2019). Alternatively, weakly informative priors regularize data, lightly pushing effects towards reasonable bounds (Gelman et al., 2020), reducing Type 1 error rates (McElreath, 2020) and increasing estimate accuracy in the face of small or noisy data (Lemoine, 2019). We specified standardized priors normally distributed around zero with a standard deviation of two, i.e. $N(0,2)$. This prior denotes the expectation that, for example, β effects on the outcome variable will likely remain somewhere between positive and negative two (e.g., rather than somewhere between positive and negative infinity, as a truly uninformed prior might theoretically imply).

We used slightly more informative priors for positive affect given previous literature. Prior research suggests positive affect is positively associated with all three basic psychological need satisfactions and negatively associated with all need frustrations (Ng et al., 2012; Schutte & Malouff, 2018; Stanley et al., 2021; Teixeira et al., 2017; Van den Broeck et al., 2016). However, while consistent with effect direction, previous research has been less specific with effect precision, in large part due to inconsistent reporting of confidence intervals and standard deviations for regression coefficients (Gunnell et al., 2013; Martela & Ryan, 2019). Therefore, we used a slightly wider standard deviation for the priors to reflect our lower confidence in the expected value range. We specified priors for positive affect on all three need satisfactions and frustrations at $N(.1,1)$ and $N(-.1,1)$ respectively (see Table 12.1 in Appendix 2 for full prior specifications, p. 153). As with Study 1, models were run in R using Blavaan (Merkle & Rosseel, 2018) with four chains and a 5000 sample burn-in and subsequent 10,000 for sampling.[2]

4.1.2 Results

Bayesian Model Diagnostics

The model was run and evaluated for initial diagnostics. Parameter chains converged as indicated by point scale reduction factors (all 1.00) and visual inspection of caterpillar plots (Figure 12.2 through 12.15 in Appendix 2, pp. 155-168). Posterior predictive model check fit statistics suggested moderate fit (CFI = .88, [.87, .89]; RMSEA = .17, [.16, .17]; SRMR = .11, [.11, .12]). For more information on Bayesian diagnostics (e.g., effective sample size, point scale reduction factors), see Appendix 1 (p. 141).

[2] The original pre-registration planned to use a multi-level modeling approach, though we reverted to the single-level residual change approach previously used in Study 1. For more technical information on this change, see Appendix 2 (p. 151).

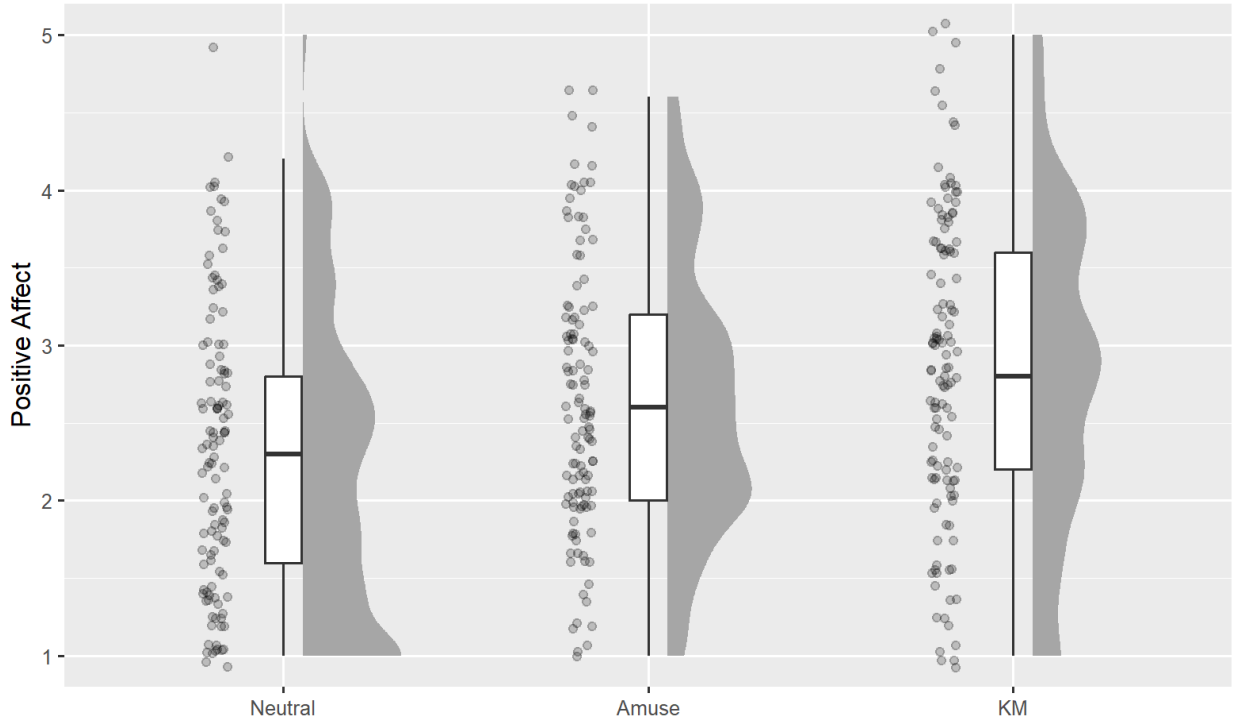
Direct Effects of the Experimental Manipulations

Participants were more likely to experience kama muta in the kama muta condition than the control, β = 1.82 [1.69, 1.95] (see Table 4.1). Additionally, those in the kama muta condition also reported higher positive affect than the control, β = .57 [.32, .83] (see Figure 4.2). Those in the amusement condition were more likely to report higher positive affect than those in the control, β = .32 [.07, .57]. Meanwhile, those in the amusement condition were also more likely to experience kama muta than the control, β = .67 [.49, .85]. In that basic sense, the kama muta and amusement manipulations affected the two mediators relative to the control condition. Exploratory analyses showed that the amusement condition had a credibly smaller effect on kama muta than the kama muta condition (β = -1.35 [-1.53, -1.18]). Meanwhile, the amusement condition had a credibly smaller effect on positive affect than the kama muta condition, (β = -.25 [-.50, -.00]; see Table 12.2 in Appendix 2, p. 169).

Even after accounting for the two mediators and pre-test scores, the kama muta condition retained a mixed direct, positive effect on relatedness satisfaction (β = .09 [-.02, .21]) and a direct negative effect on relatedness frustration (β = -.13 [-.22, -.04]) relative to the control condition. However, the kama muta condition did not retain credible direct effects on autonomy satisfaction (β = -.05 [-.23, .14]) or autonomy frustration (β = -.01 [-.18, .15]), nor on competence satisfaction (β = -.00 [-.17, .16]) or competence frustration (β = .01 [-.16, .18]) relative to the control condition. Meanwhile, the amusement condition retained a direct positive effect on relatedness satisfaction (β = .16 [.02, .31]) and a direct negative effect on relatedness frustration (β = -.18 [-.29, -.06]) relative to the control condition. However, the amusement condition did not retain credible direct effects on autonomy satisfaction (β =.03 [-.12, .17]) or autonomy frustration (β = -.00 [-.12, .12]), nor competence satisfaction (β = .07 [-.06, .19]) or competence frustration (β = .02 [-.11, .16]) relative to the control condition. Exploratory analyses showed that the amusement condition's direct effects were not credibly different from the kama muta condition across any basic psychological needs (see Table 12.3 in Appendix 2, p.170 for full model results).

Figure 4.2

Conditions by Average Positive Affect



Note. Jittered data points, boxplot, and distribution per video. KM = kama muta condition. Averaged positive affect scores range from 1 to 5. Data points visually below 1 and above 5 are from plotting jitter. On average, scores were near scale midpoint (*M* = 2.61, *SD* = .94).

Table 4.1

Estimates and Modeling Diagnostics of Study 2: X->M Parameters of Model

	Estimate	[95% HDI]	% in ROPE	ESS
Kama muta mediator (M_i)				
Intercept	-1.07	**[-1.18, -.96]**	0.00	33779
Kama Muta Condition	1.82	**[1.69, 1.95]**	0.00	50086
Amusement Condition	.67	**[.49, .85]**	0.00	42046
Positive Affect mediator (M_{ii})				
Intercept	-.31	**[-.49, -.12]**	0.00	29709
Kama Muta Condition	.57	**[.32, .83]**	0.00	34985
Amusement Condition	.32	**[.07, .57]**	0.00	34486

Note. Standardized estimates with 95% HDI reported by [lower, upper] limits. ESS = Effective Sample Size. IE = Indirect Effect. Bolded intervals do not overlap with ROPE. * denotes HDIs with 5% or less overlap with ROPE. On average, kama muta scores were low (*M* = 1.91, *SD* = 1.66), reflecting high scores in the kama muta condition and low scores in other conditions.

Table 4.2

Estimates and Modeling Diagnostics of Study 2: Autonomy Parameters of the Model

	Satisfaction				Frustration			
	Estimate	95% HDI	% in ROPE	ESS	Estimate	95% HDI	% in ROPE	ESS
Autonomy (Y_{Sat}; Y_{Frus})								
Intercept	.01	[-.10, .12]	65.92	23527	.01	[-.09, .10]	72.26	23475
Kama Muta	-.01	[-.10, .08]	75.51	32692	.02	[-.06, .10]	78.77	29241
Positive Affect	.12	[.05, .19]*	0.33	45540	-.09	[-.15, -.04]*	4.57	45543
Kama Muta Condition	-.05	[-.23, .14]	37.82	24260	-.01	[-.18, .15]	47.01	23763
Amusement Condition	.03	[-.12, .17]	50.85	31924	-.00	[-.12, .12]	60.48	33006
Pre-test	.78	**[.72, .84]**	0.00	56874	.85	**[.80, .89]**	0.00	63550
IE Kama Muta Cond. via KM	-.02	[-.18, .14]	-	-	.03	[-.11, .18]	-	-
IE Amusement Cond. via KM	-.01	[-.07, .05]	-	-	.01	[-.04, .06]	-	-
IE Control Condition via KM	.01	[-.08, .11]	-	-	-.02	[-.10, .06]	-	-
IE Kama Muta Condition via PA	.07	[.02, .12]	-	-	-.05	[-.10, -.01]	-	-
IE Amusement via PA	.04	[-.00, .08]	-	-	-.03	[-.06, .00]	-	-
IE Control Condition via PA	-.04	[-.07, -.01]	-	-	.03	[.00, .05]	-	-

Note. Standardized estimates with 95% HDI reported by [lower, upper] limits. ESS = Effective Sample Size. IE = Indirect Effect. Bolded intervals do not overlap with ROPE. * denotes HDIs with 5% or less overlap with ROPE. This table reports the effects relevant for autonomy from the larger model which included all needs. On average, autonomy satisfaction (M_{T1} = 3.43, SD_{T1} = .80, M_{T2} = 3.43, SD_{T2} = .86) and frustration scores (M_{T1} = 3.07, SD_{T1} = .94, M_{T2} = 2.99, SD_{T2} = 1.01) were spread around the scale midpoint.

Table 4.3

Estimates and Modeling Diagnostics of Study 2: Relatedness Parameters of the Model

	Satisfaction				Frustration			
	Estimate	95% HDI	% in ROPE	ESS	Estimate	95% HDI	% in ROPE	ESS
Relatedness (Y_{Sat} ; Y_{Frus})								
Intercept	-.10	[-.19, -.01]	11.96	30374	.11	[.04, .18]*	2.49	39012
Kama Muta	.00	[-.06, .06]	95.33	49882	.01	[-.04, .06]	98.17	49031
Positive Affect	.10	[.02, .17]	8.98	46720	-.07	[-.13, -.01]	25.61	51064
Kama Muta Condition	.09	[-.02, .21]	21.07	38926	-.13	[-.22, -.04]*	2.03	42449
Amusement Condition	.16	[.02, .31]*	4.27	34973	-.18	**[-.29, -.06]**	0.00	39281
Pre-test	.73	**[.69, .78]**	0.00	68611	.82	**[.78, .85]**	0.00	66908
IE Kama Muta Cond. via KM	.01	[-.10, .11]	-	-	.02	[-.07, .10]	-	-
IE Amusement Cond. via KM	.00	[-.04, .04]	-	-	.01	[-.03, .04]	-	-
IE Control Condition via KM	-.00	[-.07, .06]	-	-	-.01	[-.06, .04]	-	-
IE Kama Muta Cond. via PA	.06	[.01, .10]	-	-	-.04	[-.08, -.00]	-	-
IE Amusement Cond. via PA	.03	[-.00, .07]	-	-	-.02	[-.05, .01]	-	-
IE Control Condition via PA	-.03	[-.06, -.00]	-	-	.02	[-.00, .04]	-	-

Note. Standardized estimates with 95% HDI reported by [lower, upper] limits. ESS = Effective Sample Size. IE = Indirect Effect. Bolded intervals do not overlap with ROPE. * denotes HDIs with 5% or less overlap with ROPE. This table reports the effects relevant for relatedness from the larger model which included all needs. On average, relatedness satisfaction scores were high (M_{T1} = 3.97, SD_{T1} = .73, M_{T2} = 3.96, SD_{T2} = .75) and frustration scores were low (M_{T1} = 2.14, SD_{T1} = .88, M_{T2} = 2.08, SD_{T2} = .93).

Table 4.4

Estimates and Modeling Diagnostics of Study 2: Competence Parameters of the Model

	Satisfaction				Frustration			
	Estimate	95% HDI	% ROPE	ESS	Estimate	95% HDI	% ROPE	ESS
Competence (Y_{Sat} ; Y_{Frus})								
Intercept	-.02	[-.12, .07]	66.73	23770	-.01	[-.11, .09]	69.20	22692
Kama Muta	.04	[-.04, .11]	63.46	30820	-.00	[-.08, .08]	80.49	28540
Positive Affect	.10	[.03, .16]	5.27	39243	-.12	**[-.18, -.05]**	0.00	35291
Kama Muta Condition	-.00	[-.17, .16]	47.38	24635	.01	[-.16, .18]	45.19	24052
Amusement Condition	.07	[-.06, .19]	37.53	30285	.02	[-.11, .16]	54.31	28815
Pre-test	.82	**[.77, .87]**	0.00	52266	.79	**[.74, .84]**	0.00	55769
IE Kama Muta Cond. via KM	.07	[-.07, .21]	-	-	-.00	[-.16, .15]	-	-
IE Amusement Cond. via KM	.03	[-.03, .08]	-	-	-.00	[-.06, .05]	-	-
IE Control Condition via KM	-.04	[-.03, .08]	-	-	.00	[-.09, .09]	-	-
IE Kama Muta Condition via PA	.05	[.01, .10]	-	-	-.07	[-.11, -.02]	-	-
IE Amusement Cond. via PA	.03	[-.00, .06]	-	-	-.04	[-.07, -.00]	-	-
IE Control Condition via PA	-.03	[-.06, -.00]	-	-	.04	[.01, .06]	-	-

Note. Standardized estimates with 95% HDI reported by [lower, upper] limits. ESS = Effective Sample Size. IE = Indirect Effect. Bolded intervals do not overlap with ROPE. * denotes HDIs with 5% or less overlap with ROPE. This table reports the effects relevant for competence from the larger model which included all needs. On average, competence satisfaction scores were high (M_{T1} = 3.63, SD_{T1} = .86, M_{T2} = 3.65, SD_{T2} = .91) and frustration scores were spread around the scale midpoint(M_{T1} = 2.88, SD_{T1} = 1.09, M_{T2} = 2.62, SD_{T2} = 1.09).

Self-Report Kama Muta Mediator and Relatedness (Study 1 Replication)

After accounting for the direct effects of the conditions, pre-test scores, and alternative positive affect mediator, the self-reported kama muta mediator (without its positive affect subscale) was not associated with post-test relatedness satisfaction (β = .00 [-.06, .06]) nor post-test relatedness frustration (β = .01 [-.04, .06]; see Table 4.3). These are more credibly null effects than Study 1's because the HDIs are almost entirely within the ROPE and near symmetrically bounding zero. Consequently, there was no indirect effect from the kama muta condition to relatedness satisfaction (β = .01 [-.10, .11]) nor relatedness frustration (β = .02 [-.07, .10]) via the kama muta mediator. Similarly, there was no indirect effect from the amusement condition to relatedness needs via the kama muta mediator (see Tables 4.2-4.4).

Self-Report Kama Muta Mediator on Autonomy and Competence (New Extension)

The self-reported kama muta mediator had no appreciable effect on autonomy satisfaction (β = -.01 [-.10, .08]) or autonomy frustration (β = .02 [-.06, .10]), nor on competence satisfaction (β = .04 [-.04, .11]) or competence frustration (β = -.00 [-.08, .08]). There were no credible indirect effects from the amusement condition to any basic psychological needs via the kama muta mediator either. Consequently, there were no credible indirect effects from any condition through the kama muta mediator (see Tables 4.2-4.4).

Self-Report Positive Affect Mediator on Basic Psychological Needs (Literature Replication)

After accounting for the direct effects of the conditions, pre-test scores, and self-reported kama muta mediator, the positive affect mediator was associated with all basic psychological need satisfactions and frustrations as expected by literature (see Tables 4.2-4.4). That is, positive affect was positively associated with all need satisfactions (β_{Aut} = .12 [.05, .19], β_{Rel} = .10 [.02, .17], β_{Com} = .10 [.03, .16]) and negatively associated with all need frustrations (β_{Aut} = -.09 [-.15, -.04], β_{Rel} = -.07 [-.13, -.01], β_{Com} = -.12 [-.18, -.05]). There were credible indirect effects (HDIs mostly outside of ROPE) via positive affect for the kama muta condition on autonomy satisfaction (β = .07 [.02, .12]), relatedness satisfaction (β = .06 [.01, .10]), and competence frustration (β = -.07 [-.11, -.02]). There were no other credible indirect effects from the kama muta condition to basic psychological needs via positive affect. There were no credible indirect effects from the amusement condition to any basic psychological needs via positive affect (see Tables 4.2-4.4).

Auxiliary Subscale Analyses

Unregistered exploratory analyses examining the effects of individual subscales showed that, after accounting for the alternative positive affect mediator, none of the subscales had consistent credible effects on basic psychological needs. The effects, and subsequent indirect effects, via the positive affect mediator remained largely unchanged from the primary results. The only notably credible subscale effect emerged from communal sharing appraisal on

competence frustration (β = -.12 [-.22, -.01]), thus a credible indirect effect emerged from the kama muta condition to competence frustration via communal sharing (β = -.18 [-.24, -.02]; see Tables 12.4-12.7 in Appendix 2, pp. 171-174 for full model results).

4.1.3 Discussion

This study elaborated on two primary features of Study 1: (a) specifying the unique effects of kama muta by separating out positive affect and (b) evaluating the range of kama muta's association with basic psychological needs beyond relatedness. We clarified our mixed results from Study 1, showing that the self-reported kama muta mediator (without its positive affect component) did not affect relatedness satisfaction and frustration, nor any autonomy and competence needs. However, the most credible indirect effects in our model came from the kama muta condition via positive affect. The amusement condition generally had null to weak effects on basic psychological needs, with no credible indirect effects via either mediator, and had mostly null residual direct effects. However, the amusement condition retained a direct effect on relatedness satisfaction and frustration. Overall, these results suggest the kama muta emotion affects immediate basic psychological needs change only to the extent to which it feels positive.

Study 2 lends some insight into how our kama muta manipulation relates to positive affect. The kama muta condition had a strong effect on positive affect, with exploratory analyses suggesting it was credibly more positive than the amusement condition. This idea dovetails with previous research that has found kama muta was more positive than an amusement video (Zickfeld, Schubert, Seibt, Blomster, et al., 2019) and even more amusing than funny videos (Blomster Lyshol et al., 2020). Our findings here support the notion that the communal sharing intensifications that evoke kama muta are generally successful at generating positive affect. A wealth of literature suggests human beings have evolutionarily developed towards thinking and operating in social relationships (Adolphs, 2003; Baumeister & Leary, 1995; Coan & Sbarra, 2015; S. T. Fiske, 2004; Frith & Frith, 2007). Some research has suggested that the way individuals react to emotional expressions and behavior is largely determined by how socially connected they feel (Mauss et al., 2011). Others have even argued that positive emotions convey their physiological health benefits via perceptions of social connectedness (Kok et al., 2013). That is all to say, social appraisals are an important ingredient in what makes positive feeling truly "positive." This link between positive affect and social appraisal fits with the idea that kama muta conveys information relevant for social connectivity (e.g., a person's endorsement of communal values) to existing and potential relational partners (Fiske et al., 2017). In that sense, our kama muta manipulation being especially positive in feeling should perhaps come as no surprise.

However, this positive affect effect is notable considering that it appears the kama muta condition had effects on immediate basic psychological needs change *only* via positive affect,

and *not* the self-reported kama muta mediator. Kama muta theory proposes that kama muta both reflects an intensely communal, positive social experience, and in turn redirects attention and resources towards communal relationships (Fiske et al., 2019). If kama muta has such downstream social impacts, for example by immediately affecting basic psychological needs (which are thought to be core elements of directing and energizing behavior; Vansteenkiste et al., 2010), our data suggest it does so because of how positive it is rather than something unique to kama muta itself. Importantly, positive affect increased need satisfactions and reduced need frustrations in our data just like previous research (Gunnell et al., 2013; Martela & Ryan, 2019; Ng et al., 2012; Schutte & Malouff, 2018; Sheldon & Bettencourt, 2002; Stanley et al., 2021; Teixeira et al., 2017; Van den Broeck et al., 2016). Beyond reinforcing that our data are consistent with greater literature, the pattern of positive affect found here also helps clarify our mixed results in Study 1. With positive affect separated out as its own mediator, the effect of the kama muta mediator and the residual direct effect of the kama muta condition noticeably deflated compared to Study 1. This suggests our mixed kama muta effects in Study 1 were due, at least in part, to a positive affect confound. Indeed, exploratory analyses using the kama muta subscales further showed that none of the kama muta subscales had consistent, appreciable effects on the three basic psychological needs (unlike positive affect which had consistent, appreciable effects across all of them).

These results run somewhat against Fiske et al.'s (2019) claim that kama muta "instantly update[s]" (p. 79) communal devotion and commitment. If true, we would have expected some of the self-report kama muta mediator effect on relatedness to remain even after accounting for positive affect. Insofar as basic psychological needs are crucial ingredients for self-directed, intrinsic motives and behavior (Ryan & Connell, 1989; Ryan & Deci, 2017b), kama muta does not seem to immediately, uniquely translate to changes relevant for devotion and commitment. It is therefore somewhat surprising to see effects on relatedness, such as those from Study 1, deflate entirely. Somewhat cynically, one could have evaluated this study just in terms of positive affect without acknowledging kama muta and come away with a largely unchanged conclusion coherent with previous literature: that feeling good positively affects psychological needs, in this case the "feeling moved" video simply being the more positive manipulation. More optimistically, this study leaves open the possibility that kama muta does not operate in this kind of immediate-aftermath-of-emotion timeframe. The immediate, generally positive feeling evoked from communal intensifications experience may drive individuals in directions relevant for (but not exclusive to) communality. Meanwhile, more processed, unique aspects of the kama muta emotion may take greater communal precedence later. Kama muta may be like some emotional experiences (and associated cognitions) that span minutes or even hours (Verduyn et al., 2015; Verduyn et al., 2011). Our collection window—immediately following the manipulations—may have been too short, for example, to include accompanying emotion resurgences (Waugh et al., 2015) or more reflective, retrospective appraisals that are thought to explain the effects of emotion on behavior (Baumeister et al., 2007). In other words, our findings suggest the kama muta emotion does not immediately, nor uniquely, translate to

elements relevant to motivating social behavior (i.e., basic psychological needs, especially relatedness), but leaves open the possibility for later effects.

Outside of the mediators, the pattern of residual direct effects from the conditions suggests the presence of socially relevant unaccounted-for variables. Most notably, the amusement condition retained a relatively large residual direct effect on relatedness, but on no other basic psychological need. Furthermore, even accounting for the positive affect and kama muta mediators, the kama muta condition retained a mixed residual direct effect on relatedness but was credibly absent with autonomy and competence. Thus, there appears to be some socially specific, unaccounted-for third variable(s) at play in this context, one that is especially relevant for the amusement condition. The amusement manipulation clip depicted a classic scene from Mr. Bean, a highly recognizable British cultural icon, which may have evoked nostalgia from our largely UK based sampling pool. Nostalgia, a sentimental yearning for one's past (Sedikides & Wildschut, 2018), is thought to be a highly social emotion, for example emerging during states of loneliness (Wildschut et al., 2006) and motivating pathways that restore and stabilize a sense of a social self (Abeyta et al., 2015; van Tilburg et al., 2018; Zhou et al., 2008). The amusement condition may have tapped into a nostalgia process, reinvigorating participants' sense of social identity (e.g., connection with other Brits, remembering associated relationships like friends or family members who are fans of the character) or social continuity (e.g., reflecting on familiar comforts or previous times watching Mr. Bean) which led to the pronounced residual direct effects on relatedness. Less evocative material, or alternative sampling pools outside the UK, may alleviate this kind of concern in future research.

Finally, that the kama muta manipulation did not credibly affect autonomy and competence, directly nor via any mediator, may lend some interesting possible characterizations of kama muta. For example, considering people's sensitivity to meta-emotional tactics in media (Bartsch et al., 2008; Cotte et al., 2005), and how frequently people encounter emotional messaging across disciplines (e.g., business, politics, charities etc.; Brader, 2005; Danciu, 2014, Small & Verrochi, 2009) it is notable that our kama muta manipulation (originally from a Thai insurance advertisement) did not reduce autonomy needs. That we found no negative effects on autonomy (i.e., reducing participant's sense they are volitional agents) suggests kama muta, at least as in our experimental design, did not feel emotionally manipulative. Similarly, that we found no negative effects on competence is interesting considering kama muta is highly associated with powerful, efficacy-hindering expressions like tears and crying adjacent expressions (Aragon & Clark, 2018; Simons et al., 2012; Vingerhoets, 2013a, 2013b). Our exploratory subscale analyses lightly suggest kama muta may do the opposite. The *only* credible effect from any kama muta subscale was via higher communal sharing appraisal to reduced competence frustration (and was even comparable in strength to positive affect). These results dovetail with theories of social capital, where social relationships (re)define one's perception of resources from which to approach their environment (Coan & Sbarra, 2015)—in this case where communal sharing appraisals do not increase a sense of competence, but rather remove barriers to competence. Those specific effects are exploratory,

thus should be taken lightly, however the overall pattern paints a picture of people not feeling autonomy and competence inhibitions by kama muta, at least in our manipulation and design.

Limitations

The technical aspects of Studies 1-2 introduce some limitations. For example, one downside of using a ROPE in these analyses is that, barring calibration to real-world consequences, what is "practically null" is ultimately a subjective boundary (Kruschke, 2018). For example, we based our ROPE by splitting a halved "small" effect size across zero (Cohen, 1988) however recent meta-analyses have shown historical guidelines of effect sizes (i.e., as "small", "medium", and "large") are overestimates and should be scaled down to more accurately reflect effect distributions reported across social psychology subdisciplines (Lovakov & Agadullina, 2021). Some research suggests meta-analyses tend to be overestimates themselves, in part due to publication bias (Bartos et al., 2023), which suggests even further reduction. Some research has instead used more relaxed boundaries such as accepting any estimate with HDIs that do not overlap zero (i.e., the entire HDI is positive or negative) regardless of effect size (e.g., Wolf et al., 2016). In part because of this subjective element, benchmarks of smallest effect sizes of interest should ideally use previous precedent (Lakens et al., 2018). While not a limitation per se, the analysis of Studies 1-2 used sampling metrics more typical of the JAGS estimator while incidentally relying on the newer, Stan estimator default within blavaan which is far more efficient, requiring less sampling than originally pre-registered (Merkle et al., 2021). We proceeded with the original pre-registered sampling parameters, accepting the less efficient computation for the sake of consistency and being overly conservative. Another key limitation comes from this study's measurement of basic psychological needs, specifically frustration. The Basic Psychological Need Satisfaction and Frustration Scales (Chen et al., 2015) are the most widely used measure of basic psychological needs (Vansteenkiste et al., 2020). However, recent research by Murphy et al. (2023) provide compelling evidence that the scales do not properly measure need frustration, but instead reflect item-keying direction. Our results regarding need frustrations should thus be held with some healthy skepticism. Relatedly, our relatedness needs measure is very general and may not appropriately reflect communal relationship outcomes. While typically associated with closer ties (Baker et al., 2020), relatedness needs still reflect relatively broad social appraisals (Baumeister & Leary, 1995; Steverink & Lindenberg, 2006). In other words, we cannot presume to know how particularly communal kama muta is from a measure of relatedness.

These studies also cannot claim kama muta as a causal mechanism. This is not an unusual limitation however, considering kama muta theory's ultimate claim that kama muta "mediates much of human sociality" (Fiske et al., 2019, p. 74), it is worth additional attention. To start, while our analytic methods were inspired by calls for more robust statistics in psychological science (e.g., Dienes & McLatchie, 2018; Oberauer & Lewandowsky, 2019; Yarkoni, 2019), mathematics cannot fully address causality (Pearl, 2009). Kazdin (2007)

proposes several indicators to establish a causal mechanism, most notably five: coherence, strong associations, consistency, experimental manipulation, and temporal precedence. While Studies 1-2 have multiple mediators and temporal precedence, they did not evidence strong associations (relatively weak effects) nor coherence (e.g., positive affect was the more plausible mediator effect to BPNs, not self-reported kama muta). Relatedly, due to technical complexities of their inclusion and to retain focus on extricating positive affect and kama muta, these analyses do not include some relevant covariates. For example, gender (Zickfeld, Schubert, Seibt, Blomster, et al., 2019) and empathic concern (Zickfeld et al., 2017) have both been associated with kama muta experience, where women and highly empathic individuals tend to experience more kama muta. Claiming causality in psychological science is difficult (Hommel, 2020), perhaps being more uncommon (e.g., Farrell & Stanton, 2019) and complex (e.g., Farrell et al., 2021) than many would appreciate, even with experimental designs (Bullock et al., 2010). That is not to say psychological research fails without causative, mechanistic claims (indeed the field has long struggled with causation; White, 1990) but rather that we should be honest in how we evaluate our findings.

The design used in Studies 1-2 also somewhat limits our conclusions. When viewing the produced video, participants were virtual bystanders to communal intensification of strangers rather than experiencing it firsthand in their *own* relationships. Previous research has found that people feel kama muta exclusive to their own political party ads (Seibt et al., 2019), which suggests people experience kama muta differently depending on their connection to the people experiencing the communal intensification. However, in this relatively "socially sterile" study environment (i.e., online surveys) with a manipulation involving strangers, we cannot speak to how different their emotional experience (nor downstream consequences) looks in more personally relevant and ecologically valid social contexts. This idea dovetails with recent literature on emotion regulation that argues for the consideration of how individuals encounter and regulate a given emotion, rather than purely on an emotion's quality and process (Fischer et al., 2016; Parkinson & Manstead, 2015). In short, insofar as emotions have social functioning (Keltner & Gross, 1999; Keltner & Kring, 1998), the social context in which someone experiences an emotion remains a critical piece of how people regulate emotion (Barthel et al., 2018; Beckes & Sbarra, 2021). Overall, kama muta may operate differently when felt in more naturalistic, personally relevant stimuli and experiences than delivered via online video manipulations.

5 Chapter 5: Technical Interlude

Reflecting on Studies 1-2, we made some overarching methodological changes to carry forward into the remaining Studies 3-4. Our investigation now moves from laboratory-based experiments to intensive longitudinal daily diary collection. In doing so, our focus turns to studying kama muta both at the daily level (i.e., rather than momentary) and in more ecologically valid contexts (i.e., contexts in which the emotion is more typically experienced). Partly in adapting to new demands with this overall design change, and in part taking insights from Studies 1-2, we made some technical adjustments to our measures and analyses. Since these are broad changes, and generally reflect research development in this body of work, the author of this thesis thought it prudent to briefly address them separate from those individual methods. We describe such changes in these interlude subsections.

5.1 Kama Muta Measurement in Studies 3-4

Following Studies 1-2, we reflected on our measurement of kama muta, two thoughts of which motivated a measurement change that we carry forward into the later studies of this thesis. We discuss each reflection and alteration in turn.

5.1.1 Kama Muta Outside of Positive Affect

We opted to operationalize kama muta without a positive affect subscale in Studies 3-4. Logistically, the data in Studies 3-4 came from larger longitudinal projects with limited space for additional measures. Beyond avoiding survey fatigue risk, measuring positive affect specific to potential kama muta experiences was not a priority for the greater data collection (e.g., relative to a measure of general daily positive affect). In other words, we had data of general positive affect (i.e., “how positive did you feel today?”) but did not have positive affect for the given kama muta experience (“how positive did you feel during that particular emotional instance?”). More conceptually, and especially as seen in Studies 1-2, we note the considerable psychological potency of positive affect, which suggests we should try to be more precise in evaluating what kama muta is uniquely doing. As suggested by Studies 1-2, including positive affect into a quantitative operationalization of kama muta risks confusing and overinflating the breadth and depth of what kama muta specifically affects. To continue our evaluation of effects unique to kama muta, we thus shifted focus to the combination of the four remaining elements of kama muta (labeling, physiological profile, motivational and communal sharing appraisals), acknowledging that any such effects may come in parallel with effects associated with positive affect given a (presumably positive) kama muta experience.

5.1.2 Quantitatively Operationalizing Kama Muta

Rather than continue the “probability of kama muta” construction from Studies 1-2, we pivoted to a latent factor kama muta operationalization in Studies 3-4. We originally tried to adhere as strictly as possible to the original KAMMUS Two measure’s intent as a probability measure in Studies 1-2. However, doing so requires complex mathematical transformations (e.g., sigmoid transformations) and potentially introduces new statistical considerations (e.g., to what extent do probabilistic distributions impinge gaussian assumptions in linear modeling?). The alternative of using individual subscales (e.g., as used by Steinnes et al., 2019) provides more flexibility though risks multiple testing (Bender, 2001) and obfuscates kama muta as a singular construct. Averaging together is more tenable in that respect (e.g., as used by Blomster Lyshol et al., 2020; Seibt et al., 2023 ; Swarbrick et al., 2021), though runs counter to recommendations against singular averaging for risk of paving over internal component coherance (Zickfeld, Schubert, Seibt, Blomster, et al., 2019) and makes unilateral assumptions of all items equally, and perfectly, reflecting the construct (DiStefano et al., 2019). Similar to Blomster Lyshol, Pich, et al. (2022), we turn to the psychometric tradition of factor analyses to represent data as the combination of product functions (Bartlett, 1938), wherein the correlation of observable subcomponents reflect a composite, unobserved multidimensional kama muta variable (Bastlevsky, 1994).

5.2 Shifting Away From Bayesian

Bayesian methods are a more complicated statistical paradigm than NHST not least because they add additional analytic and computational considerations that increase with model complexity. Where Bayesian modeling excels, for instance, in iterating upon previous data and knowledge, generating evidence for hypotheses, reducing power concerns, and clearer effect interpretations (Gelman, 2018; Gelman et al., 2020; Gelman et al., 2012; Gelman & Shalizi, 2013), it comes at the “cost" of underlying complexity. For example, Bayesian analysis demands the consideration of priors for all parameters in the model which, while some default recommendations exist (Lemoine, 2019), adds layers of complexity for both researcher (e.g., deciding and justifying priors) but also computation (e.g., more advanced code, longer model run times, additional model checks etc.; Du et al., 2019). As the initial concepting and planning of Studies 3-4 progressed, it became clear they would utilize more complicated design and data structures (longitudinal and dyadic data) that themselves bring new computational and practical challenges. For example, as will be described in more depth later, Study 3 used a relatively novel model framework that literature is still developing a base of resources and open code for (Mulder & Hamaker, 2020) and, beyond the most cutting-edge versions of it (Asparouhov et al., 2017; Zhou et al., 2019), has rarely extended to Bayesian affordances. That is all to say, while the forthcoming analyses of Studies 3-4 could theoretically be run in a Bayesian framework (as most, if not all statistical analyses can), practically doing so became increasingly limited. The author of this thesis thus decided it practical for the purposes of this thesis to rely on traditional frequentist approaches to utilize these more complex analyses in Studies 3-4.

6 Chapter 6: Close-Others and Kama Muta, Individual Diary

6.0 Study 3 Background

Studies 1-2 kept a tight frame examining kama muta as an emotion with immediate psychological consequences for an individual in an experimental setting. However, emotional experiences vary in form and function across time and situations (Barrett, 2012; Fischer et al., 2016; Sels et al., 2021; van Kleef & Côté, 2022). Deep study of an emotion, especially a highly social one like kama muta, should therefore approach some level of how a given emotion emerges in daily life—where the emotions are "truly" experienced. There also remains a related, simple but important unresolved question: how often in day-to-day life would one reasonably expect to experience kama muta in the first place, and what sorts of stimuli or people elicit it? In short, we need to study kama muta outside of the lab to fully understand its social antecedents and consequences.

Additionally, beyond a lack of insight into how kama muta emerges in daily life, literature would benefit from an examination of kama muta in a more communal context. Theorized to emotionally move people to deeper communal relationships (Fiske et al., 2019), kama muta should be visible in the psychosocial experiences of close relationships in particular. Within close relationships, kama muta's prosocial consequences may evidence in *responsiveness*, a communally oriented and core principle of close relationships (Clark & Mills, 2011; Reis & Clark, 2013; Reis et al., 2004). Responsiveness constitutes the interactive process by which partners in a given relationship attend to and support each other's needs, wishes, concerns, and goals (Reis et al., 2004). While actual, "objective" behaviors inform responsiveness (Reis & Clark, 2013), the responsiveness of a relationship is largely driven by the *perception* of attendance and support—in other words, the extent to which an individual *feels* that a close other understands, validates, and cares for them (Hinnekens et al., 2019; Reis et al., 2004). Perceived partner responsiveness (PPR) is important because it features prominently in theoretical models of close relationships and health and wellbeing (Farrell et al., 2023; Reis, 2012; Stanton, Slatcher, et al., 2019) and has robust links with outcomes ranging from sleep quality (Selcuk et al., 2016) to smoking cessation (Britton et al., 2019; Derrick et al., 2013) and even mortality (Stanton, Selcuk, et al., 2019). If kama muta is to have prosocial effects in communal terms, PPR is a theoretically and socially relevant downstream construct to investigate.

6.1 Study 3

We preregistered our research questions and analysis plan on OSF (https://osf.io/24ru5). Study 3 had three primary research questions. Firstly, how common is kama muta in day-to-day life and, when it does occur, what are its most common reported elicitors? The only (unpublished) data on this topic known to the author of this thesis suggests kama muta being felt three times a week (Seibt & Schubert, 2017); however, this research was conducted prior to the formalization of the KAMMUS Two measure, meaning it is unclear what extent of feeling "counted" as kama muta or not, and data were collected solely from undergraduate psychology students. In Study 3, therefore, we retained this first question of kama muta frequency and elicitation as exploratory and largely descriptive, without firm a priori hypotheses.

Secondly, to what extent do kama muta and PPR covary at the daily level? More specifically, is there a link between kama muta and PPR on a given day for an individual (i.e., do they happen together on the same day)? Kama muta theory's emphasis on pro-relational outcomes (Fiske et al., 2019) led us to hypothesize a non-zero, positive relationship between kama muta and PPR on the same day.

Thirdly, at the lagged level, does kama muta experienced on a given day predict PPR the following day for an individual? For similar reasons as the daily level, we expected a positive association such that kama muta experience should be linked with greater perceived partner responsiveness at the following time point. We also tested the alternative lagged path—does PPR experienced on a given day predict kama muta the following day?—though such a relationship seemed less likely because it implies that greater PPR on a given day prospectively determines a communal sharing intensification that would evoke kama muta the following day. In any case, this effect direction was explored for completeness.

It is worth noting that this latter question of lagged kama muta and PPR covariance is not entirely confirmatory. They were exploratory to the extent that kama muta theory, like many social science theories (George & Jones, 2000; Meehl, 1967; Mitchell & James, 2001), do not specify testable temporal expectations. In other words, kama muta theory as yet does not specify exactly *when* kama muta's supposed prosocial outcomes should manifest or become visible. Thus, our third research question was confirmatory insofar as expecting prosocial effects, but more broadly exploratory insofar as whether days were even a relevant unit of time for kama muta.

6.1.1 Method

Participants

Participants were 87 individuals in relationships recruited across three sites, two in the southern United States (n= 14, 16 % of the sample; n = 28, 32% of the sample) and one in the United Kingdom (n = 45, 52% of sample). Twelve percent of participants reported that their partner was also participating in the study, while 55% of the sample reported living with their partner. The mean relationship length was 61.3 months (*SD* = 94.9, Range = 1-508 months) and participants ranged in age from 18 to 66 years (*M* = 26.1, *SD* = 9.6). Participants were reimbursed up to GBP-£20.00 for their participation depending on how much of the study they completed. Full participant demographics can be seen in Table 6.1.

Table 6.1

Demographics of Study 3 Participant Sample

Characteristic	*n*	*% of Sample*
Gender		
Woman	64	73.6
Man	18	20.7
Nonbinary, Genderqueer	3	3.5
Bigender, Genderfluid	3	3.5
Agender, Genderless	1	2.3
Write-In	0	0.0
Race & Ethnicity		
White, Caucasian, Anglo	56	64.4
East Asian	6	6.9
Black, African, Caribbean	1	1.2
Hispanic, Latino, Chicano	12	13.8
South Asian	1	1.2
Aboriginal, Indigenous, Native	0	0.0
Southeast Asian	5	5.8
West Asian	0	0.0
Middle Eastern, Arab	0	0.0
Mixed or Multiple Ethnic Group	5	5.8
Other	1	1.2
Education		
GCSE, O-Levels, or Standard Grades	45	51.7
A-Levels or Highers/Advanced Highers	0	0.0
Vocational degree (e.g., SVQ, HNC, HND)	1	1.2
Undergraduate degree (e.g., BSc, BA)	28	32.2
Master's degree (e.g., MSc, MPhil)	8	9.2
PhD, PsyD	4	4.6

Other Advanced or professional degree (e.g., MD, JD)	1	1.2
Employed		
No	31	35.6
Yes, part-time	36	41.4
Yes, full-time	20	23.0
Relationship Status		
Dating partner and others	0	0.0
Dating partner exclusively	63	72.4
Common-law	2	2.3
Civil Partnership	0	0.0
Engaged	4	4.6
Married	18	20.7
Sexual Orientation		
Heterosexual, Straight	61	70.1
Bisexual, Pansexual	15	17.2
Gay	1	1.2
Lesbian	6	6.9
Demisexual	0	0.0
Asexual	1	1.2
Queer	3	3.5
Other	0	0.0
Student Status		
Yes	62	71.3
No	25	28.7

Note. N = 87. Participants were on average 26.1 years old (*SD* = 9.6, Range = 18-66). Incomes not reported due to complexities of reporting multiple currencies.

Procedure

After providing informed consent, individuals completed baseline assessments in the lab, before completing daily 10-12 minutes online surveys every day for 6 consecutive days. We use demographic information from this baseline survey. The online surveys contained a battery of measures, with those relevant to this study detailed below.

Measures

Kama Muta

Daily kama muta was measured using a shorthand, 6-item version of the KAMMUS Two scale (Zickfeld, Schubert, Seibt, Blomster, et al., 2019) simplified in collaboration with an author of the original scale (J. Zickfeld, personal communication, September, 2021). Items used the question stem, “Please indicate whether you experienced any of the following sensations,

feelings, or actions today" rated on a 5-point scale (0 = *Not at all*, 4 = *A great deal*) to assess each of the four unique core aspects of kama muta: lexical labeling ("felt 'moved' or 'touched'"), physiological sensation (e.g., "felt a warm feeling in the center of my chest"), communal sharing appraisal ("felt/observed an incredible bond"), and prosocial motivation ("felt like telling someone how much I care about them"). Kama muta was constructed as a single latent factor made of up these six observed indicators in the measurement model (see Figure 6.1), though later results (see pp. 63-65) motivated a reduction to a 4-indicator measurement model.

If participants scored higher than 0 on any of the kama muta indicators, they were prompted to indicate what made them feel that way that day, selecting all that applied from a 12-item list covering a range of relationships ("my partner, "a friend", "a stranger", "a family member", "a colleague", "an acquaintance") and things ("Music", "Fictional media", "Nonfictional media", "Nature", "an Animal (e.g., my pet)") or other write-in.

Perceived Partner Responsiveness (PPR)

Daily perceived partner responsiveness was measured using the short-form 4-item version of the Perceived Responsiveness and Insensitivity scale (PRI: Crasta et al., 2021). Items used the question stem, "Today, my partner…", using a 7-point scale (0= *Not at all true*, 6 = *Completely true*) on items like; "…really listened to me", "…seemed interested in what I was thinking and feeling", "…was understanding", and "…tried to see where I was coming from." Perceived partner responsiveness was constructed as a single latent factor made of up these four observed indicators in the measurement model (see Figure 6.1).

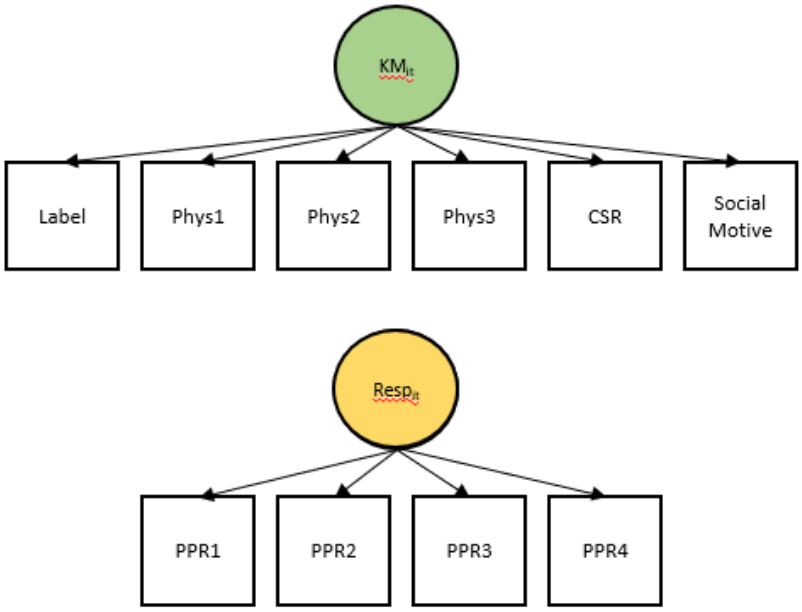
Analytic Method

Beyond the descriptives of kama muta elicitors, the primary statistical analyses of this study relied on a longitudinal panel model. Specifically, this study used a random intercept cross lagged panel model (RI-CLPM), a newer extension of the classic cross-lagged model, which distinguishes between-person differences from within-person processes (Hamaker, Kuiper, et al., 2015). This iteration of cross-lagged panel models (CLPMs) is especially useful since the autoregressive effects of the standard CLPM do not adequately control for time-invariant traits (i.e., relatively stable individual differences), thus making interpretation of causal relationships complex and difficult since the between and within-individual variances get collapsed together (Hamaker, Kuiper, et al., 2015; Usami, 2020). The combination of autoregressive and bi-directional dynamics in the RI-CLPM has also been shown to perform especially well compared to multilevel models of cross-lagged effects (the primary alternative to the SEM-based RI-CLPM), whose unidirectional assumptions can create biases in cross-lagged estimates (Falkenstrom et al., 2022). The RI-CLPM has also performed well against alternative SEM approaches to modeling prospective effects over time, which has made it the current standard for prospective modeling, especially for attending to within-person process (Orth et al., 2021).

We used a multiple indicator RI-CLPM (Mulder & Hamaker, 2020)—i.e., one utilizing latent variable representations of our constructs rather than rely on individual observed indicators—to leverage structural equation model's (SEM) ability to utilize a latent variable paradigm (Bollen, 2003; Borsboom et al., 2003). The model included both (residual) covariances at a given time point as well as the aforementioned autoregressive and cross-lagged effects. The primary model, presenting these main variables and parameters of interest, can be seen in Figure 6.2.

Figure 6.1

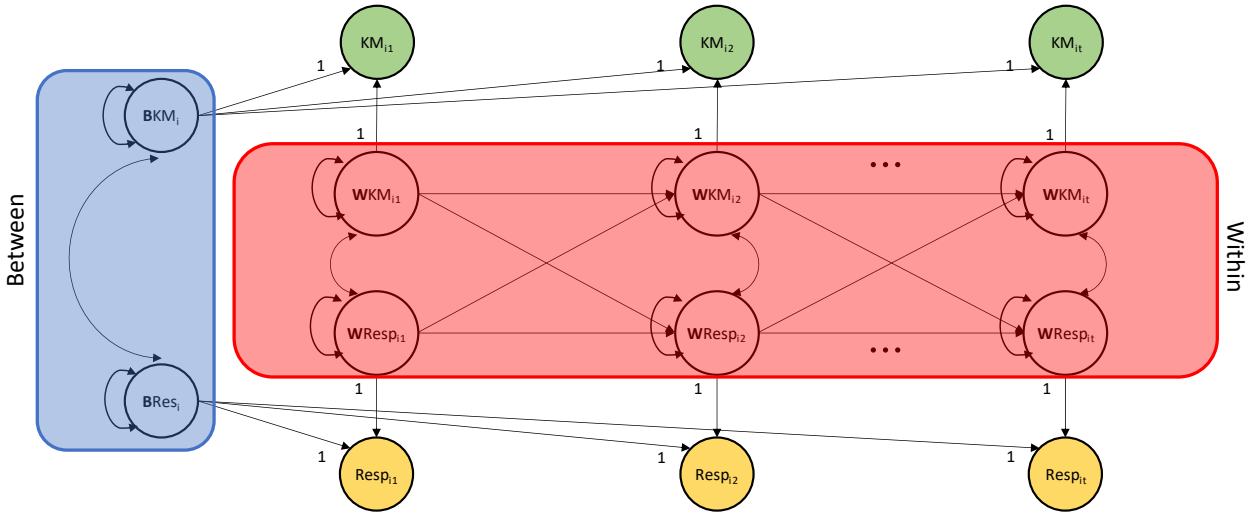
Measurement Model of RI-CLPM



Note. Measurement model of the base model of interest. The kama muta latent variable is a single factor comprised of 6 observed indicator variables. The responsiveness latent variable is a single factor comprised of 4 observed indicator variables. Items 2 and 3 of the kama muta latent variable (Phys1; "Today, I had moist eyes or cried", Phys2; "Today, I had goosebumps or chills") were later removed due to low factor loading (see Results section 6.1.2 for more detail).

Figure 6.2

Structural Model of the RI-CLPM



Note. Model with primary parameters of interest, denoted as latent variables. Each time occasion has a latent variable (for kama muta and responsiveness), the trait-like part of which is reflected in the random intercepts, while the state-like part captures the within-person dynamics of the process over time. The model evaluates within-person deviation; the cross-lagged effects indicate a within-person change from trait level of one construct prospectively affects within-person change from trait level of another construct (Orth et al., 2021). This is to say, using one of our hypotheses, when individuals experience greater KM *than usual for them*, we would expect that individual to experience greater PPR *than their usual* tomorrow.

Models were estimated using lavaan in R (Rosseel, 2012) with maximum likelihood estimation, and missing data handled with full information maximum likelihood (Jakobsen et al., 2017). Model fit metrics were decided a priori against common criteria for assessing good model fit; RMSEA < .05, TLI > .95, CFI > .95 (Hu & Bentler, 1998). We also recognized that goodness of fit cutoff evaluations are difficult to generalize, as subsequent benchmark iterations (e.g., use and standards of SRMR fit index) have shown variability in making objective claims of good fit (Marsh et al., 2004; Maydeu-Olivares et al., 2017). Modification indices were consulted for theoretically relevant potential re-specifications to the model. The models were tested for weak and factorial (Meredith, 1993) and coefficient (Mulder & Hamaker, 2020) invariances.

6.1.2 Results

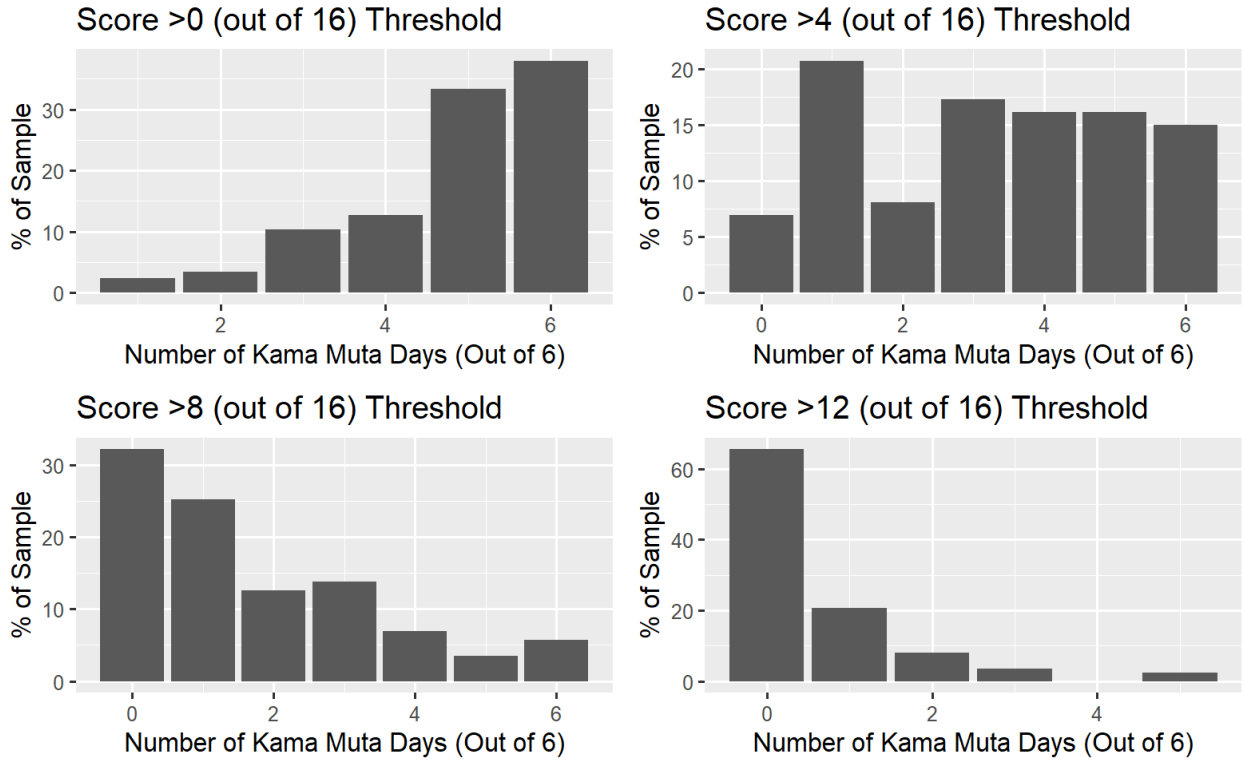
Kama Muta in Daily Life: How Often Did Kama Muta Happen?

To represent kama muta experienced on a given day, we calculated a sum score of the kama muta items (excluding items 2 and 3; see next section for factor loading details that motivated this change). Sum score was used in this case to more closely parallel the survey logic design (i.e., participants were only prompted for further evoker questions if they recorded a non-zero response on any of the kama muta items) and for clarity in showing absolute scores (e.g., rather than relative, standardized scores) across different thresholds. Since the quantitative boundary of kama muta remains unclear (Zickfeld, Schubert, Seibt, Blomster, et al., 2019), we evaluated a spread of kama muta at multiple thresholds.

Out of 522 days recorded across the study period, 422 recorded at least some non-zero kama muta score (80.84% of total days, an average of 4.85 days out of 6 had a kama muta experience by this most minimal threshold). When looking at a stricter threshold, (e.g., score greater than 12 out of a maximum 16, or ¾ of total scale), 51 days out of 522 recorded a kama muta event (9.77% of total days, an average of .59 days out of 6—roughly once every 10 days—had a kama muta experience at this high threshold). Figure 6.3 shows the percent of the sample who experienced a given amount of “days with kama muta” as marked by different KAMMUS Two scale thresholds.

Figure 6.3

Kama Muta Scores Meeting Different Scale Thresholds (Study 3)



Note. Proportion of people who experienced X number of days experiencing kama muta, as split by increasingly higher thresholds for having experienced kama muta as measured by the KAMMUS Two. For example, in the upper right figure, approximately 15% of the sample experienced kama muta (as defined by scoring greater than 4 out of a maximum 16 score) all 6 days of the period.

Kama Muta in Daily Life: Who/What Evoked the Kama Muta?

The most common evokers of kama muta noted by participants were romantic partners. No matter the kama muta threshold, partners took up about one quarter of all evokers mentioned. Family and friends were the next most common elicitors mentioned across all thresholds, accounting for approximately 14% and 13% of all listed kama muta evokers, respectively (see Table 6.2). Thus, approximately 50% of all listed evokers of kama muta mentioned by participants involved at least one close other.

Table 6.2

Top 5 Reported Evokers per Kama Muta Threshold

	Proportion of Scale Threshold							
	>0		>4/16		>8/16		>12/16	
Evoker	*n*	**%**	*n*	**%**	*n*	**%**	*n*	**%**
Partner	336	**25.6**	240	**24.5**	135	**24.7**	47	**22.9**
Family	193	**14.7**	148	**15.1**	76	**13.9**	30	**14.6**
Friend	181	**13.8**	132	**13.5**	68	**12.5**	26	**12.7**
Music	156	**11.9**	122	**12.4**	77	**14.1**	28	**13.7**
Nature	106	**8.1**	82	**8.4**	50	**9.2**	20	**9.8**
Remaining								
Fiction Media	94	**7.2**	74	**7.5**	44	**8.1**	18	**8.8**
Animal	95	**7.2**	63	**6.4**	37	**6.8**	11	**5.4**
Colleague	46	**3.5**	35	**3.6**	14	**2.6**	5	**2.4**
Non-Fiction Media	43	**3.3**	39	**4.0**	24	**4.4**	11	**5.4**
Acquaintance	27	**2.1**	19	**1.9**	8	**1.5**	5	**2.4**
Stranger	18	**1.4**	14	**1.4**	7	**1.3**	3	**1.5**
Write-In	17	**1.3**	13	**1.3**	6	**1.1**	1	**0.5**
Total	1312		981		546		205	

Note. Top 5 evokers listed first, with remaining additional evokers below. Participants could report more than one evoker per (potential) kama muta event. Bolding is for visual distinction of percentages from counts. Interestingly, music became a larger proportion of listed evokers listed when using a high threshold for kama muta experience, surpassing friends.

Kama Muta and PPR Covariance Models

Initial measurement models suggested two items ("Today, I had moist eyes or cried" and "Today, I had goosebumps or chills") from the kama muta scale loaded notably poorly onto the kama muta factor, with loadings all below .50 and even reaching below .20 (see Table 6.2 for full loadings). Furthermore, some of the kama muta evoker write-ins described contexts that seem reasonable to score highly on the aforementioned items yet would not reflect a kama muta factor (e.g. "Pain from cramps made me cry" or "Found out I have a stress fracture in my hip, ending my track season"). The two items were therefore removed from these analyses.

Table 6.2

Measurement Model Factor Loadings: Removing Kama Muta Items 2 & 3

Item	Fixed Estimate (95% CI)	SE	Loading Per Day					
			1	2	3	4	5	6
Model 1: All Original Items								
Factor 1: Kama muta. "Today, I …"								
…felt 'moved' or 'touched'	**.61 [.53, .69]**	**.04**	**.74**	**.63**	**.65**	**.71**	**.71**	**.81**
…had moist eyes or cried	.11 [.04, .18]	.03	.15	.13	.14	.18	.16	.15
…had goosebumps or chills	.23 [.18, .28]	.03	.36	.45	.41	.43	.39	.49
…felt a warm feeling in the center of my chest	**.67 [.59, .74]**	**.03**	**.75**	**.75**	**.76**	**.79**	**.76**	**.82**
…felt/observed an incredible bond	**.77 [.69, .86]**	**.04**	**.80**	**.83**	**.79**	**.82**	**.81**	**.82**
…felt like telling someone how much I care about them	**.72 [.64, .80]**	**.04**	**.79**	**.76**	**.79**	**.79**	**.78**	**.75**
Factor 2: PPR. "Today, my partner…"								
…really listened to me	**1.02**	**.05**	**.91**	**.92**	**.88**	**.90**	**.88**	**.93**
…seemed interested in what I was thinking and feeling	**.96**	**.05**	**.89**	**.83**	**.82**	**.83**	**.79**	**.82**
…was understanding	**.94**	**.04**	**.82**	**.86**	**.89**	**.92**	**.88**	**.87**
…tried to see where I was coming from	**.88**	**.05**	**.81**	**.80**	**.76**	**.82**	**.79**	**.75**
Model 2: Sans Kama Muta Items 2 & 3								
Factor 1: Kama muta. "Today, I …"								
…felt 'moved' or 'touched'	**.58 [.66, .83]**	**.04**	**.72**	**.61**	**.63**	**.69**	**.69**	**.77**
…had moist eyes or cried	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
…had goosebumps or chills	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
…felt a warm feeling in the center of my chest	**.65 [.58, .73]**	**.04**	**.73**	**.74**	**.76**	**.77**	**.75**	**.82**
…felt/observed an incredible bond	**.77 [.69, .85]**	**.04**	**.81**	**.83**	**.79**	**.83**	**.80**	**.83**
…felt like telling someone how much I care about them	**.72 [.64, .80]**	**.04**	**.80**	**.76**	**.80**	**.81**	**.79**	**.76**
Factor 2: PPR. "Today, my partner…"								
…really listened to me	**1.02**	**.05**	**.91**	**.81**	**.88**	**.89**	**.88**	**.92**
…seemed interested in what I was thinking and feeling	**.95**	**.05**	**.89**	**.83**	**.82**	**.83**	**.79**	**.82**
…was understanding	**.94**	**.04**	**.82**	**.86**	**.89**	**.92**	**.88**	**.87**
…tried to see where I was coming from	**.88**	**.05**	**.81**	**.80**	**.76**	**.81**	**.79**	**.75**

Note. N = 87 individuals, across 522 total days. Model 1 refers to the measurement model when weak and strong restrictions are applied (fixed loadings and item intercepts across the timespan). Notably, kama muta items 2 and 3 load poorly onto the kama muta factor. Model 2, in the primary analyses, reports the subsequent measurement model under the same restrictions but without kama muta items 2 and 3. Bold reflects final retained items. Loadings were fixed but daily loadings appear to vary slightly due to the model's standardization at each time-point.

Following the removal of the two extraneous kama muta items, the model was refit and tested for measurement invariance across the time window. Measurement invariance tests evaluate the extent to which a given measure varies due to conditions *unrelated* to the construct of interest (Meredith, 1993; Sakaluk et al., 2021). In the concept of latent variables, measurement invariance is typically thought of in two ways: weak and strong factorial invariance (Meredith, 1993). Weak invariance holds when *factor loadings* are the same across time. In contrast, variable factor loadings would suggest that the construct in question is interpreted differently at each time point, which makes it difficult to make meaningful comparisons across occasions (Mulder & Hamaker, 2020). Strong invariance is typically assessed after establishing weak invariance (Vandenberg & Lance, 2000). Strong invariance goes a step further, when the loadings *and intercepts* are the same across time, which implies that not only are factor scores comparable over time, but the actual scores are as well (Mulder & Hamaker, 2020). These invariances are most commonly tested using progressive, nested tests where a model is fit and tested against the same model with constraints reflecting weak or strong invariance (Newsom, 2015). If the constrained model is *not* statistically significantly different, it implies the given constraints do not appreciably worsen the model—i.e., that the constraints *are* tenable—and we can conclude a given level of measurement invariance holds. If the models are statistically significantly different, researchers typically examine, and remove constraints for, whichever loading or measurement occasion insists on remaining variant and continue with a model of partial measurement invariance (Newsom, 2015). In our case, a chi-square difference test showed that a model with weak measurement invariance constraints (χ^2 (1093) = 2255) did not perform appreciably worse than one with free estimates ((χ^2 (1053)=2217 ; $\Delta\chi^2(40) = 38.34$, $p = .55$), suggesting the constraints are tenable. Furthermore, a model with strong measurement invariance constraints (χ^2 (1123) = 2289) did not perform appreciably worse than one with weak constraints (χ^2 (1093) = 2255; $\Delta\chi^2(30) = 33.64$, $p = .30$). A model with strong factorial invariance was thus carried forward in the analyses.

After establishing measure invariance, effects invariance across the diary-period was evaluated. Effects invariance refers to whether the effects are variable across the period. If a chi-square difference test shows this constraint is not tenable, we can conclude that some of the covariance effects differ (Mulder & Hamaker, 2020). For a hypothetical example, it could be that the autoregressive effect of PPR from day two leading into day three is different than from day five leading into day six. A model with constrained day-of, within-person kama muta and PPR covariances (χ^2 (1128) = 2295) did not perform appreciably worse than one with free estimates ((χ^2 (1123)=2289 ; $\Delta\chi^2(5) = 6.38$, $p = .27$), suggesting the daily covariance constraints were tenable. This model was then tested for regression effects invariance. A model with constrained autoregressive and cross lagged effects (χ^2 (1144) = 2321) did not perform appreciably worse than the model with free regression estimates ($\Delta\chi^2(16) = 25.58$, $p = .06$). This final model was then evaluated for overall model fit, with fit statistics suggesting moderate fit ($CFI_{robust} = .80$; $TLI_{robust} = .80$; $RMSEA_{robust} = .08$, 90% CI [.07, .10]; SRMR = .13). Modification indices did not reveal any theoretically-relevant potential re-specifications to the model.

Same-Day Covariance

Kama muta and PPR covaried consistently on the same day. Within factors of kama muta and PPR were positively correlated, r = .51 [95% CI; .40, .62], showing that when someone had higher than usual kama muta on one day, they also reported higher than usual PPR that same day. Furthermore, the between factor random intercepts of kama muta and PPR were positively correlated, r = .60 [95% CI; .40, .79], showing that individuals who on average reported more kama muta also on average reported more PPR (and/or vice versa).

Lagged Covariance

Accounting for autoregressive effects (e.g., carryover of yesterday's PPR affecting today's PPR), fixed regression effects did not show statistically significant cross-lagged effects (i.e., yesterday's kama muta did not affect today's PPR; yesterday's PPR did not affect today's kama muta). The autoregressives, however, indicated that when individuals reported more than their average kama muta, they also reported higher than their average kama muta the following day (b = .28 [95% CI; .02, .54], p = .03). Similarly, when individuals reported more than their average PPR, they also reported higher than their average PPR the following day (b = .28 [95% CI; .08, .47], p = .006).

6.1.3 Discussion

Following a sample of romantically-involved individuals across six days, we found kama muta at varying levels occurred at least once a week and most often involved someone from participants' closest relationships. While hypothesized to occur in everyday life outside of culturally structured events (Fiske et al., 2019), to our knowledge this is the first study to record how often, and from what, kama muta (as described by the KAMMUS Two) occurs in daily life. Besides autoregressives, we did not see robust evidence for kama muta prospectively affecting later PPR, nor PPR to later kama muta for a given individual. However, within-person variability of kama muta was highly correlated with within-person variability of PPR on a given day, suggesting that both tend to co-occur on the same day.

Kama muta theory posits that the emotional experience of feeling moved has the evolutionarily adaptive function to discriminately devote and commit people to their communal relationships (Fiske et al., 2019). Our finding that kama muta is evoked largely from partners, family, and friends (in that order) supports that notion. Previously hypothesized hierarchies of communal relationship partners typically range in a near exact sequence: from spouses, to immediate family, to close friends as the most communal, with strangers and acquaintances as the least (Clark & Mills, 2011; Reis et al., 2004). While much work has shown that kama muta is evoked from observing communal sharing intensifications (Blomster Lyshol, Seibt, et al., 2022; Schubert et al., 2018; Swarbrick et al., 2021), our findings further that idea by showing that

people most often attribute kama muta experiences in their daily lives to communal relational partners. Thus, kama muta indeed appears to belong to the domain of communal relationships.

Notably, the proportions of each evoker category remained largely the same across different thresholds of kama muta. This suggests that the "most" kama muta experiences are not more (or less) associated with partners, family, and friends than less intense kama muta experiences. Interestingly, music, the next most frequent and highest non-social evoker, appears to slightly increase in prevalence across escalating scale thresholds, rising from nearly 12% of all kama muta experiences to nearly 14% of the more intense kama muta experiences, even surpassing friends. Humans intuitively pick up on the usage and salience of emotions in music (Swaminathan & Schellenberg, 2015), so it is perhaps no surprise music is the most commonly reported medium for experiencing self-transcendent or inspiring feelings (Raney et al., 2018). Music frequently evokes shivers, chills, and goosebumps (Grewe et al., 2010), making it quite likely that we would see many music reports. A. P. Fiske (2004) has previously noted how certain media favors the creation of certain relationships, noting for example that particular narrative frames are highly tied to communal sharing relationships since they potently evoke kama muta (e.g., Fiske et al., 2017). Highly emotional music is related to narrative immersion (Strick et al., 2015) and, considering humans rely on narrative organizations for memory (Black & Bower, 1979; Bousfield, 1953; Miller, 1956; Tulving, 1962), it makes sense to think music as an especially salient medium for evoking kama muta feelings. In other words, music is a highly emotional, narrative-delivering medium so it makes sense that so many people would report it as a common kama muta evoker.

The lack of cross-lagged associations between individuals' kama muta experience and their PPR can be interpreted from at least two lenses. More liberally, the lack of cross-lagged effects but presence of same-day correlations somewhat supports Fiske et al.'s (2019) claim that kama muta "instantly update[s]" (p. 79) communal devotion and commitment. Our findings provide initial evidence that kama muta and PPR do seemingly go together and may suggest the span of days are perhaps not "soon" enough. More conservatively, our findings can be framed as a critique. These results show a near zero cross-lagged kama muta effect on what is the prime ingredient to communal relationships (PPR) even after accounting for between-person differences. That means that when people experienced more (or less) kama muta than their usual, they did not report feeling more (or less) cared for, validated, or understood by their partner than usual the following day. In other words, we did not find evidence that an individual's kama muta experience prospectively makes themself feel more communal in their relationships. Supplementing this idea, we did not find evidence for the alternative pathway—greater PPR associated with greater kama muta the following day—which one could have expected since PPR tends to lower barriers to prosocial appraisals, like reducing ego-protective self-serving biases (Reis et al., 2022) and increasing open-mindedness (Itzchakov & Reis, 2021; Itzchakov et al., 2024). Ultimately, if changes in kama muta are not prospectively linked to changes in communally-oriented appraisals like PPR (or vice versa) across even a single day, then it becomes difficult to see how the downstream impacts of communal sensitivity instilled

by kama muta should warrant such wide-ranging societal implications (e.g., on cultural institutions, practices, and artifacts) as suggested by Fiske et al. (2019).

However, these data focus on an individual's kama muta experience impacting their own communal experience—e.g., if Jane feels moved today, is that linked to *her* feeling more cared for, validated, and understood by her partner tomorrow? (The answer, apparently not). Perhaps kama muta is a more relational process than that; it may be the case that an individual's kama muta experience may not deliver such communal "benefits" to themselves, but instead delivers them to their (communal) partner—if Jane feels moved today, is that linked to *her partner* feeling more cared for, validated, and understood tomorrow. Therefore, whether a person's experience of kama muta affects someone else's experience of feeling cared for, validated, and understood remains an important standing question for this issue.

Limitations and Extensions

Despite the robustness of the RI-CLPM within a longitudinal dataset, the complexity of specifying RI-CLPMs with latent factors limits our abilities to add covariates. For example, we originally wanted to add covariates, such as gender (e.g., women tend to experience more kama muta; Zickfeld, Schubert, Seibt, Blomster, et al., 2019) or general daily positive affect, in our preregistered analyses. However, we encountered gross model misfit and convergence failures when we added these extensions to our primary model. While the RI-CLPM would theoretically aggregate the stable trait-like variance (theoretically, like gender) relevant for kama muta and PPR with the rest of the random intercept variance, thus preserving the interpretation of the within-person effects, that still means gender's (or other covariates) specific variance is unknown. We also found that one of the institutions had variable kama muta scores (see Appendix 3, p. 175 for more information). While our findings emerged from models that passed measurement invariance tests, reducing concern over what appears to be an institution data integrity effect, that cannot give insight into how or why data collection from a specific institution would have different score distributions.

Finally, these data are of romantically-involved individuals, which creates at least three relevant considerations. To start, the distribution of evokers we found is biased towards partner inclusion (e.g., single individuals would not report as many "partner" evokers, if any). Secondly, approximately 12% of participants reported their same partner was also in this sample. These data did not include dyadic markers thus we could not track and account for such interdependence in those respective scores. Thirdly, as alluded to in our discussion, these results only speak to how individuals' kama muta affects their own communal experiences, while kama muta is perhaps more situated in how individuals' kama muta translates to *others*' communal experiences (Fiske et al., 2019). Thus, examining kama muta in a dyadic dataset would not only allow us to better account for interdependence, but also give us a clearer

picture of how kama muta contributes (if at all) to the daily dynamics of communal appraisals in actual relationships. We turn to that question next.

7 Chapter 7: Close-Others and Kama Muta, Dyadic Diary

7.0 Study Background

Previously, Study 3 showed that kama muta most often is elicited by romantic partners and occurs alongside perceived partner responsiveness (PPR) day-to-day. Thus, kama muta appears to be evoked by communal relational partners and is even highly correlated with a relationally critical, communally oriented appraisal like PPR. However, kama muta was not associated with PPR within a given individual from one day to the next. Taking a hypothetical Jane and John Doe; Jane feeling more kama muta today was not associated with her feeling more cared for, validated, and understood tomorrow. But might the effects of this communally oriented emotion extend beyond a given individual? In other words, if Jane's kama muta experience does not affect her own PPR, might John's kama muta experience do it instead?

As mentioned in Study 3, responsiveness is an interactive process (Reis & Clark, 2013), wherein one partner expresses a need or goal that the other partner engages with. For example, one's expression of, *and the other's reception and reaction to,* vulnerability describes the process of intimacy (Reis & Shaver, 1988; Willems et al., 2020). Consequently, PPR is an inherently relational frame (Reis et al., 2004) —how a given person feels *other relational partners* respond to their needs. Communal relationships, what kama muta is theoretically tied to in both evocation and outcome, are rooted in *mutual* responsiveness (Clark & Mills, 2011); thus, kama muta's consequences may emerge in a context that includes both individuals. Considering that kama muta is thought to commonly occur with and around other people such as with storytelling, in religious rituals, or at social events (Fiske et al., 2017; Fiske et al., 2019), one might reasonably think the effects of one person's kama muta may spill over into someone else's psychosocial experience, especially so to a communal relational partner. Romantic partners are perhaps the quintessential close relationship dyad to study not only because they are theoretically considered the most communal (Clark & Mills, 2011; Reis et al., 2004), but also because Study 3 showed that romantic partners are the most common evokers of kama muta (at least for partnered individuals). In summary, one's kama muta may have something to do with *others'* psychosocial experience of communality and, if so, romantic dyads are perhaps the best place to start investigating.

7.1 Study 4

We preregistered our research questions and analysis plan on OSF (https://osf.io/fdhk7). Most simply, Study 4 operates as a replication and extension of Study 3's two primary questions of kama muta in daily life and kama muta/PPR covariance. Firstly, Study

4 continues Study 3's tracking of kama muta evokers and frequency, allowing us to examine whether Study 3's patterns emerge with a new, larger sample. In other words, we can again ask, how often does kama muta happen and who elicits it?

Secondly, we can also attempt to replicate the findings of how an individual's kama muta and PPR covary across time. Study 3 only included individuals (without tracking their partners), essentially examining how their psychological qualities influence *their own* psychological qualities. Thus, we could consider those associations as "actor effects", as opposed to "partner effects" where one person influences *another person* (Kenny, 1996). That is to say, while Study 4 expands our view to consider partner effects as well, it is worth noting the actor effects seen in this study serve as de facto replication tests for Study 3's findings of kama muta and PPR (daily and lagged) covariance.

Study 4's most notable extension is the inclusion of both dyad members. As alluded to in Study 3, we did not have visibility into how kama muta experiences impact *others'* appraisals of PPR (or vice versa), nor did we have the dyadic tracking data to account for couple interdependence (for those participants who reported their partner was also in the study). Kama muta's theoretical social emphasis, particularly as experienced with others (Fiske et al., 2019), suggests an importance in how others' experiences of communality (i.e., kama muta) would implicate one's own emotional and social experience (and vice versa). To that end, is there a link, on the same day or lagged, between a person's kama muta and their *partner's* PPR (or vice versa)?

A final point to note is that these data come from a multi-phase intervention project. As part of this project, and immediately before their daily diary collection period, all individuals first participated in an experiment designed to test a new responsiveness intervention. Considering couples in the experimental condition reported increased responsiveness compared to those in the control (Stanton et al., 2024), it is important that we attend to, or otherwise control for, the potential spillover influence of this responsiveness intervention on kama muta experiences. Did the responsiveness intervention affect experiences of kama muta (a) on the day of the activity and/or (b) across the diary period?

7.1.1 Method

Participants

The initial baseline sample consisted of 126 couples in the United Kingdom, recruited via research volunteer panels, online advertisements, and printed flyers. Participants were reimbursed up to GBP-£75.00 for their participation depending on how many phases of the study they completed. Partners were at least 18 years of age, fluent in English, currently involved in a relationship of at least three months, saw their partner in-person at least five days a week, and had regular access to the internet. Both partners were required to participate in

the study. Of the original 126 couples, five couples dropped out before Phase 2 resulting in a sample of 121 couples (n = 242) in the current research. Participants had an average age of 32.2 years (*SD* = 14.0, Range = 19-78). Approximately 79% of participants reported living with their partner. The mean relationship length was approximately 100 months (*SD* = 131.9, Range = 6 – 630 months). Most participants (82.64%) were in man-woman dyads. Full participant demographics can be seen in Table 7.1.

Table 7.1

Demographics of Study 4 Participant Sample

Characteristic	*n*	*% of Sample*
Gender		
Woman	125	51.7
Man	109	45.0
Nonbinary, Genderqueer	5	2.1
Bigender, Genderfluid	0	0.0
Agender, Genderless	3	1.2
Write-In	0	0.0
Race & Ethnicity		
White, Caucasian, Anglo	203	83.9
East Asian	5	
Black, African, Caribbean	5	2.1
Hispanic, Latino, Chicano	5	2.1
South Asian	5	2.1
Aboriginal, Indigenous, Native	0	0.0
Southeast Asian	7	2.9
West Asian	0	0.0
Middle Eastern, Arab	0	0.0
Mixed or Multiple Ethnic Group	9	3.7
Other	3	1.2
Education		
GCSE, O-Levels, or Standard Grades	1	.4
A-Levels or Highers/Advanced Highers	39	16.1
Vocational degree (e.g., SVQ, HNC, HND)	20	8.3
Undergraduate degree (e.g., BSc, BA)	103	42.6
Master's degree (e.g., MSc, MPhil)	64	26.5
PhD, PsyD	6	2.5
Other Advanced or professional degree (e.g., MD, JD)	9	3.7
Employed		
No	69	28.5
Yes, part-time	50	20.7

Yes, full-time	123	50.8
Relationship Status		
Dating partner and others	4	1.7
Dating partner exclusively	114	47.1
Common-law	34	14.1
Civil Partnership	3	1.2
Engaged	19	7.9
Married	68	28.1
Income		
£0-£12,500	80	33.3
£12,501-£14,549	8	3.3
£14,550-£24,944	48	20.0
£24,945-£43,430	65	27.1
£43,431-£150,000	39	16.3
£150,001+	0	0.0
Sexual Orientation		
Heterosexual, Straight	170	70.3
Bisexual, Pansexual	48	19.8
Gay	5	2.1
Lesbian	12	5.0
Demisexual	0	0.0
Asexual	2	.8
Queer	4	1.7
Other	1	.4
Dyad Type		
Man-Woman	200	82.6
Woman-Woman	20	8.3
Woman-Agender/Genderless	6	2.5
Man-Nonbinary/Genderqueer	8	3.3
Man-Man	6	2.5
Woman- Nonbinary/Genderqueer	2	.8
Student Status		
Yes	82	66.1
No	160	33.9

Note. N = 242. Participants were on average 32.3 years old (SD = 14.0, Range = 19-78).

Procedure

The main project was comprised of 5 phases, but this current study used data only from Phase 1 through Phase 3. All phases of the study were completed online. Phase 1 was a 20–30-minute baseline survey, which was used in this study to report sample demographic data (see Table 7.1). Phase 2 was a 35–40-minute Zoom session couples attended together 3-5 days after

Phase 1. In the session, couples were randomly assigned to either an intervention or control condition, completed videorecorded behavioral tasks, then completed a 10–15-minute post-intervention questionnaire. We used Phase 2 data to record what condition participants were in, and to evaluate the immediate day-of effect of the intervention on kama muta. Phase 3 was a 14-day diary period immediately following the session of Phase 2, during which participants each completed a 10–12-minute survey at the end of each day for 14 consecutive days. We describe the measures that are relevant to this project below.

Measures

Phase 2 (Intervention Session) Measures

Responsiveness Intervention

Couples were randomly assigned to the responsiveness intervention or control condition. In the intervention condition, partners were briefly educated about what responsiveness is, why it is important, and how it manifests in relationships. Partners then took turns leading 7-minute discussions about when and how they perceived responsiveness from their partner in their relationship (e.g., the types of things their partner did that they thought demonstrated responsiveness, things they wished their partner would do to demonstrate responsiveness etc.). The order of which partner went first was randomized and, although one partner was asked to lead the discussion, both partners were told they could respond and contribute as much as they would under normal circumstances. The responsiveness intervention was created by Stanton et al. (2024)

In the control condition, partners were given two 7-minute problem solving tasks to work through as a couple (the order of the two tasks given out was randomized). In both control tasks, partners were asked to imagine a survival scenario and given a list of materials to rank-order in terms of their importance for survival. Partners were told they must come up with a ranking of the materials in terms of importance as a couple. One task involved imagining being stranded on the moon, while the other in the Northern Canadian wilderness in winter. The lists of items for the moon and Canadian tasks have been used in previous cooperation tasks, initially taken from NASA and wilderness experts respectively (Hall & Watson, 1970; Johnson & Johnson, 1991).

Kama Muta

After the intervention, kama muta was measured with similar measures as in Study 3. A shorthand 6-item version of the KAMMUS Two (Zickfeld, Schubert, Seibt, Blomster, et al., 2019) simplified in collaboration with an author of the original scale (J. Zickfeld, personal communication, September, 2021) using the question stem, “Please indicate whether you experienced any of the following sensations, feelings, or actions today” rated on a 5-point scale (0 = *Not at all*, 4 = *A great deal*) on each of the four unique core aspects of kama muta: lexical

labeling ("felt 'moved' or 'touched'"), physiological sensation (e.g. "felt a warm feeling in the center of my chest"), communal sharing appraisal ("felt/observed an incredible bond with my partner"), and prosocial motivation ("felt like telling my partner how much I care about them").

A 6-indicator single factor model of kama muta was initially tested for consistency with the original scale, with expectation of reducing to a similar 4-indicator model as found in Study 3. Results (presented later, p. 80) again motivated a return to this 4-indicator model.

Phase 3 (Daily Diary) Measures

Kama Muta (Daily)

Phase 3 items for kama muta were the same as those previously used in Study 3. The items had a question stem reflecting the day; "Please indicate whether someone or something made you experience any of the following sensations, feelings, or actions **today**" (emphasis in-survey) rated on a 5-point scale (0 = *Not at all*, 4 = *A great deal*) to assess each of the four unique core aspects of kama muta: lexical labeling ("felt 'moved' or 'touched'"), physiological sensation (e.g. "felt a warm feeling in the center of my chest"), communal sharing appraisal ("felt/observed an incredible bond"), and prosocial motivation ("felt like telling someone how much I care about them"). These were comparable to the items from Phase 2 but two items that were partner-specific in the Phase 2 intervention became more general in scope (e.g., "Today, I felt like telling someone how much I care about them"; "Today, I felt/observed an incredible bond").

As in Study 3, if participants scored higher than 0 on any of the kama muta indicators, they were prompted to indicate what made them feel that way that day, selecting all that applied from a 12-item list covering a range of relationships ("my partner, "a friend", "a stranger", "a family member", "a colleague", "an acquaintance") and things ("Music", "Fictional media", "Nonfictional media", "Nature", "an Animal (e.g., my pet)") or other write-in.

Perceived Partner Responsiveness (PPR)

Daily perceived partner responsiveness was measured using the 4-item responsiveness subscale of the 8-item version of the Perceived Partner Responsiveness and Insensitivity scale (Crasta et al., 2021). Items used the question stem, "Please use the scale to indicate how true the following statements are of your partner **today**" (emphasis in-survey) rated on a 7-point scale (0 = *Not at all true*, 6 = *Completely true*) on items like, "Today, my partner was understanding", and "Today, my partner tried to see where I was coming from."

Analytic Method

We used the Actor-Partner Interdependence Model (APIM) with indistinguishable dyads to analyze these dyadic data. The APIM is among the most widely used models of dyadic relationships because it elegantly presents a statistical methodology to represent a conceptual

view of relational partners as interdependent (Kashy & Kenny, 2000; Kenny, 1996). Conceptually, in relationships, interdependence refers to the impact of one person's emotion, cognition, or behavior on their partner (Kelley & Thibaut, 1978). Romantic relationships are a prime example of interdependence, wherein one partner's characteristics and inputs (e.g., relationship satisfaction) impact the other's outcomes (Kelley et al., 2003; Rusbult & Van Lange, 2003). Statistically speaking, this means observations for two partnered individuals are correlated to a non-trivial degree, also known as *nonindependence of observations* (Cook & Kenny, 2005). Analyzing dyads thus requires some attendance to this within-couple correlation to avoid undue bias (Kenny, 1996). Also, since our data is not exclusively men-women dyads, we use an indistinguishable dyad structure (Kenny, 1996). *Indistinguishable dyads* are dyads in which both individuals are considered interchangeable with another, thus one partner is not "distinguishable" from the other (e.g., individuals in parent-child and men-women dyads are *distinguishable* by adulthood and binary gender, respectively).

For the primary analyses of kama muta and PPR over time, we fit a longitudinal-APIM (L-APIM) with multi-level modeling (MLM). MLM naturally fits APIM analyses since the MLM notation of nested grouping variables smoothly translates to reflecting within-dyad residual dependency (i.e., a couple grouping variable for partners) and within-individual residual dependency across time (i.e., an individual grouping variable for multiple observations). To create a multivariate model (i.e., modeling both partners) from what is otherwise technically a univariate approach (i.e., MLM), analysts use what is called a pairwise long format data structure (Kenny et al., 2006; Ledermann & Kenny, 2014). In a pairwise dataset, each dyad member's data is recorded with their respective partner on the same line for a given time point. Indistinguishable dyads are actually structurally simpler in this pairwise setup since the data, and resulting model, only need consider a single actor and partner effect pooled across individuals within each dyad (Iida et al., 2023). Kama muta and PPR scores for each participant were extracted from a confirmatory factor analysis (CFA) akin to that specified in Study 3—a 4-indicator model of kama muta and PPR, respectively—to reflect their latent constructs without measurement errors (e.g., rather than simply summing the scores of the given measures). We used between- and within- person centered variables in the models to evaluate the effects of within-subject variance separated from, and accounting for, between-person variability (Bolger & Laurenceau, 2013), mimicking the decomposition of between and within-person variance used in Study 3.

The final L-APIM MLM regressed the actor's within-person PPR variation by the actor and partner's previous day within-person kama muta and PPR variation, controlling for the actor's and partner's between-person kama muta and PPR variance, and controlling for initial Phase 2 intervention condition and time alongside random intercepts for individuals and couples. A second model was run with actor within-person kama muta variation as the outcome variable. To evaluate the impact of the responsiveness intervention on kama muta on the day of the intervention, we ran a separate multi-level model with a random intercept for each couple, regressing kama muta by condition. Multi-level models were run in R using lme4 (Bates

et al., 2015). The above analysis plan with MLM was pre-registered as a fallback option to a more complicated L-APIM in SEM that was attempted first but failed due to gross identification and convergence failures. See Appendix 4 (p. 177) for more detail on that initial SEM decision and the difficulties associated with that method in this context.

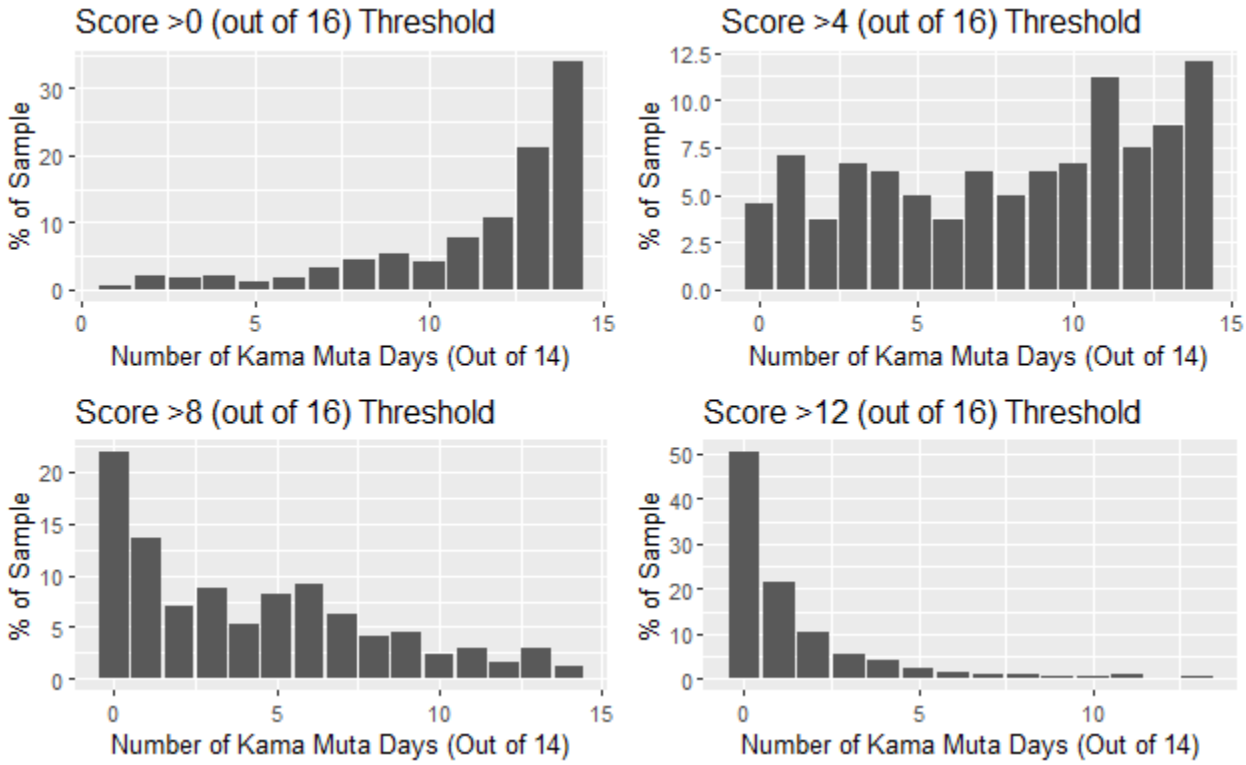
7.1.2 Results

Kama Muta in Daily Life: How Often Did Kama Muta Happen? (Replication)

To represent kama muta experience on a given day, a sum score of the 4 kama muta items was calculated. As in Study 3, a sum score was used in this case for paralleling the survey design for these questions (i.e., participants were only prompted for further evoker questions if they recorded a non-zero response on any of the kama muta items) and for clarity of showing score differences at different levels. Out of 3388 days recorded across the study period, 2775 recorded at least some non-zero kama muta score (81.91% of total days, an average of 11.47 days out of 14 had a kama muta experience by this most minimal threshold). At a stricter threshold (e.g., score greater than 12 out of a maximum 16, or ¾ of total scale), 326 days recorded a kama muta experience (9.62% of total days, an average of 1.35 days out of 14 had a kama muta experience at this higher threshold). Figure 7.1 shows the percent of the sample who experienced a given amount of “days with kama muta” as marked by different KAMMUS Two scale thresholds.

Figure 7.1

Kama Muta Scores Meeting Different Scale Thresholds (Study 4)



Note. Proportion of people who experienced X number of days experiencing kama muta, as split by increasingly higher thresholds for having experienced kama muta as measured by the KAMMUS Two. For example, in the upper right figure, approximately 5% of the sample experienced kama muta (as defined by scoring greater than 4 out of a maximum 16) 5 different days of the study period.

Kama Muta in Daily Life: What/Who Evoked the Kama Muta? (Replication)

As in Study 3, the most common evokers of kama muta reported by participants were romantic partners. At every threshold, partners took up at least a quarter of all evokers mentioned. Once again, the next most mentioned evokers were family and friends (in that order), accounting for approximately 13% and 12% of all mentioned evokers respectively (see Table 7.2). Thus, as in Study 3, a little over 50% of all evokers mentioned by participants involved at least one close other.

Table 7.2

Top 5 Reported Evokers per Kama Muta Threshold

	Scale Threshold							
	>0		>4/16		>8/16		>12/16	
Evoker	*n*	**%**	*n*	**%**	*n*	**%**	*n*	**%**
Partner	2266	**29.0**	1721	**28.6**	945	**28.5**	301	**26.9**
Family	1007	**12.9**	798	**13.3**	437	**13.2**	144	**12.9**
Friend	915	**11.7**	692	**11.5**	380	**11.5**	131	**11.7**
Music	722	**9.2**	560	**9.3**	321	**9.7**	113	**10.1**
Nature	543	**6.9**	422	**7.0**	232	**7.0**	89	**8.0**
Remaining								
Fiction Media	466	**6.0**	366	**6.1**	199	**6.0**	63	**5.6**
Animal	676	**8.6**	519	**8.6**	307	**9.3**	99	**8.8**
Colleague	403	**5.2**	301	**5.0**	151	**4.6**	47	**4.2**
Non-Fiction Media	326	**4.2**	253	**4.2**	128	**3.9**	40	**3.6**
Acquaintance	181	**2.3**	123	**2.3**	86	**2.6**	39	**3.5**
Stranger	201	**2.6**	153	**2.5**	73	**2.2**	30	**2.7**
Write-In	115	**1.5**	95	**1.6**	54	**1.6**	23	**2.1**
Total	7821		6018		3313		1119	

Note. Top 5 evokers listed first, with remaining additional evokers below. Participants could report more than one evoker per (potential) kama muta event. Bolding is for visual distinction of percentages from counts. As in Study 3, though to a lesser extent, music once again becomes a larger proportion of listed evokers listed when using higher and higher thresholds for kama muta experience.

Extracting Latent Kama Muta and PPR

A CFA of the two latent constructs, PPR and kama muta (6-item), was constructed and compared to a similar CFA model that used a 4-item kama muta measure. As expected, and consistent with Study 3, kama muta items 2 and 3 in the 6-item model (RMSEA = .061, SRMR = .073, χ^2 (9212) = 17513) loaded poorly (loadings ranging from .1 to .3) and, in addition to all absolute fit metrics (e.g., RMSEA, SRMR) improving in the more parsimonious 4-item kama muta model without those items (RMSEA = .055 (Δ = -.0006), SRMR = .056 (Δ = -.017), χ^2 (5726) = 9931), a chi-square difference test between the two models suggested a statistically significant difference ($\Delta\chi^2(3486) = 7582$, $p < .001$). For these reasons, we continued with the 4-item model of kama muta. The 4-item kama muta and PPR freely estimated model was tested for weak measurement invariance, which evaluates whether the loadings for each item remained consistent across the study period and is important for making credible comparisons across multiple occasions (Mulder & Hamaker, 2020). A chi-square difference test showed that a model with weak measurement invariance constraints (χ^2 (5830) = 10043) did not perform appreciably worse than the one with free estimates ($\Delta\chi^2(104) = 111$, $p = .28$), suggesting the constraints were tenable. We proceeded to test strong invariance, which evaluates whether the loadings *and the actual scores* are comparable across the time period (Mulder & Hamaker, 2020). A model with strong measurement invariance constraints (χ^2 (5934) = 10152) did not perform appreciably worse than one with weak constraints ($\Delta\chi^2(104) = 108$, $p = .36$), suggesting the constraints were tenable. A measurement model with strong factorial invariance was thus carried forward in the analyses. Factor scores from this model were extracted and used to represent participants' kama muta and PPR in the subsequent MLM analyses.

Actor Effects (Replication)

In terms of same-day actor covariance, similar to Study 3, kama muta and PPR covaried on the day. Within-factors of kama muta and PPR were positively correlated (r = .43, 95% CI; [.40, .46]). Thinking again of a hypothetical Jane Doe; when Jane had higher than her usual kama muta on one day, she also reported higher than her usual PPR that same day. Also replicating Study 3, between-person differences were correlated (r = .63 [95% CI; .61, .65]), showing that individuals who on average reported more kama muta also on average reported more PPR (and/or vice versa).

In terms of lagged actor covariance, as in Study 3, after accounting for (statistically significant) autoregressives, we did not find evidence for cross lagged effects. In other words, when Jane scored higher than her usual kama muta, that was associated with a higher than her usual kama muta (β = .19 [95% CI; .15, .23], $p < .001$) but not PPR (β = .01 [95% CI; -.03, .05], $p = .59$) the following day. Similarly, when Jane scored higher than her usual PPR, that was associated with a higher than her usual PPR (β = .15 [95% CI; .11, .19], $p < .001$) but not kama muta (β = .02 [95% CI; -.02, .06], $p = .24$) the following day.

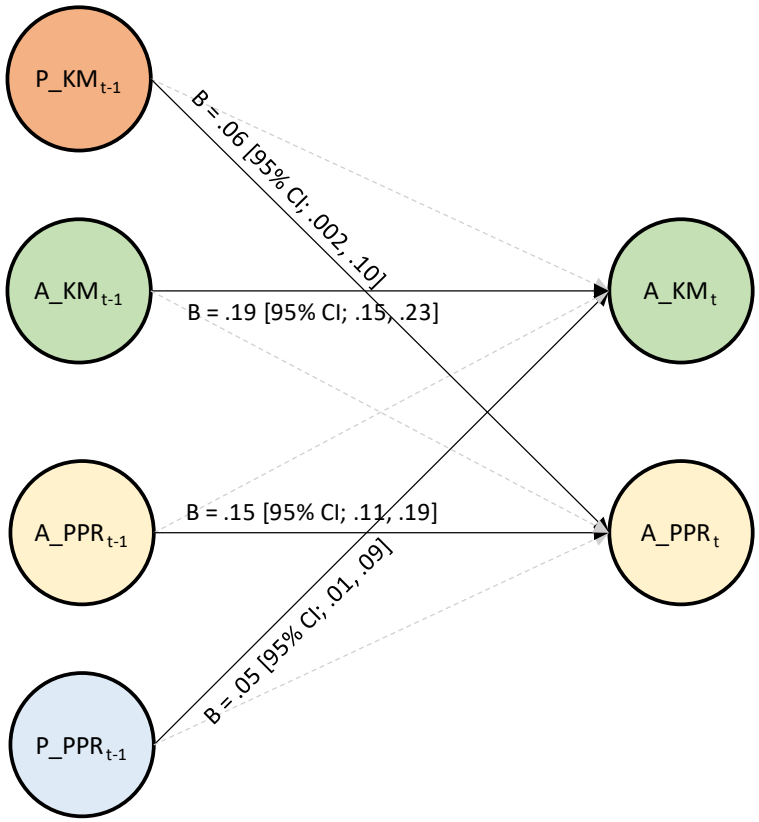
Partner Effects (New Extension)

As for same-day actor-partner covariance, individuals' scores of kama muta and PPR generally covaried with their partner. When actors reported higher than usual kama muta one day, their partner also reported higher than their usual kama muta (r = .25 [95% CI; .22, .28]) and PPR (r = .15 [95% CI; .12, .18]) that same day. Similarly, when actors reported higher than usual PPR, their partner also reported higher than their usual PPR (r = .22 [95% CI; .19, .26]). Generally, on days when Jane experienced higher PPR or kama muta, her partner did as well. Furthermore, between-person differences were also correlated wherein actors who on average reported more kama muta had partners who also on average reported more kama muta (r = .38 [95% CI; .35, .41]) and PPR (r = .31, [95% CI: .28, .34]). Actors who on average reported more PPR also had partners who also on average reported more PPR (r = .45 [95% CI; .43, .48]).

As for lagged actor-partner covariance, we found statistically significant partner cross lagged effects, though not autoregressives. In other words, when *Jane's partner* scored higher than their usual kama muta yesterday, that was associated with Jane's higher than usual PPR today (β = .06 [95% CI; .002, .10], p = .002) but not for Jane's kama muta (β = .04 [95% CI; -.004, .07], p = .08). Alternatively, when *Jane's partner* scored higher than their usual PPR yesterday, that was associated with Jane's higher than usual kama muta today (β = .05 [95% CI; .01, .09], p = .01) but not for Jane's PPR (β = -.01 [95% CI; -.05, .03], p = .57). Summarized within-person actor and partner effects can be seen in Figure 7.2. Actor and partner between and within effects did not change even after controlling for general daily positive affect in unregistered exploratory analyses (see Table 14.1 in Appendix 4, p. 179).

Figure 7.2

Summary of Within-Person Actor and Partner Effects



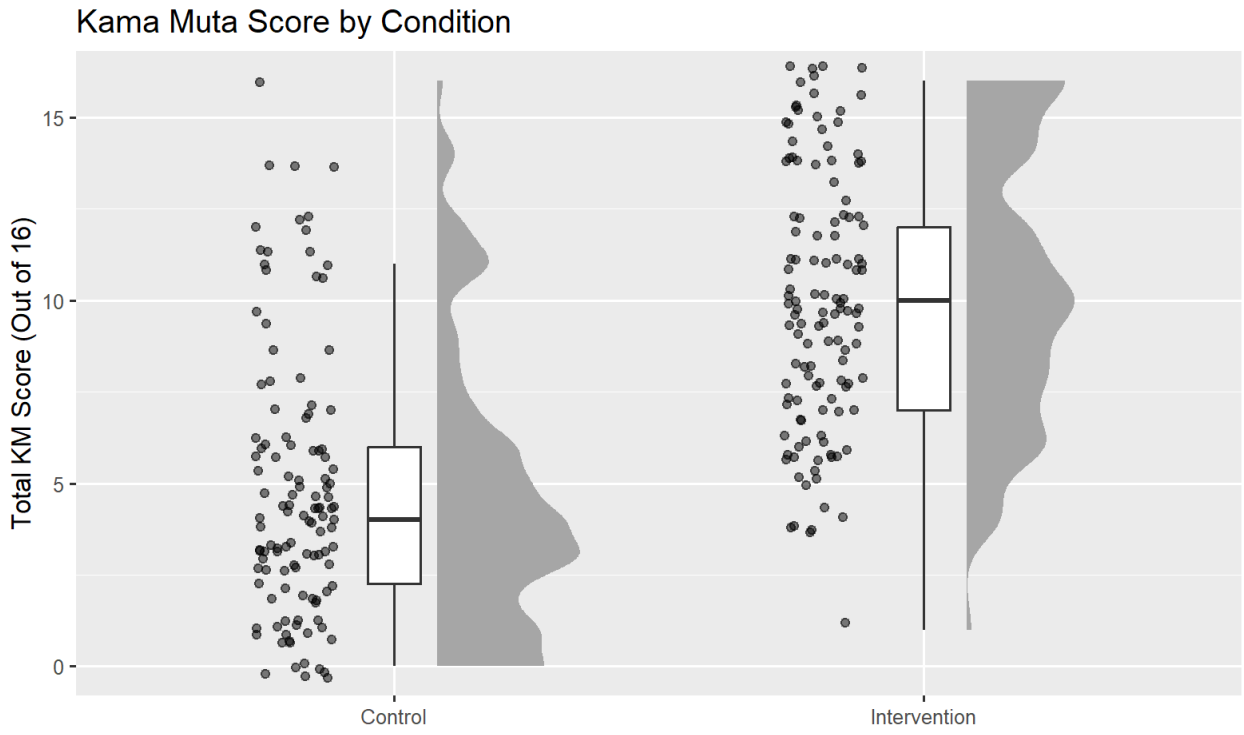
Note. Notation reflects an Actor (A) or Partner (P) for kama muta (KM) or PPR. Non-statistically significant paths are greyed out for clarity. Statistically significant actor and partner standardized effects are summarized with effects and 95% confidence intervals. Variables are person-centered, reflecting within-person variations. Time, as reflected by t, is in days.

Responsiveness Intervention (New)

On the day of the intervention, the responsiveness intervention condition was associated with higher kama muta than the control condition, as seen in Figure 7.3 (β = 1.13 [95% CI; .92, .1.33], p < .001). In other words, the responsiveness intervention (relative to the control condition) also made participants feel kama muta. However, across the Phase 3 diary period, there were no significant differences between conditions for kama muta (β = -.007 [95% CI; -.05, .03], p = .74).

Figure 7.3

Kama Muta (KM) by Condition, Day of Intervention



Note. Raincloud plot shows the horizontally jittered raw data points on the left, corresponding boxplot in the center, and density distribution on the right. Data points below zero are from plotting jitter. The responsiveness intervention condition scored on average approximately 5 points higher on the scale than those in the control condition.

Table 7.3

MLM Model Parameters of Study 4

	Estimate [95% CI]	p
Outcome: Actor Kama Muta		
Intercept	.07 [.02, .12]	.007**
Intervention Condition	-.007 [-.05, .03]	.74
Day	-.008 [-.01, -.003]	.001**
Within-Person		
Previous Day PPR	.02 [-.02, .06]	.24
Previous Day PPR Partner	.05 [.01, .09]	.02*
Previous Day KM	.19 [.15, .23]	<.001***
Previous Day KM Partner	.04 [-.004, .07]	.08
Between-Person		
PPR	-.01 [-.04, .02]	.48
PPR Partner	-.01 [-.04, .03]	.65
KM	.03 [-.01, .09]	.10
KM Partner	.01 [-.03, .04]	.85
Outcome: Actor PPR		
Intercept	-.06 [-.11, -.01]	.02*
Intervention Condition	-.01 [-.05, .03]	.65
Day	.008 [.003, .01]	<.001***
Within-Person		
Previous Day PPR	.15 [.11, .19]	<.001***
Previous Day PPR Partner	-.01 [-.05, .03]	.60
Previous Day KM	.01 [-.03, .05]	.59
Previous Day KM Partner	.06 [.02, .10]	.002**
Between-Person		
PPR	.0002 [-.03, .03]	.99
PPR Partner	-.004 [-.04, .03]	.81
KM	.01 [-.02, .05]	.40
KM Partner	.003 [-.03, .04]	.85

*Note. *p < .05,**p<.01, ***p <.001.* Decimals rounded to the hundredths place for clarity, though extended further to convey precision in some cases (when hundredths place constitutes a gross rounding bias, e.g., .0009 to .01). Estimates are standardized. KM is used as shorthand for kama muta.

7.1.3 Discussion

Overall, we replicated the pattern of kama muta frequency and evokers found in Study 3; kama muta occurred somewhat prevalently at various levels throughout the study period (the more intense experiences of which on average about once every 10 days) and was most commonly evoked by close-relational partners (partners, family, and friends, respectively). We also replicated the major findings from Study 3, wherein we found autoregressive, but not cross lagged, associations within an individual from day-to-day. Extending beyond our previous study, we found higher actors' kama muta was associated with increased partners' PPR the following day, and that actors' higher PPR was associated with increased partners' kama muta the following day. Day-to-day actor and partner reports of kama muta and PPR were also positively correlated such that dyads largely experienced similar variability of kama muta and PPR.

We replicated many of the main findings of Study 3. To start, we found a very similar pattern of kama muta evocation frequency, with kama muta proportionally occurring nearly the same amount as found in Study 3, across all scale thresholds (i.e., low levels like >4 out of maximum 16 or high levels like >12), even in this longer diary period. We also again found that partners, family, and friends (similarly, in that order) were the most common elicitors of kama muta, once again together accounting for approximately 50% of all evokers listed, further suggesting kama muta's close-other focus. Furthermore, we again found that an individual's kama muta experience yesterday had little to no bearing on how cared for, validated, and understood they felt the next day and vice versa. Same-day correlations of kama muta and PPR were also similar to Study 3, perhaps most notably kama muta and PPR appeared to once again occur on the same day for a given individual. All told, the patterns found in Study 3 replicated in this new, larger sample.

The new correlations (i.e., actor <-> partner) from this study add some interesting extensions, suggesting that dyad members tend to experience changes in kama muta and PPR on the same day. These correlations of day-to-day variation suggest that dyad members have similar emotional and relational experiences, which is consistent with the notion of romantic couples as interdependent (Kelley et al., 2003; Rusbult & Van Lange, 2003). Furthermore, between-person correlations suggest that dyad members tend to experience similar average amounts of kama muta and PPR, and that individuals who experience more kama muta on average also tend to have partners who experience more PPR on average. That partners generally share stable trait-like emotional and relational appraisals makes sense seeing that people selectively favor those with similar emotional responses (Gibbons, 1986; Locke & Horowitz, 1990) and also that couples become more emotionally similar over time (Anderson et al., 2003). Emotional similarity also serves functional purpose. Some research has found perceiving greater emotional similarity reduces stress responses (Townsend et al., 2013), increases dyadic mastery beliefs (Schade et al., 2020), and makes partners feel more responded to (Sels et al., 2019). However, it should be noted that more recent research has found mixed

results on the frequency and downstream effects of emotional interdependence (Sels et al., 2020; Sels et al., 2016).

One of the most important new findings from this study is that one's PPR today was predicted *by their partner's* experience of kama muta yesterday. Our findings lend some of the most direct evidence that kama muta is associated with explicitly communal outcomes, supporting the core conceit of kama muta theory as invigorating the creation and maintenance of communal relationships (Fiske et al., 2019). Previous research has shown that kama muta orients, and in essence "prepares", individuals to participate in communal relationships. For example, when evaluating hypothetical others, kama muta humanizes outgroups (Blomster Lyshol et al., 2020) and can expand the consideration of, and knit together, in-group members (Blomster Lyshol, Seibt, et al., 2022). Our study makes two important extensions to that literature by showing (a) kama muta is positively associated with later communal qualities *in real-life relationships* and (b) kama muta effects from one day to the next manifest at the dyadic, rather than individual, level. This latter finding is crucial since it suggests that individuals receive some combination of behaviors, cues, or expressions from relational partners who have experienced kama muta that results in them feeling more cared for, validated, and understood. While these data cannot speak to whether kama muta makes individuals outwardly appear or behave more communally sensitive or devoted, it appears relational partners at least *feel* in some way as if they are.

Somewhat surprisingly, one's experience of kama muta today was predicted *by their partner's* experience of PPR yesterday. One potential explanation is that partners passively support each other's socioemotional status, for example bolstering emotional security or self-esteem. Clark et al. (2017) contend that communal contexts allow partners to drop self-protections in favor of greater environmental focus that amplifies emotional reaction and makes it safe to express emotion. Interestingly, partners are sensitive to ostensibly undetected forms of support (Girme et al., 2018), which may mean that individuals need not consciously recognize their partner's high PPR in order to feel this kind of partner security. In other words, when individuals have partners who feel higher PPR, perhaps regardless of whether they recognize it, they may feel more secure in experiencing and expressing emotions without need for more monitored self-regulation. In line with this thinking, partner support reduces stress responses to emotional expression (Kane et al., 2019) and PPR itself has been associated with openness and non-defensiveness (Caprariello & Reis, 2010; Reis et al., 2018). A related perspective emerges from sociometer theory (Leary & Baumeister, 2000), and its newer extension hierometer theory (Mahadevan et al., 2016), which argues self-esteem reflects an internal monitoring of one's social belongingness amongst important, relevant others to reconcile their own social status and goals. In this perspective, social status appraisal leads to self-esteem which in turn links to emotion (Mahadevan et al., 2023). Perhaps individuals pick up on their partners' higher PPR as a reflection of their own relational status (e.g., "I am a good partner"), which increases their self-esteem thus making them more likely to experience heightened emotionality.

However, these partner security and self-esteem explanations are somewhat insufficient, particularly concerning the combination of partner effects we found. There are at least two relevant considerations to note. Firstly, since the effects appear for the partner and not the actor—for example, Jane feels greater PPR than usual one day which makes her partner (*but not herself)* feel more kama muta the next day— the mediator of these effects should explain why the effects focus on partners. Secondly, since we did not find a PPR partner effect on actor next-day PPR— that is, Jane feeling greater PPR than usual one day makes her partner (but not herself) feel more kama muta (*and not PPR*) the next day—the mediator should explain why these partner effects cross load onto each other but not to themselves. In contrast, explanations like bolstered emotional security or self-esteem would suggest a more unilateral pattern of effects than the ones we see here. For example, if individuals feel more emotionally secure when their partners feel higher PPR, we would expect to see an effect on those individuals' kama muta *and* PPR. Perhaps a more plausible mediator is partner-targeted behaviors. For instance, it may be that those who feel greater PPR then enact certain behaviors that are associated with evoking kama muta in their partner. Social behavior directed toward positive outcomes can be thought of as enacting upon approach (i.e., to "approach" positivity in contrast to "avoid" negativity) oriented motives or goals (Gable, 2006). Previous research has shown that translating these kinds of approach goals to behaviors do indeed enact downstream approach-like outcomes, like increased relationship quality or even responsiveness (Canevello & Crocker, 2010; Impett et al., 2010). The question then is, what kinds of behaviors may exhibit this kind of partner-focus?

Gratitude literature shares some relevant similarities that may clue in a plausible behavioral pathway for these two partner effects (kama $muta_{partner}$ -> PPR_{actor}, $PPR_{partner}$ -> kama $muta_{actor}$). Gratitude appears a good place to start since gratitude research has also found partner effects similar to those found here, wherein having a more grateful partner is associated with one's own higher relationship satisfaction (Algoe et al., 2010; Gordon et al., 2011; Park et al., 2023). Gratitude is a partner (rather than self) focused emotion (Algoe et al., 2016; Ma et al., 2017) that is linked to prosocial behaviors, like the expression and reception of gratitude, that in turn lead to communal outcomes (Algoe, 2012; Algoe et al., 2010; Peng et al., 2018; Regan et al., 2023). Our partner effects here may fall into a kind of gratitude pattern; (for kama $muta_{partner}$ -> PPR_{actor}) perhaps kama muta makes individuals more likely to translate feeling gratitude ("feeling moved or touched viscerally reminds me of how important my relationships are/this person is; I am lucky to have them in my life") to *expressing* gratitude which a partner at least partly receives as PPR. Expressing gratitude tends to increase the communal strength of that relationship (Lambert et al., 2010), however expressing gratitude is hindered by egocentric bias (Kumar & Epley, 2018). Kama muta may provide enough affective motive to reduce that bias or surpass the internal threshold for expressing one's internal gratitude feelings. Meanwhile (for $PPR_{partner}$ -> kama $muta_{actor}$), the reception of gratitude is associated with prosocial behavior because gratitude makes people feel more socially valued (Grant & Gino, 2010) and engages relationship maintenance (Kubacka et al., 2011; Ma et al.,

2017), which may in turn make it more likely that a person behaves in a way that causes their partner to feel kama muta. In other words, kama muta may help kickstart a gratitude process that manifests in reciprocal, partner (not self) targeted relational behaviors.

Interestingly, the responsiveness intervention made participants feel more kama muta on the day than those in the control. That partners discussing how and when they support each other—highlighting the communal qualities of each other and their relationship— evokes kama muta is theoretically consistent with kama muta emerging from communal intensifications (Fiske et al., 2019). Indeed, the initial appraisal of feeling cared for, validated, and understood (like those in the intervention) may itself be characterized by a kama muta-style emotionality (feeling warm in the chest, prosocial motivation etc.). This would be consistent with our findings from the diary period that kama muta and PPR are highly correlated on the day. Findings from the daily data further suggest that kama muta may facilitate PPR (e.g., which begs the inverse question of whether a kama muta intervention would lead to increased PPR), however we can only speak to the effect of a responsiveness intervention increasing kama muta from these current data. The effect of the intervention also hints to the accessibility of kama muta. Most kama muta research has relied on manipulating it via videos (Seibt et al., 2018; Zickfeld et al., 2020), ostensibly of one-off or otherwise exceptional communal gestures (e.g., unexpected, urgent, pro bono medical care as seen in the manipulations of Studies 1-2) and often delivered in cinematic or manicured forms (e.g., marketing advertisements). Our data here suggest kama muta occurs not-infrequently in daily life, indeed the stronger feelings of which about once every 10 days. That is all to say, kama muta may be just as (if not more) likely to emerge from something as simple and ostensibly ordinary as a meaningful conversation with a close other.

Limitations

Analytically, these data take a quantitative step beyond Study 3 in combining latent variables in a nested group (i.e., dyadic) structure, though that creates at least two considerations. Firstly, measurement and structural models are ideally built together (as traditionally done in SEM) to provide a closed system (i.e., reducing proverbial “moving parts”). The package lme4 (Bates et al., 2015) which we use here is the current standard for MLMs (cited over 72,000 times at time of writing), however implementing factor models in it requires one to separately, a priori, establish a factor structure (Rockwood & Jeon, 2019), which we attempted via a separate CFA. Some new tools have been developed to more easily integrate latent class variables into MLM, for example work by Sorensen et al. (2023) on generalized additive latent and mixed model builds, though they are recent and still in development (e.g., version 0.1 of their galamm R package was published in October, 2023). Future work should ideally use SEM or rely on these increasingly more integrated MLM frameworks. Secondly, partner effects tend to be small if present at all (Joel et al., 2020), so it becomes harder to

contextualize these kinds of partner effects with other, similar patterns in literature. In that sense, these effects merit replication.

More conceptually, as in Study 3, the temporal span of a day limits our precision. It is notable that kama muta has effects across days in part because it suggests how individuals feel one day has downstream psychosocial consequences into the next. On the other hand, that breadth also obscures more precise examination of how and/or why we might see those downstream effects. Considering that the deployment of attention is a key part of emotion regulation (Sheppes & Gross, 2011) and, as per kama muta supposedly "instantly" updating communal salience (Fiske et al., 2019), kama muta may have more pronounced, or perhaps altogether different, effects when taken at a more granular level with a partner than recorded in a 24-hour retrospective diary. Ecological momentary assessments, or other intensive longitudinal designs, may help bridge the gap between the immediate momentary experience of kama muta seen in Studies 1-2 and the downstream lagged daily effects we found here.

Relatedly, these data cannot speak to whether the kama muta that both partners report on a day reflects the same event(s) and/or whether those kinds of shared kama muta events have notable differences from unshared ones. Experiencing events together seems to amplify the emotional qualities dyad members experience (Levavi-Francy et al., 2020). Especially in a communal context, expressing emotional content conveys information to partners that enhance support, for example, an expressor's sharing of vulnerabilities or goals, and the receiver's active listening (Itzchakov et al., 2021). Expressing emotional content has also been thought to invite responsiveness by both showing one person's desire for care while inviting, and giving necessary diagnostic information for delivering, that care from the other (Clark & Lemay, 2024). The extent to which both partners experience kama muta together, how much they express it to each other, and how much they emotionally align (or not) from the same event may lead to more or less potent effects (e.g., compounding when partners are in concert or deflating when discordant). That kama muta was commonly evoked from close others suggests this kind of co-occurrence should not be too unusual, however further study is needed to evaluate differences, if any, in co-experienced kama muta. Further extensions and considerations emerging from this body of work will be covered in the following General Discussion.

8 Chapter 8: General Discussion

In this thesis, we investigated the psychosocial consequences of kama muta, the emotion characterized by English speakers as feeling "moved" or "touched." Studies 1-2 showed that kama muta momentarily affects basic needs such as relatedness, but only to the extent that the emotion generates positive affect. Studies 3-4 demonstrated that kama muta occurs relatively commonly in day-to-day life and was largely evoked by close others. Moreover, we found kama muta was associated with a personal communal outcome, PPR, on the day (i.e., higher perceptions of feeling understood, validated, and cared for by a romantic partner) and next-day communal outcomes for a romantic partner.

8.1 Contributions

Perhaps most importantly for kama muta theory, our findings provide direct evidence of the kama muta emotion affecting communal qualities. Our findings in Studies 3-4 provide evidence that kama muta is associated with feeling communally fulfilled (i.e., on days when people felt more kama muta than usual, they also felt more PPR than usual) and that kama muta seems to prospectively make *partners* feel more communally fulfilled (i.e., on days when people felt more kama muta than usual, their *partner* felt more PPR than usual the following day). Kama muta theory claims the emotion (re)invigorates the salience of communal bonds, thus "moving" people towards the enhancement and sustaining of those bonds (Fiske et al., 2019). Previous research has shown kama muta is broadly associated with correlates of devotion and commitment such as intentions for reducing racial inequality (Lizarazo Pereira et al., 2022), increasing feelings of warmth and trust between political opponents (Blomster Lyshol, Seibt, et al., 2022), and intentions to mitigate climate change (Seibt et al., 2023). However, intentions do not necessarily translate to their intended outcomes (Ajzen et al., 2004; Sheeran, 2002; Sheeran & Webb, 2016) and such intentions are not themselves evidence of communal effects. Our findings help bridge that gap by showing kama muta does have effects on a communal relational quality like PPR. Kama muta also appears like a communally oriented emotion in daily life, occurring most often from close communal relationship partners. Our findings from Studies 1-2 further hint at this communal focus, showing kama muta is not uniquely related to more general needs for social connection and belonging (i.e., relatedness). Kama muta thus seems, both in its pattern of associations and daily evocation, focused on communal relationships.

Our findings also point to potential differences in third- and first-person kama muta. Our studies show that kama muta occurred both when observing others (Studies 1-2) and in participants' personal experiences (Studies 3-4). This is in line with kama muta theory, which

claims that kama muta can emerge from any communal intensification regardless of whether someone projects or receives communal intensification, or if they observe it happen to others (Fiske et al., 2019). In other words, kama muta should be evoked from any communal intensification regardless of witnessing or personally experiencing the intensification (Scheel et al., 2021); our findings bear this idea out. However, Studies 1-2 suggest kama muta as evoked by observing communal intensification of others is not uniquely associated with general relatedness appraisals. Meanwhile, Studies 3-4 suggest kama muta as evoked in personal experiences is associated with daily appraisals of PPR. Put together, kama muta had unique effects in more specifically personal experiences and outcomes. Our data in Studies 3-4 also show that kama muta occurred most often in more personally relevant relationships (i.e., with close others) rather than with more distant or external entities (e.g., strangers, fictional media, etc.), suggesting that while third-person kama muta is possible, it is perhaps less common or salient. This runs somewhat counter to results from Seibt et al. (2017) that suggested that perceptions of closeness did not differ depending on whether participants recounted episodes of positive tears they witnessed or personally experienced. Considering that kama muta literature (including our Studies 1-2) frequently rely on third-person kama muta manipulations (e.g., showing participants videos of other people; Seibt et al., 2018) research may wish to consider ways of accessing more personally relevant kama muta experiences (e.g., Blomster Lyshol, Pich, et al., 2022).

Another area in which we expand kama muta's knowledge base is its expected temporal span. Our patterns of results in Studies 1-2 are somewhat inconsistent with kama muta theory's claim that kama muta "instantly" updates communal devotion and commitment (Fiske et al., 2019). At the immediate level, we found general positive feeling from the manipulations was associated with immediate changes to relatedness (and autonomy and competence) needs, rather than self-reported kama muta. However, that we found consistent correlations of kama muta and PPR at the daily level in Studies 3-4 suggests kama muta does covary with a communal quality at a longer timescale. The unique aspects of kama muta may operate more like goal setting (i.e., directing towards communality), while the immediate feel-good nature of the emotional experience provides momentary goal striving (Tamir et al., 2020). In other words, it appears the communal devotion and commitment aspects crucial for kama muta are processed and reflected upon beyond the immediate kama muta experience, which is in the moment largely characterized and driven by positive affect. In this sense, our findings highlight the importance of distinguishing kama muta from "feeling good" more broadly and add some initial boundaries to not just how kama muta "moves" people, but when.

Lastly, our findings also contribute to a broader understanding of kama muta in daily, personal experiences. Kama muta theory has paid special attention to how organized practices and institutions have developed to evoke kama muta, while only lightly speculating upon kama muta in everyday life (Fiske et al., 2019). That we found a responsiveness intervention where partners reflect upon and discuss their attendance to each other's needs evoked more kama muta than a control discussion implicates relatively modest (though still emotionally salient)

social interactions as kama muta evokers. Alongside a remarkably consistent pattern of kama muta evocation in daily life (at least with coupled participants), paired with the daily and lagged covariances of kama muta and PPR, our findings emphasize the importance of daily relational experiences as a fruitful domain for kama muta.

8.2 Limitations

This collection of studies is limited by the contexts in which we evaluated them. The vast majority of emotion research agrees that emotions are functional in tailoring (oftentimes social) fitness to a given environment (Barrett, 2012; Fischer et al., 2016; Keltner & Gross, 1999; Keltner & Kring, 1998; Levenson, 1999; Parkinson & Manstead, 2015). Thus, our results are liable to vary depending on, for example, a person's emotional and social goals (e.g., Mauss & Tamir, 2013) and appraisal of a social environment's demands (e.g., Pauw et al., 2019). Studies 1-2 opted for largely removing social context for experimental control, though in doing so limited ecological validity in how participants regulated their emotions in a relatively solitary, artificial, virtual environment. While we partially attended to this concern with more naturalistic data in Studies 3-4, daily diaries still obscure relevant contextual information—such as, what participants were doing when they experienced kama muta, where they were, and who they were around. While our results do not necessitate answers to these kinds of questions for interpretation, more contextual information would lend much richer understanding about how kama muta actually operates (e.g., what does devotion and commitment look like? And with whom?). In other words, we presume these more naturalistic diary collections allowed deeper visibility into more ecologically valid emotional contexts for kama muta though, in part because we do not know said contexts, cannot say for certain.

Our sampling occurred in Western nations and approximately 80% of the total sample across the four studies were White, limiting our ability to generalize our findings to other samples. Emotional experiences are culturally constructed to the extent that they enhance fitness within a given culture (Mesquita et al., 2016). Different cultures place different values on different emotions (Bastian et al., 2014; Ford & Gross, 2018; Ma et al., 2018). Some have argued that core emotional experiences seem to be universal, while their correlates and meanings get shaped by culture (Elfenbein & Ambady, 2002). For example, while the core elements of awe are consistent, the evokers and quality of the emotion differ between East Asian and North American samples (Bai et al., 2017; Nakayama et al., 2020). Kama muta has similarly shown some consistent elements across countries (Seibt et al., 2018; Zickfeld, Schubert, Seibt, Blomster, et al., 2019). However, we have yet to see a full picture of what kinds of cultural differences may emerge both in initial kama muta experience but also in the consequences of kama muta that we examine in this thesis (e.g., BPNs and PPR). Westerners tend to idealize positive emotions (Oishi, 2016) which may have inflated our results compared to, for example, East Asians who tend to favor less intense and mixed emotions (Grossmann &

Ellsworth, 2017; Kitayama et al., 2000; Miyamoto et al., 2010). People living in Western cultures also typically endorse different relational values (e.g., "self-expression" vs. "survival" values; Inglehart & Welzel, 2005; Yum et al., 2015) and use different communication styles with their partners than those living in some Eastern cultures (Ge et al., 2022). Indeed, we might expect kama muta to have different associations with PPR across culture knowing that PPR appears less potent and prevalent for Eastern couples (Choi & Oishi, 2022; Tasfiliz et al., 2018). In summary, kama muta is thought to be adaptive to the extent it operates in a culturally appropriate way (Fiske et al., 2019), and our data can only speak to how kama muta emerges in a Western environment with a primarily White population.

8.3 Future Directions

8.3.1 Implications for New Kama Muta Research

Co-Experienced Kama Muta

A potentially fruitful area of future research for kama muta is to join a growing literature exploring co-experienced emotionality. There are calls to study emotions as interpersonal processes that encompass more than a single person (Parkinson & Manstead, 2015). Emotions experienced with others tend to be more intense, last longer, and can change in quality (e.g., become more or less variable; Goldenberg et al., 2020), reflecting a complex interchange of contextual calibration, reciprocation, and social appraisals (Parkinson, 2020). This growing literature also echoes the idea of emotions regulated in social context (Barthel et al., 2018; Beckes & Sbarra, 2021), which suggests the variability of emotional experiences partially depends on who a given individual is around. Take the response-focused (i.e., after the initial emotional experience) emotion regulation strategy of suppression as an example. With close others, visible and verbal emotional expression are important for relational wellbeing (e.g., Peters et al., 2016, Rime et al., 2020) and is often encouraged such as via capitalization behaviors where close others actively try to maximize the benefits of positive disclosures from their partner (Donato et al., 2014; Gable & Reis, 2010; Peters et al., 2018). However, with more distant others, people tend to suppress their emotions, especially highly positive ones (English et al., 2017). Kama muta, as an emotion with positive affect qualities and strong emotional expression signals (e.g., teary eyes, hand on chest), will likely get suppressed or expressed by individuals differently depending on their social company. Further considering the prevalence of mediums and rituals seemingly favored to (re)produce kama muta (Fiske et al., 2017)— ranging from larger collectives like religious ceremonies to more intimate experiences like childbirth (Fiske et al., 2019)— there seems to be a wide range of opportunities to experience kama muta in the presence of a wide range of relationships. Kama muta may feel different when, for instance, watching a "best-loved story" like *Romeo and Juliet* (Fiske et al., 2017) at home (versus in a large theatre) or with a romantic partner (versus with strangers). This notion

can be taken a step further when considering emotional coregulation, where partners bidirectionally oscillate emotional channels between them that affect emotional and physiological stability of *both* partners (Butler & Randall, 2012). Teasing out what parts of kama muta experiences vary or stay consistent when experienced around different social contexts, and thus privy to different forms of emotion regulation, may evidence different examples of communal devotion and thus different relational outcomes.

Beyond co-experienced emotions generally, there is additional reason to expect that co-experienced *positive* emotions like kama muta are especially important. Positive (relative to negative) emotions seem especially liable to become enhanced with other people (Fischer et al., 2003). Observation studies of couples' conversations show that greater shared instances of laughter reflect greater relationship wellbeing (Kurtz & Algoe, 2015). A similar trend has appeared for more general positive affect, where co-experienced positive affect in interactions (i.e., the more both partners self-reported positive affect at the same time) was associated with greater marital quality (Brown et al., 2021) and greater prosocial tendencies (Zhou et al., 2022). This notion of co-experienced positive emotions has been brought to the fore by positivity resonance theory. Positivity resonance theory is an offshoot of the broaden-and-build theory of positive emotions (Fredrickson, 2001; Fredrickson, 2013) that specifically calls attention to the accumulation of jointly experienced positive emotions between individuals that in turn build and sustain social bonds (Fredrickson, 2016). Initial empirical research has borne this idea out, showing that positivity resonance is associated with long-term, supportive marriages (Otero et al., 2020; Wells et al., 2022). Positivity resonance is thought to occur when individuals collectively (a) share positive affect, (b) display caring non-verbal synchrony (e.g., affiliative gestures), and (c) share biological synchrony (physiological alignment; Fredrickson, 2013, 2016). In that sense, considering kama muta's positive affect generation (e.g., Study 2), its seemingly universal set of nonverbal gestures (Farley et al., 2021; Zickfeld et al., 2021), and consistent physiological profile (Schubert et al., 2018), kama muta seems particularly liable to contribute to this positivity resonance process. Since we found kama muta is evoked most often with close others, not infrequently throughout daily life, and potentially evoked from simple (but meaningful) acts like conversations with a partner, kama muta may be a somewhat common (or at least not uncommon) source of positivity resonance in close relationships. All told, positivity resonance theory seems a potential avenue for kama muta literature to extend into for considering co-experienced emotionality.

Kama Muta Out in Everyday Life

Our findings, particularly in Studies 3-4, show kama muta as experienced in daily life, however it may be beneficial to take a more concerted look at communally salient periods or events. As alluded to earlier, kama muta theory has postulated extensively on the way the emotion has participated in human anthropology, highlighting that rituals, practices, and institutions across history and cultures seem tailored towards evoking kama muta (Fiske et al.,

2019). While deeply embedded into kama muta theory, there is relatively little empirical research explicitly on kama muta within these kinds of events or periods. Considering that kama muta is thought to be important for the development, persistence, and enactment of cultural rituals and practices (Fiske et al., 2017; Fiske et al., 2019), it makes sense to directly investigate kama muta within such events. Some research has investigated kama muta in special collective experiences like virtual music concerts during the COVID-19 pandemic (Swarbrick et al., 2021), though more prescriptively communal events may be especially informative. Rituals offer a great opportunity to see how individuals regulate their emotions and social connections within predefined, repetitive sequences that carry cultural meaning (Hobson et al., 2018). Take the ostensibly simple case of weddings, for example. Weddings around the world focus on celebrating and honoring communal relationships (Coontz, 2004; Daneshpour & Fathi, 2016; Dunn, 2008). However, they also have immense diversity in how different elements like religion (e.g., Lauterbach, 1925), social norms (e.g., gender norms, heteronormativity; Currie, 1993; Kalmijn, 2004), class (e.g., Pauli & Dawids, 2016), and power (e.g., Jensen & Thornton, 2003) interact in creating a seemingly singular goal—formalizing a relationship. In other words, these periods when individuals participate in organized or prescribed practices may provide different patterns of kama muta than the ostensibly day-to-day patterns that we observed.

Kama muta research may also benefit from other intensive longitudinal methods which would not only lend greater access to studying kama muta across a wider variety of domains, but also contribute to evaluating kama muta's timeline. Our experimental work suggests self-reported kama muta does not have unique, immediate effects on relatedness needs, but our daily diary studies show within-person variations of kama muta correlate with both day-of and next-day PPR. That is, day-to-day appears to be a good timeframe for capturing some kama muta effects, but mere seconds/minutes following a third-person kama muta manipulation may be too short (at least for general connectedness appraisals like relatedness). Finer ecological momentary assessments like experience sampling may help fill this temporal middle ground—on the order of minutes to hours—for example, using proactive triggers throughout the day via smartphones or other wearable devices (Shiffman et al., 2008; van Berkel et al., 2017). These more concentrated data collections also better lend themselves to exploring inter and intra-personal processes (Curran & Bauer, 2011; Hamaker, Ceulemans, et al., 2015; Hamaker & Wichers, 2017) and are particularly helpful for evaluating behavior (van Berkel et al., 2017). Most prosocial emotions promote behavior either intrapersonally or interpersonally and not both, which suggests both perspectives should be considered (van Kleef & Lelieveld, 2022). Indeed, our analytic methods (e.g., RICLPMs) in Studies 3-4 show how important these distinctions can be for interpreting results. Experience sampling methods could also dovetail with investigations of extended communal events and practices (e.g., Eid al-Fitr, Lent, Lunar New Year, Diwali etc.) to see how individuals experience and respond to kama muta throughout communally salient periods for a given community. Such designs could also be dyadic. As we saw in Study 4, one strength of dyadic longitudinal data is visibility into how individuals influence each other. Our Study 4 results suggest how one person experiences kama muta is

relevant to the outcomes of someone else. In short, kama muta literature may benefit from more kinds of longitudinal, multiple time-point data, and perhaps ideally where interacting partners can be tracked.

Moderators of Kama Muta

Our results of kama muta and PPR in romantic couples implicates at least two potential moderators. To start, and as per our focus on romantic couples, these associations may be moderated by attachment. Attachment theory (Bowlby, 1969) suggests that early interactions with significant caregivers are internalized as working models of what relationships should be like (Campbell & Stanton, 2019; Mikulincer & Shaver, 2016; Mikulincer et al., 2003). Individuals process information and experiences in reference to these models (Collins & Feeney, 2004), thus developing relatively stable attachment orientations reflecting patterns of behaviors, emotions, and expectations (Mikulincer et al., 2003; Shaver & Mikulincer, 2002). Individual differences in attachment in adulthood are generally thought of as falling along two dimensions: attachment avoidance and attachment anxiety (Fraley et al., 2015). Kama muta perhaps most implicates attachment avoidance because avoidantly attached individuals utilize strategies that minimize their exposure to not just unpleasant emotions generally (Mikulincer & Shaver, 2019) but especially to those involving social intimacy. While doing so minimizes pain of rejection, loss, or disappointment, avoidantly attached individuals in turn reap fewer social rewards (Impett & Gordon, 2010; Spielmann et al., 2013). Avoidantly attached individuals may therefore downregulate their own emotional kama muta feelings (e.g., Brandão et al., 2019) and/or have diminished downstream communal devotion and commitment, perhaps even rejecting such behaviors to re-establish emotional or social distance. This pattern would parallel work showing that lonelier individuals report weaker kama muta feelings because they are more doubtful of others' goodwill (Śmieja et al., 2022). Meanwhile, anxiously attached individuals, who crave closeness and emotional support and are hypervigilant to intimacy losses (Campbell et al., 2005), may welcome kama muta experiences as evidence confirming their working model's hyperactive bias towards eliciting support and love from significant others (Shaver & Mikulincer, 2002). Other moderators may have similar intensifying patterns on a communal outcome like PPR. In particular, those who on average feel more responsibility for their communal partner's welfare (i.e., higher trait-level *communal strength*; Mills et al., 2004) should be more motivated to respond to their communal partner's needs. For instance, those high in communal strength may be more willing to express, and accept, emotional intimacy with their communal partners (Clark et al., 2017). High communal strength is generally associated with prosocial behaviors like helping others, willingness to express emotion and fair allocation of rewards in negotiations (for review, see Clark & Mills, 2011). In other words, there are individual differences in how people respond to emotional closeness, and their expectations and desires for communality, that may interact with kama muta's path to communal outcomes.

8.3.2 (De)Humanization and Moral Expansion

Kama Muta and (De)Humanization: Feeling the Humanity

Kama muta may feed into judgements about humanization, particularly insofar as human nature reflects the ability to form social bonds. The dual model of humanization presents humanness as two parts: a uniquely human aspect (the denial of which represents them as animal-like) and human nature (the denial of which represents them as object-like; Haslam, 2006). Social connectivity appears to be a key element of this latter human nature concept—withholding judgements of human nature implies a lack of someone's ability (or need) for closeness and relationship (Haslam, 2022). Research on this topic has especially highlighted social disconnection. For example, when individuals feel excluded, they not only dehumanize the offender (i.e., judging them to lack human traits), but they also dehumanize themselves (Bastian & Haslam, 2010). Individuals also feel dehumanized when their belonging needs are thwarted (Demoulin et al., 2021). In other words, how able, available, and "successful" people are in social connectivity forms a key part in judging humanness.

Kama muta may play a role in this humanness discussion by affecting perceptions of potential social connection. Our results suggest kama muta does not uniquely affect general connectedness appraisals (i.e., relatedness) but does affect communal appraisals, at least specifically with close partners. This disjunction may reflect kama muta highlighting the communal abilities and needs of salient others (i.e., perceiving them to have more human nature), but not to unspecific, perhaps more distant, relational others. Some early work in this area has shown promise. For instance, observing out-group members in communal intensifications appears to reduce blatant dehumanization of not just those individual members but the entire out-group (Blomster Lyshol et al., 2020). Cute animals interacting seem to be more humanized than cute animals by themselves, which Steinnes et al. (2019) use to similarly suggest communal interactivity displays communal ability. Kama muta should be especially good at projecting human nature traits because communal intensifications that evoke kama muta, and the expressions of kama muta itself, are typically characterized by expressions that outwardly convey sincere inner feelings (e.g., Farley et al., 2021, Gračanin et al., 2018, Zickfeld et al., 2021). This is important because humans consistently display an ego-centric bias of ascribing more emotionality, depth, and importance to their own needs than to others (Haslam et al., 2005; Loughnan et al., 2010; Schroeder & Epley, 2020; Sedikides & Gregg, 2008), reflecting the difficulty of intuiting the internal mental states and capacities of (especially psychologically distant) others (Schroeder & Epley, 2020). In other words, kama muta may be good at making people believe others as having human nature (i.e., are not "robots") with communal abilities and needs. These human nature attributes of social need and ability may be one lens to think about how people allocate their communal attention and devotion.

Kama Muta and Moral Expansion: Expanding and Expanding to What?

Kama muta may reflect general moral judgements as well, which could be examined via moral circles. Earlier we noted that the pattern of evokers found in Studies 3-4 followed theoretical hierarchies of communal relationship partners (close partners at the pinnacle and acquaintances at the bottom; Clark & Mills, 2011; Reis et al., 2004), though this pattern also matches the innermost strata of the normative moral circle. The normative moral circle includes close kin in the center (i.e., deserving most moral concern), extending outwards like layers of a bulls-eye to in-group members, out-group members, then to high-sentience animals, the environment, low-sentience animals, plants, and lastly villains (Crimston et al., 2018). The breadth of moral circles—those boundaries that distinguish what people and things are deemed worthy of moral concern—is known as moral expansiveness (Crimston et al., 2016). As evident in this hierarchy, perceiving moral concern is highly related to perceiving humanness (Bastian et al., 2011; Haslam et al., 2012) in part because mind perception is core to moral concern (Gray et al., 2007; Gray et al., 2012). Moral boundaries are flexible, for example changing based on appraisals of perceived similarity (Bastian et al., 2012; Laham, 2009). Moral circles also seem to be affected by social factors like generalized trust (Kirkland et al., 2022) which is interesting since kama muta manipulations have been shown to reduce distrust in outgroups (Blomster Lyshol, Seibt, et al., 2022). Like humanization (e.g., Blomster Lyshol et al., 2020), perhaps experiencing kama muta with or about entities at differing circle layers expands one's consideration of that specific entity or layer category as available and able for communal relationships.

Moreover, moral circles provide an interesting perspective to examine kama muta beyond individual human entities. Our results from Studies 3-4 show that approximately 25% of all kama muta experiences occurred with non-human entities like nature, fictional media, or animals (like pets). This proportion may be even higher with single individuals since our samples of romantically involved individuals biased the pattern of evokers towards romantic partners. Humans have long had intimate connections to non-agentic (e.g., babies) or non-human entities (e.g., pets, ancestors, deities, or imagined collectives like "humanity"; Fiske, 2004; McFarland et al., 2012, Steinnes et al., 2017). As such, kama muta theory allows for the idea that communal intensifications, and consequently kama muta, can occur with non-human entities (Fiske et al., 2019). The most recent kama muta research in this area has focused on connecting with nature (Petersen et al., 2019). For example, work from Seibt et al. (2023) shows that kama muta can increase pro-environmental messages, which suggests kama muta can extend to affect even very large entities (e.g., a global community or identity; Pizarro et al., 2021). This line of work dovetails nicely with an interesting phenomenon observed in moral circles literature. Moral circles have been expanding for at least the last century if not earlier (Bloom, 2010; Glover, 1999; McFarland, 2011; Singer, 1981), where people have been attributing moral concern to more and more entities (e.g., apes, caged/farmed animals, rivers, forests etc.). With a current general trend towards moral circle enlargements over time, people may not just be able but

increasingly liable to experience kama muta from or with non-human entities, which could be fruitful for future research to explore.

8.3.3 Meaning in Life

Finally, kama muta may contribute to judgements of meaning in life by affectively highlighting the importance of communal relationships. We speculated in Studies 3-4 that, considering the frequency of kama muta, how often it occurs with close others, and that a responsiveness-tailored discussion made people feel kama muta, kama muta may emerge from relatively simple interactions in daily life. We suggested that these moments positively contribute to relational processes like PPR. Perhaps daily experiences of kama muta also serve as affective drivers of judgements that one's life has meaning in the routines of life (Heintzelman & King, 2019), where a daily "I love you" text message or a note in a lunchbox or a door held open is occasionally imbued or received with exceptional meaning and depth. Meaning in life is typically understood in terms of three facets: comprehension, purpose, and mattering (George & Park, 2016a, 2016b), but has largely kept to general judgements (e.g., "Even considering how big the universe is, I can say that my life matters"; Costin & Vignoles, 2020) or ambiguous statements (e.g., "I understand my life's meaning"; Steger et al., 2006). However, over the past decade researchers have become increasingly interested in the links between meaning in life judgements and the presence and quality of social relationships (Delle Fave & Soosai-Nathan, 2014; Hicks et al., 2010; Lambert et al., 2013; Macia et al., 2021). For example, research has shown people derive meaning in life from their relationships (Yu & Chang, 2021a, 2021b) and report their social relationships as one of the two most common sources of meaning (the other being positive affect; Heintzelman et al., 2020). In other words, there is good reason to think that believing "my life matters to others" may be just as (if not more) important than "my life matters in the grand scheme of things." People generally think of their lives as meaningful (Heintzelman & King, 2014), and perhaps day-to-day affective spikes in communal salience such as those from kama muta may play a role.

9 Chapter 9: Conclusion

"When I meet you, in that moment, I'm no longer a part of your future, I start quickly becoming part of your past. But in that instant, I get to share your present, and you, you get to share mine, and that is the greatest present of all."

— Sarah Kay, Hiroshima

We set out in this thesis to shed light on the new psychological theory of feeling "moved" or "touched", seeking to better understand how and where this emotion, characterized by moments of intense communal connection, fits in the constellation of our social worlds. We found that experiencing kama muta is a potent feel-good emotion, which in turn helps make us feel more connected to others. We also found that kama muta seems to be associated with making us, as well as those closest to us, feel more cared for, validated, and understood in day-to-day life. As with previous research, we found kama muta emerges from observing grandiose communal displays, but we also found that kama muta may also arise from more modest, but salient, personal experiences of communality. Put together, kama muta appears to have a place in describing how we *feel* connection in our relationships; reminding us what our relationships are about, what it means to be a part of them, and inviting us to do something about it.

10 Chapter 10: Bibliography

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11 Appendix 1: Chapter 3

Study 1 Pilot

Sample Descriptives

Table 11.1

Demographics of Pilot Participant Sample

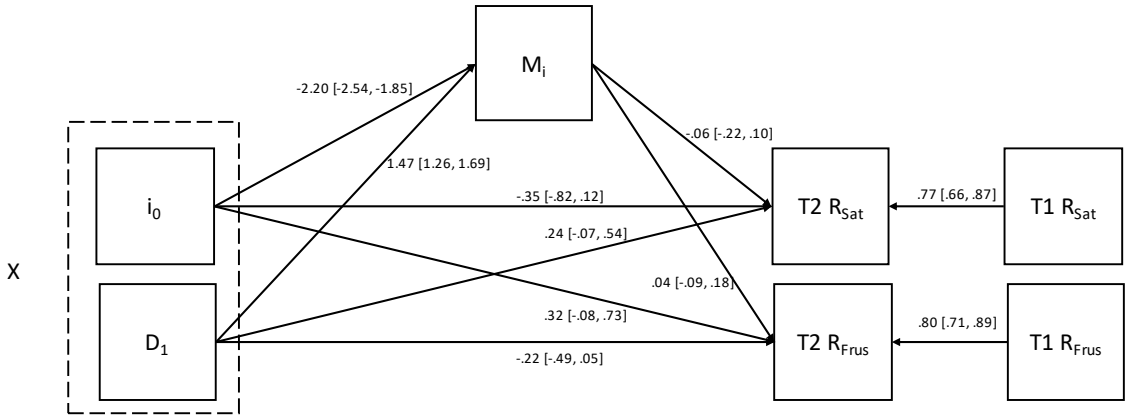
Characteristic	*n*	*% of Sample*
Sex & Gender		
Female	116	79.5
Male	27	18.5
Nonbinary, Genderqueer	1	.7
Bigender, Genderfluid	1	.7
Agender, Genderless	1	.7
Race		
White, Caucasian, Anglo	108	75.0
East Asian	17	11.6
Black, African, Caribbean	2	1.4
Hispanic, Latino, Chicano	2	1.4
South Asian	4	2.7
Aboriginal, Indigenous, Native	0	0
Southeast Asian	6	4.1
West Asian	0	0
Middle Eastern, Arab	1	.7
Mixed or Multiple Ethnic Group	5	3.4
Other	1	.7
Education		
GCSE, O-Levels, or Standard Grades	2	1.4
A-Levels or Highers/Advanced Highers	91	62.3
Vocational degree (e.g., SVQ, HNC, HND)	10	6.8
Undergraduate degree (e.g., BSc, BA)	25	17.1
Master's degree (e.g., MSc, MPhil)	14	9.6
PhD, PsyD	1	.7
Other Advanced or professional degree (e.g., MD, JD)	2	1.4
Skip/Missing/NA	1	.7
Employed		
No	97	66.4

Yes, part-time	34	23.3
Yes, full-time	15	10.3
Income		
£0-£12,500	16	11.0
£12,501-£14,549	8	5.5
£14,550-£24,944	12	8.2
£24,945-£43,430	28	19.2
£43,431-£150,000	56	38.4
£150,001+	20	13.7
Skip/Missing/NA	6	4.1
Sexual Orientation		
Heterosexual, Straight	103	70.6
Bisexual, Pansexual	33	22.6
Gay	2	1.4
Lesbian	1	.7
Demisexual	0	0
Asexual	2	1.4
Queer	1	.7
Other	2	1.4
Skip/Missing/NA	2	1.4

Note. N = 146. Participant were on average 27.6 years old (*SD* = 17.5, Range = 18-84).

Figure 11.1

Pilot Mediation model of relatedness



Note. Effects are median standardized β coefficients of the posterior distribution with 95% HDIs for relatedness. T1 and T2 reflect pre- and post-test scores of relatedness needs. D_1 and i_0 are the kama muta dummy condition and the control reference group intercept respectively. Effects here were used as priors in Study 1's main analyses.

Study 1

On Mediation & Multicategorical Mediation

Mediation analyses attempt to model the relationship between an independent variable *X* on a dependent variable *Y* through the introduction of an intermediary "mediator" *M* variable (Baron & Kenny, 1986). In simplest terms, mediation analyses expands the base relationship of X causing Y, by modeling how *X* causes *M*, *M* causes *Y*, and thus presents how *X* causes *Y* (MacKinnon et al., 2007). While not a panacea for establishing causation, even with experimental design (Bullock et al., 2010), the indirect effect of *X* on *Y* through *M*, at best provides supporting evidence for why *X* affects *Y* (Hayes & Scharkow, 2013) and at least provides additional information about the relation between *X* and *Y* (MacKinnon et al., 2007). The statistical model, as with all statistical models, does not prove causality (Hayes & Preacher, 2014; Thoemmes, 2015). The mediation itself is represented as an *indirect* effect, via the paths to and from *M* (paths *a* and *b*). These effect estimates are a quantified description of the process by which *X* has effects on *Y*, thus constitute a critical part of mediation analyses' ability to document the process by which relationships occur (Hayes & Preacher, 2014). The estimates of a mediation model are represented by at least two equations (Baron & Kenny, 1986; Hayes & Scharkow, 2013):

$$M = i_1 + aX + e_m \quad (1)$$

$$Y = i_2 + c'X + bM + e_y \quad (2)$$

where *a*, *b*, and *c'* coefficients represent the effect estimates for their given path in the model (e.g., Figure 3.1), *i*'s represent the equations' respective regression intercepts, and likewise *e* represents respective regression errors. As perhaps more clearly evident in the model equations, mediations are simply an interpretive lens on a particular combination of regressions. Consequently, the presence of an indirect effect (the product of path *a* and *b*) is the primary requirement for mediation analyses, regardless of whether the *direct* effect of *X* to *Y* (path *c'*) remains after accounting for the mediator (Zhao et al., 2010).

The analyses in these studies use a particular iteration of the mediation analyses structure with a categorical condition variable *X*. Where *X* is a categorical variable, for example assignment into a control versus one or more experimental groups, the effects of *X* on *M* and *Y* are no longer continuous but in terms of means (Hayes & Preacher, 2014). In other words, Equations 1 and 2 each become represented as any other ordinary least squares regression representing categorical variables through a coding scheme (Alkharusi, 2012). We use dummy coding because the control group offers a logical reference group for comparison. With *k* amount of groups within the *X* variable, there are *k* – 1 number of dummy variables *D* (Cohen et al., 2002) and, substituting for *X*, Equations 1 and 2 become:

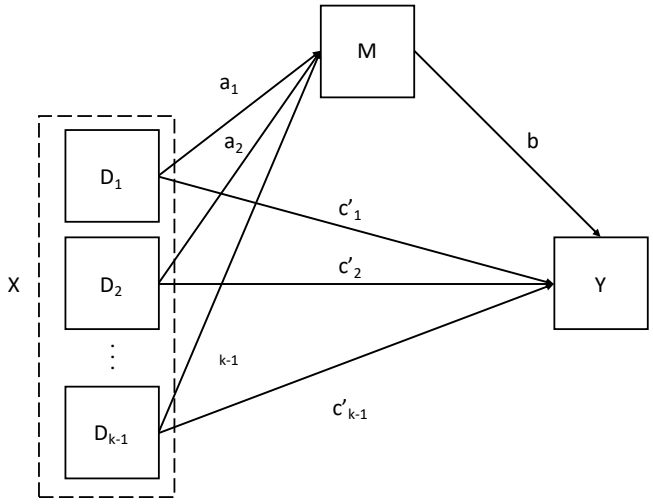
$$M = i_1 + a_1D_1 + a_2D_2 + \cdots + a_{k-1}D_{k-1} + e_m \quad (3)$$

$$Y = i_2 + c'_1 D_1 + c'_2 D_2 + \cdots + a_{k-1} D_{k-1} + bM + e_y \quad (4)$$

where the intercept *i* coefficients now represent the control group, a_i coefficients refer to differences between group D_i and the control group on *M*, *c'* coefficients refer to the differences between group D_i and the control group on *Y* holding *M* constant, and the *b* coefficient (most simply, and as is the case in these studies, a continuous mediator) refers to the effect of *M* on *Y* (Hayes & Preacher, 2014). With these new equations, the mediation model more technically becomes like the following in Figure 11.2:

Figure 11.2

Single Mediator Model with Categorical X



Note. Adapted from Hayes (2017). The total effect of X on Y is omitted here (path c) for clarity purposes in favor of highlighting the more consequential coefficients for these analyses as described by equations 3 and 4.

Pathways a_i are effectively a manipulation check of the condition—to what extent did the given condition deliver the relevant 'dosage' of *M*— embedded alongside the primary analyses of their respective effects on Y. In other words, this mediation framework condenses what could be two separate questions—did the conditions "work?"; did the conditions enact psychological changes on Y?— into a singular question, to what extent did the conditions enact changes on Y *in terms of our variables of interest*?

On the Sigmoid Function and Kama Muta Scale Transformations

While ostensibly like many other psychological measures (Clark & Watson, 2019; Joshi et al., 2015) —a series 7-point Likert scale items ranging from 0 "Not at all" to 6 "A Lot" — the

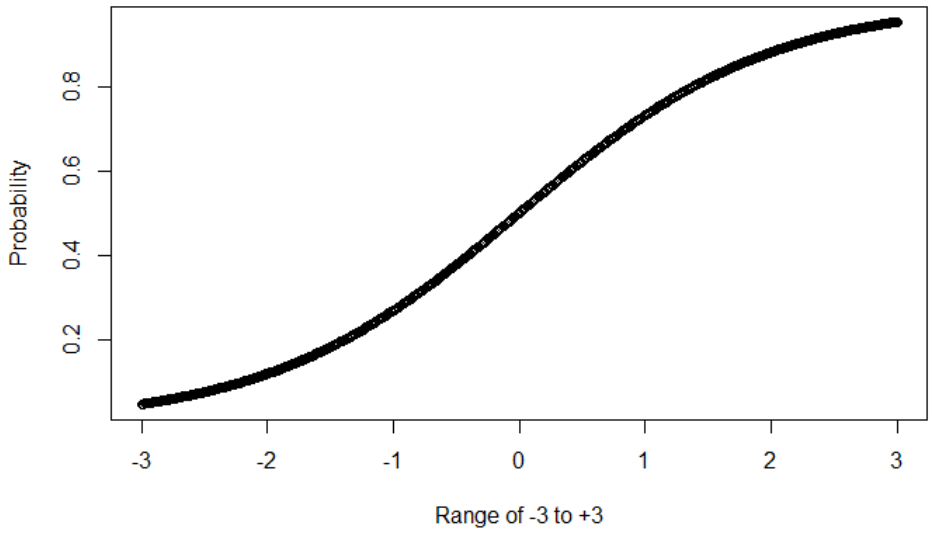
KAMMUS Two was originally claimed to reflect probability of its construct (kama muta) rather than a singular reflection of that construct. A sum or average of scores could be misinterpreted as a quantity of kama muta, an indicator of feeling strength, for example. In this vein, Zickfeld, Schubert, Seibt, Blomster, et al. (2019) suggest that determining relationships between kama muta and another construct is determined by the extent to which all subscales correlate to each other and individually correlate to the constructs in question. Doing so retains the relative importance of all five features as indicators of kama muta, however there are no other further guidelines, leaving it open how to exactly determine such relationships.

Ideally, kama muta can be modeled with a single variable befitting what is supposedly a singular emotion construct. Most obviously, reducing the number of tests performed in a given study to their most necessary and parsimonious features generally decreases errors that come with multiple testing (Bender, 2001; Dresp et al., 2019; Sainani, 2009). More conceptually however, determining relationships between kama muta and other variables becomes inferentially difficult when left with the five individual KAMMUS Two subscales. For example, if a given experience fails to engage, or be reflected by, a single KAMMUS Two subscale, how does one conceptualize the remaining four subscales as characterizing kama muta or not? Statistical models are quantifications of verbal expressions, thus they should mirror their hypotheses as closely as possible which is largely determined by how the operationalized variables in the model represent the constructs of interest (Yarkoni, 2019). In other words, using all five subscale indicators of kama muta in a model allows for inferences about those individual indicators, but cannot then *also* represent the scale's hypothetical reflection of both a *single* emotion construct and in terms of *probability* of kama muta. If we want to make conclusions about kama muta, kama muta must be tested in the models. For the purposes of these initial tests of kama mata, we tried to balance these construct and analytical practicalities in the following way.

To reflect a singular kama muta construct, whilst retaining as much validity to the scale intention of probability of kama muta, we applied a sigmoid function transformation to the assembled subscales of the KAMMUS Two. A sigmoid function, also known as an S-curve (see Figure 11.3), is a function describing logit (and probit) algorithms—the algorithmic base of logistic regressions, which model binomial data in terms of probability distributions (de Souza et al., 2015; Hilbe, 2009). The formula for the basic function is as follows (Equation 5):

Figure 11.3

A Sigmoid Function



Note. A sigmoid function centered at zero, plotting the range of points between -3 to +3 in .01 increments.

$$f(x) = \frac{1}{1+ e^{-x}} \tag{5}$$

where *e* is Euler's number. Several characteristics of the sigmoid function are worth noting. Firstly, the function asymptotically approaches 0 and 1 on either end of its given bounds, which belies its utility to describing probability distributions; for any given input of *x*, the function output approaches 0 or 1 (i.e. 0% or 100%) but never reaches either terminus. Secondly, *f(0)* is exactly equal to .5, denoting equal (50%) probability of either of the binary outcomes. This latter characteristic is informative as an anchor for scaling the scores from the KAMMUS Two.

To transform the KAMMUS Two items with the sigmoid function, we took the means of the individual subscales, and averaged those into a kama muta score. Doing this consolidation by subscales, rather than all scale items at once, ensures that all subscale dimensions are given equal weight in the final metric, no matter if one subscale has more or less items than others. This average kama muta "score" was then centered to the scale by subtracting three (the midpoint of the 0-6, 7-point Likert scale used in the KAMMUS Two). For a hypothetical example then, imagine a participant answered every item in every subscale at the midpoint--as a "3". The means their five subscales would therefore be $\frac{3+3+3+3+3}{5} = 3$, which after scaling by subtracting three, would mean this participant's scaled kama muta score would be 0. Using their scaled score in the sigmoid function would then describe *f(0)*, a 50% probability of their self-reported experience being kama muta. Applying this format to all participant scores results

in a probability of their self-reported experience being kama muta or not. By modeling kama muta directly in terms of probability, we can make inferences about the construct at large, rather than in terms of its component pieces and adhere as closely as possible to the scale's original intent.

On Bayesian Theory (and NHST)

Reviewing Null Hypothesis Significance Testing (NHST) in Research

Before contrasting with the Bayesian statistical approach, it is worth reviewing the core tenants of NHST. NHST's most easily recognized, and pervasive, feature in scientific discourse are *p-values*. First popularized by Fisher (1925), *p-values* represent the probability of a given or more extreme alternative hypothesis under the null hypothesis. If a significance test yields a *p* below a cutoff, often set at .05 as per Fisher's original recommendation, then the null hypothesis is rejected and the result deemed statistically significant (Nickerson, 2000). Foundational to this framework is the null hypothesis, lending its name to the larger methodological process, 'Null Hypothesis Significance Testing.' The default null hypothesis assumes there is no difference between means—that the data is represented randomly across some distribution, i.e. the effect of interest is zero (Dienes & McLatchie, 2018; Szucs & Ioannidis, 2017). NHST methods are therefore often taken as a test against "chance", where a small *p-value* designates that the given effects would be sufficiently unlikely to be found under random circumstance, and therefore conclude that some other alternative paradigm is in operation. This statistical ritual has become the dominant form of analytic process across biomedical and social sciences for decades (Chavalarias et al., 2016; Gigerenzer, 1998; Ioannidis et al., 2014).

However, the NHST method as-writ has some notable limitations. To start, NHST has a problem of hypotheses—both null and alternative. The null hypothesis is more technical and imperial than often appreciated. It is not merely the assumption that there are simply no true differences or effects present, it is the assumption that any such differences or effects are *exactly* zero (Bakan, 1966). It is exceedingly rare in which the null hypothesis is either realistic and/or relevant (Bakan, 1966; Meehl, 1978). Moreover, the base null hypothesis is assumed at the start, which means that NHST (as *p-values*) cannot provide weight of evidence for the null hypothesis. For example, a large *p-value* does not provide evidence that the null hypothesis is true, just that the observed effects are not inconsistent with the $H_0 == 0$ (Bakan, 1966; Nickerson, 2000). Put simply, one can never "accept" that which was assumed to be true in the first place. Relatedly, in part because of this assumption, NHST relies on logic of rejection (Bakan, 1966; Fisher, 1925), applying the logical argument form known as *modus tollens*, or denying the consequent (Nickerson, 2000; Szucs & Ioannidis, 2017):

If A, therefore B.	If it is a car, then it has four wheels.	If H_0 is true, then H_1 will be false
B is not true.	This does not have four wheels.	H_1 is true
Therefore, A *is not* true	Therefore, it is not a car.	Therefore, H_0 is false (i.e. reject H_0)

However, this proposition means that it is also impossible to accept the *alternative* hypothesis because to do so commits the logical fallacy known as *affirming the consequent*:

If A, therefore B.	If it is a car, then it has four wheels.	If H_1 is true, then H_0 will be false
B is true.	This has four wheels.	H_0 is false
Therefore, A *is* true	Therefore, it is a car.	Therefore, H_1 is true

If H_1 (A) is true, therefore H_0 (B) will be false. H_0 (B) is false. Therefore, H_1 (A) is true. In other words, if the null hypothesis is false, it could be *any* alternative hypothesis. NHST thus only produces quantifiable evidence in favor of the null hypothesis and never provides evidence for any given alternative hypothesis. Even liberal use of this logical fallacy (i.e. knowing that rejecting the null hypothesis does not prove the alternative hypothesis but at least suggests at least some evidence for it) still cannot fully corroborate a given hypothesis. A specific "nonchance" effect of a given alternative hypothesis must be held against other potential "nonchance" effects (Lykken, 1968; Nickerson, 2000; Szucs & Ioannidis, 2017). NHST, however, is highly reliant on this controversial decision-based framework— the adoption of one belief over another, that of significance or not (Bakan, 1966; Good, 1983; Rozeboom, 1960). In sum, NHST at its most technical underpinnings somewhat struggles to provide evidence for either hypothesis. Furthermore, NHST is a tool for deciding the better belief given the long-run error expectations of a single experimental design theoretically repeated over and over again, a research paradigm that does not commonly occur in psychological science (Bakan, 1966; Rozeboom, 1960; Szucs & Ioannidis, 2017).

On Bayesian Theory, Differences from NHST

Starting at a place of overlap, both Bayesians and frequentists seek to make statements about a given parameter θ (for example, a regression coefficient β in a linear model) in terms of probability. However to a frequentist, θ is a limiting frequency (where the name "frequentist" originates) determined by randomness, visible over a long-run of repeated events, just as the probability of a fair coin landing heads is ½ as determined by many, exact repetitions (Wagenmakers, 2007). In other words, there is a single, assigned population value of parameter θ that frequentist statistics de facto attempt to estimate across many real (or theoretical) repetitions. This statistical philosophy is visible when looking at frequentist 95% confidence

intervals (Wagenmakers et al., 2008). For example, a frequentist 95% confidence interval of [2, 4] does not mean 95% probability of the true parameter value being between two and four, but rather that, if repeated many times over, the true mean *would* lie between two and four 95% of the time (Wagenmakers et al., 2008). Bayesians disagree with frequentists about this limiting frequency treatment of parameters which, while a seemingly pedantic philosophical issue, has significant statistical repercussions (Bayarri & Berger, 2004; Little, 2006) and ultimately produces key features of the Bayesian method. Bayesian statistics instead treat parameters (and unobserved data for that matter) as probability statements conditioned on the observed data *y* (Gelman et al., 2020). In other words, parameter θ is considered a random variable that *can vary* depending on ("conditioned upon") the data *y*; the probability estimate of a fair coin landing heads can vary *depending* upon the given observed coin flips. Because Bayesians take this philosophic statistical stance, statements about parameter(s) θ are not made in terms of point estimates, but in terms of probability *distributions* (Gelman et al., 2020).

The Bayesian approach to treating parameters in terms of conditioned probability distributions facilitates two critical features of Bayesian statistics: priors and posteriors. As alluded to in the coin flip example, and unlike frequentists, Bayesians can assign probability distributions to all manner of events, including those that have not occurred and those following the observation of new data (Wagenmakers, 2007). The specification of these two distributions is the primary concern of Bayesian estimation—the probability of a given parameter (a "prior" distribution) and the probability of said parameter after given the observed set of data (a "posterior" distribution; Gelman et al., 2020). The relationship of these distributions is codified by Bayes Rule, sometimes also known as Bayes Theorem:

$$p(\theta|y) = \frac{p(\theta)p(y|\theta)}{p(y)} \propto p(\theta)p(y|\theta) \quad (6)$$

where the *posterior distribution* (left side of the equation), the probability of parameter θ given y data $p(\theta|y)$, is equal to the product of the *prior* $p(\theta)$, an *a priori* described knowledge/belief/certainty of θ, and the *sampling distribution* of the data $p(y|\theta)$. Since the denominator of this rule, the marginal distribution of the data $p(y)$, is a constant, it is commonly removed. Thus, as reflected by the right side of the equation, Bayes Rule condenses to say that the posterior is proportional to the product of the prior and likelihood distribution (Gelman et al., 2020). It should be noted as well that Bayes Rule is a proven mathematical statement. No mathematician nor statistician, of frequentist philosophy or otherwise, disputes its validity (Stone, 2013). What *is* in dispute is, based on their philosophical differences (what is a limited frequency variable vs a variable with a condition-able probability distribution), the extent to which this rule can be applied—essentially, Bayesians argue that this rule can be applied liberally for all manner of things while frequentists disagree.

While technical, the point of all of this complex formulation is that Bayesian inference, at its heart, attempts to summarize a posterior distribution of a parameter—a quantifiable measure of a parameter *given* observed data—which is directly related to *quantified prior*

beliefs about said parameter (Gelman et al., 2020). In other words, applying Bayes rule in research means one can quantifiably incorporate previous knowledge/belief/certainty into their estimates and effectively update that knowledge/belief/certainty with new data (Gelman et al., 2020; Wagenmakers, 2007). This unique ability to update prior belief with new information subsequently allows for direct hypothesis testing (Westbury, 2010).

On Bayesian Estimation

Bayesian analytic methods have several key features, and subsequent strengths. Such strengths are usually held in relative contrast to the limitations of the frequentist-based, Null Hypothesis Significance Testing (NHST) paradigm that dominates many areas of science (Chavalarias et al., 2016; Ioannidis et al., 2014; Nickerson, 2000). In justifying our choice of analyses, we will inevitably present some such NHST limitations (that Bayes ameliorates or may otherwise attend to), however a full discussion of the relative merits and flaws of frequentist NHST and Bayesian methods is beyond the scope of this dissertation, and not strictly necessary to appreciate our use of Bayesian approaches further than those merits presented here. For the purposes of this dissertation appendix, we will now highlight the core features of Bayesian estimation and in doing so explain why and how we use it in these analyses.

Fundamental to Bayesian statistics is the concept and use of "priors." This ability to integrate previous belief/confidence/certainty/expectation into an analytic model is a key, unique strength of the Bayesian method. Priors reflect, and allow a way of updating, previous knowledge. While the influence of priors diminishes as more data is collected, as the data "dominates" the prior, until such data saturation is obtained (and because of practical limitations of large sampling) specifying priors becomes of significant interest to a Bayesian analyst (Gelman et al., 2020; Van Dongen, 2006). Priors are often broadly labeled in terms of how informative or influential they are to the model, i.e. how "strong" a belief one has about the given parameter. Strong priors reflect high certainty or confidence of a parameter value, while noninformative (or "uninformative") priors refer to no previous expectation or knowledge, effectively letting the data speak for itself (computationally speaking, analogous to NHST analyses; Lemoine, 2019). While the effects of kama muta are relatively unstudied, particularly in terms of basic psychological needs as in Studies 1-2, this project instead elects for so-called "weakly informative" priors. Entirely uninformed priors can actually introduce bias in estimates and the uniform distributions usually used to denote such "uninformed" expectations are themselves not necessarily uninformative (Du et al., 2019; Lemoine, 2019). Weakly informative priors, as a broad middle ground between strong and uninformative priors, effectively regularize data, shrinking low-powered data towards zero unless sufficient evidence of an effect, thus minimizing Type 1 error rates (Lemoine, 2019; McElreath, 2020). The goal is to rule out known *a priori* unreasonable values, thus retaining a more realistic range of plausible values, leaning more or less conservative depending on prior knowledge. Weakly informative

priors thus offer more conservative, accurate estimations in the face of small or noisy data (Lemoine, 2019).

The estimates finally produced from this whole process of integrating priors with the collected data are called "posteriors." Posteriors, just like priors, are described in terms of distributions (Gelman et al., 2020). The posterior distribution contains all the information about the given parameter estimate, however for practical purposes, summaries are more commonly reported than entire distributions (Gelman et al., 2020). Just as in typical frequentist NHST analyses, a point estimate can be derived from this posterior—often the median of the distribution—however Bayesians have the additional benefit of describing parameter estimates in what are called credible intervals (Kruschke, 2021). Credible intervals (CIs) present the uncertainty in the posterior point estimate, describing the percentage of the posterior distribution encompassed by a given range of values (Gelman et al., 2020). Helpfully, *credible* intervals do not depend on long-run, large-N sampling as frequentist *confidence* intervals do (Kruschke, 2021). A commonly reported credible interval is the 95% highest density interval (HDI), which describes the range of data that encompasses 95% of the posterior distribution (Gelman et al., 2020; Kruschke, 2021), thus essentially reflecting the range encompassing the 95% most credible values for the estimate (Kruschke, 2018). Put together, a Bayesian posterior estimate with a 95% HDI of, say $\beta = 1.6$ [.5, 3.4] can be interpreted that the median value of parameter β's posterior distribution is 1.6, with 95% of all estimates of parameter β found in the analyses falling between .5 and 3.4.

As perhaps apparent, Bayesian analysis does not output a significance value upon which to judge whether this hypothetical $\beta = 1.6$ estimate is statistically significantly different from a null hypothesis of zero as per NHST. Bayesian analysis interests itself more in posterior (and by extension, parameter) estimation and description rather than a default comparison to a base null hypothesis. Remember, *a priori* beliefs/hypotheses about the parameter in question are already built into the posterior via the integration of the prior—the posterior gives full information about a parameter estimate, it is up to the analyst for its interpretation. In this sense, Bayesians favor presenting values with their uncertainty (i.e., estimates with their 95% HDIs) to avoid what many see as fallacious black-and-white thinking that accompanies discrete accept/reject decisions commonly performed in NHST (Bakan, 1966; Cumming, 2014; Kruschke, 2018; Rozeboom, 1960; Wasserstein & Lazar, 2016). However, decisions such as whether a value is null or not are sometimes necessary, for example when exploring whether a new construct has any appreciable, non-zero effect on an outcome (as we examine in Study 1 and later in Study 2). To make the *secondary* conclusion whether a parameter estimate is effectively a null value, whilst respecting the weight of the parameter estimate and uncertainty (the *primary* conclusion), it is useful to decide upon the basis of a Region of Practical Equivalence (ROPE; Kruschke, 2018).

We can use a ROPE to decide whether a given effect can be considered null. A ROPE describes the range of values an analyst considers for practical purposes zero (or otherwise,

null), a concept analogous to the smallest effect size of interest (Kruschke, 2018). Decisions of whether a parameter estimate is effectively null are based on the extent to which the ROPE and 95% HDI parameter distribution overlap (Kruschke, 2018). If the 95% HDI is entirely within the ROPE boundary, then it can be concluded that the parameter is effectively null, because that means the 95% most credible values of the parameter are all within the range considered practically zero. Alternatively, if the 95% HDI is entirely outside of the ROPE, then it can be concluded that the parameter is non-zero because the 95% most credible values of the parameter are outside the range considered practically zero. However, if the 95% HDI is neither fully encompassed nor outside the ROPE, then there is mixed evidence that the parameter estimate is non-zero because some of the 95% most credible values are within a range considered practically zero while some others are not. For these studies, we use a ROPE boundary of $\beta = \pm.05$, specifying that we consider standardized regression coefficients practically equivalent to null if smaller than half a "small" effect size split across zero (Cohen, 1988; Kruschke, 2018). It should be reminded here that the decision of a whether a parameter value is practically speaking null with a ROPE is a secondary data conclusion—the primary focus of the Bayesian analysis is the parameter posterior summary, which includes the full magnitude and uncertainty of the data (Kruschke, 2018).

On Bayesian Diagnostics

Bayesian analysis relies on simulated draws in order to create the posterior distribution, in effect combining the data and the prior together over and over again in different starting points to construct a full probability distribution of the final effects. A common method is the Markov Chain Monte Carlo (MCMC) method which iteratively draws values from approximations of the parameter posterior distribution, updating itself with each draw to create a "chain" of values that better and better approximate the posterior distribution (Gelman et al., 2020). These chains of dependent samples, iterating upon themselves thousands of times over, eventually become chains of independent samples that converge upon a stable representation of the posterior. However, since there is no guarantee of when such stability occurs, analysts rely on several aspects of the chains as diagnostic checks. Effective sample size (ESS) for parameters reflects the number of independent samples from the posterior (thus is one way to determine stability of the posterior, that the chains have high resolution) and should ideally be above 10,000 (Kruschke, 2021). Meanwhile, Point Scale Reduction Factors (PSRFs) indicate whether the chains in the MCMC simulation have converged and should be at or near 1.00 to reflect chain convergence (Brooks & Gelman, 1998), acceptably below 1.10 or preferably below 1.05 (Kruschke, 2021).

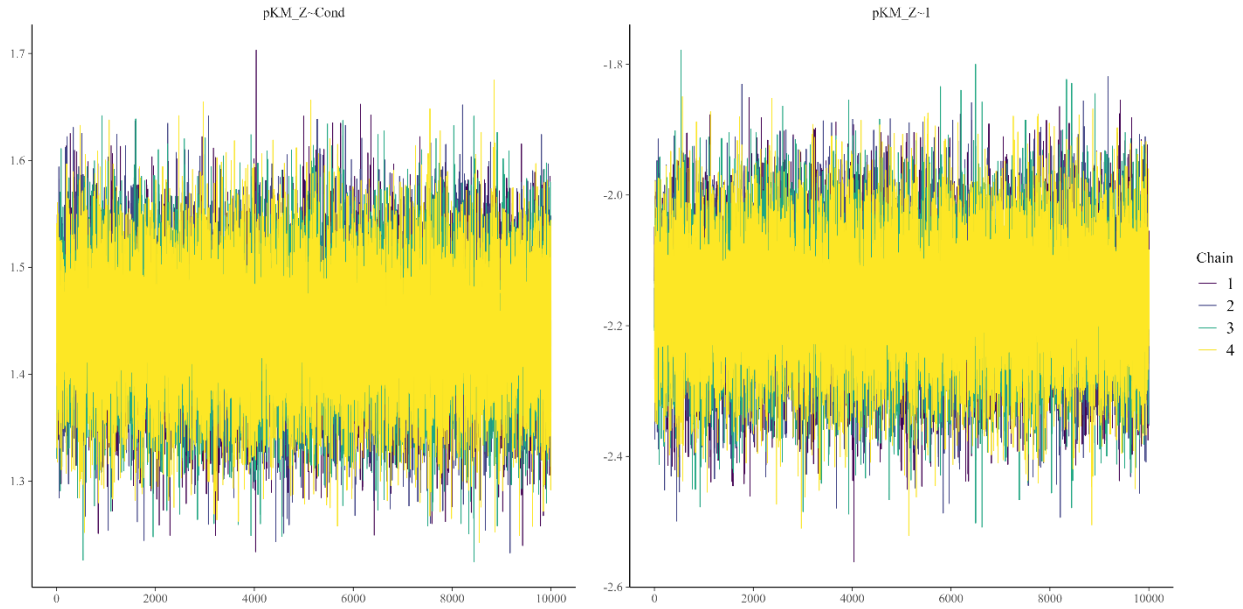
Additional checks that assess the overall model can be performed, such as posterior predictive model checks (PPMCs) and sensitivity analyses. PPMCs assess the posterior distribution's ability to essentially recreate the original data, in effect testing whether the simulated data from the model resembles the original data (van de Schoot et al., 2021). While

helpful for model evaluation (Gelman & Shalizi, 2013; Kruschke, 2013), there are no universal guidelines for them (Kruschke, 2021). A longstanding critique of their usage has been that they using the data twice over which, as Moran et al. (2024) point out, means that their diagnostic information may not be accurate (e.g. particularly from low power).

Diagnostic Plots: Study 1

Figure 11.4

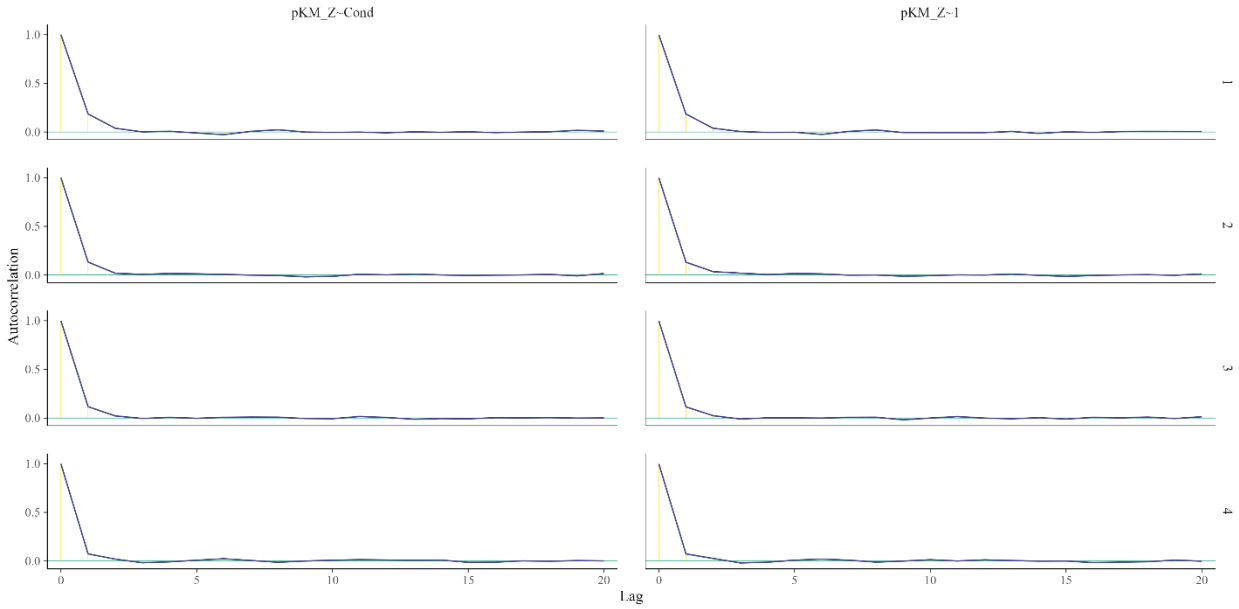
Chain trace plots of X -> M model



Note. Chain mixing plot of the posteriors' chains.

Figure 11.5

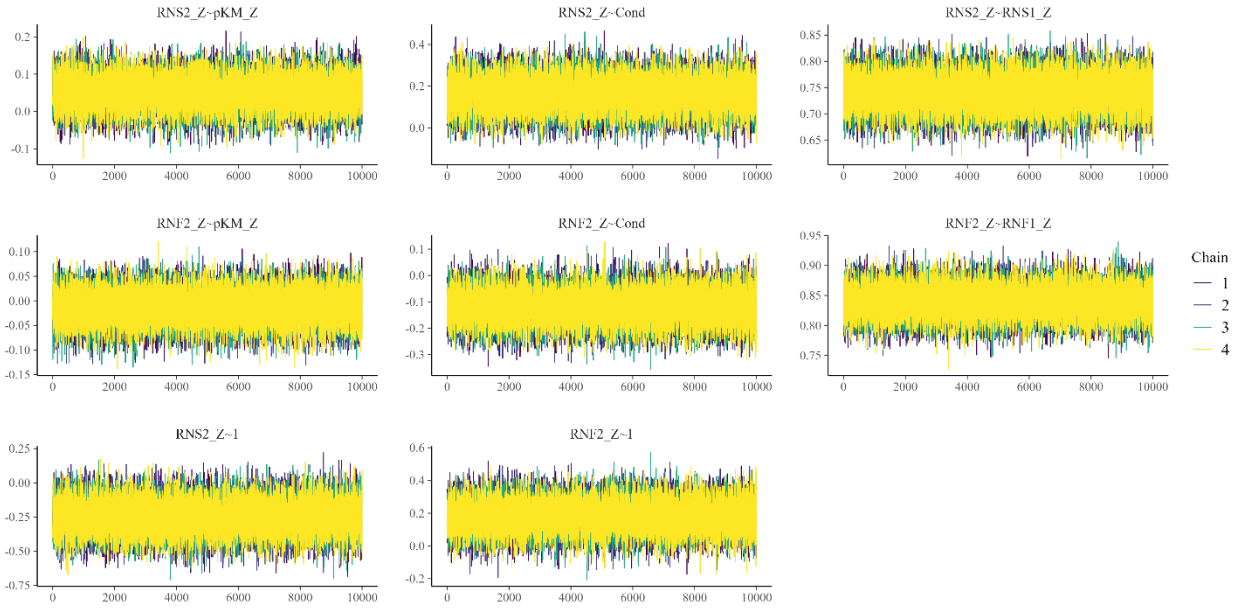
Autocorrelation plots of X -> M model



Note. Autocorrelation of lagged sampling draws.

Figure 11.6

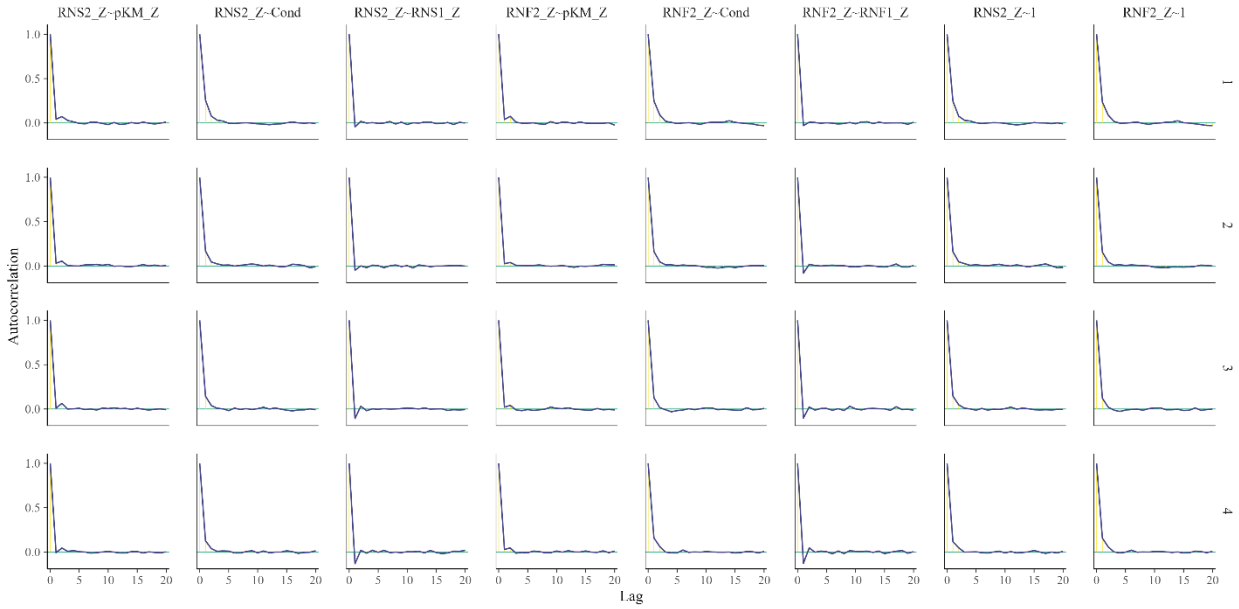
Chain trace plots of X + M + T1 -> Y model



Note. Chain mixing plot of the posteriors' chains.

Figure 11.7

Autocorrelation plots of X + M + T1 -> Y model



Note. Autocorrelation of lagged sampling draws.

On Two-Time Point Data: Residual Change Versus Difference Scores

The analysis of Study 1 (and later Study 2) uses a residual change approach to model two-time point data. This perspective of two-time point data models the outcome *Y* at Time 2 (T2) as a function of *Y* at Time 1 (T1); i.e. in a simple, single variable model:

$$Y_{T2} = X + Y_{T1} \quad (7)$$

In this sense, the previous time point is treated like a covariate, where *X* reflects the unique effect on the "residual" variance leftover in *Y* after accounting for the variance explained by the previous time point. This approach stands in contrast to change scores, the other most popular method of two time point data. While a seemingly simple decision, reflecting an ostensibly simple design, arguments about which analytic format better suits social scientific research have lasted for over a half century (Lord, 1956). Proponents of the change or "difference" score, perhaps most famously John Willet, have argued change scores are more reliable measures across more situations (Rogosa & Willet, 1983) and that difference scores (unlike residual change scores) remain substantively intuitive and meaningful in and of themselves (Willet, 1989). Meanwhile, proponents of residual change, perhaps most famously Lee Cronbach, argue the difference score both compounds measurement reliability issues (the difference score being the combination of two measures *and* their unreliability) and fails to take into account relative base points (i.e., change may not uniformly impact all individuals, e.g. a change in $100 means something very different to someone who earns $1,000 a year vs $100,000), concluding residual change better represents within-person processes (Cronbach & Furby, 1970). The author of this thesis take the view consistent with Curran and Bauer (2011) that, especially for longitudinal data, most psychological theories describe within-person processes, thus analyses should become primarily interested in the disaggregation of within/between processes. Though it is worth acknowledging, and agreeing with, Willet's ultimate assessment that regardless of method, two-time point data is the bare minimum evaluation of change and can be substantially improved upon with further time points (Willet, 1989). In summary, we will rely on residual scores for these analyses to better represent within-person change.

On Exploratory Subscale Results: Study 1

Table 11.2

Estimates and Model Diagnostics of Kama Muta Subscales

	Estimate	95% HDI	% ROPE Overlap	ESS
Communal Sharing mediator (M)				
Model: X -> M				
Intercept	-1.99	**[-2.27, -1.72]**	0.00	27452
Kama Muta Condition	1.33	**[1.16, 1.51]**	0.00	27882
Full Relatedness Model (Y_{Sat};				
Satisfaction Post-Test				
Intercept	-.16	[-.39, .34]	15.08	25798
Communal Sharing	.12	[.03, .21]*	4.26	32048
Kama Muta Video	.10	**[-.05, .25]**	0.00	25733
Pre-test	.73	**[.67, .79]**	0.00	43481
IE Kama Muta Condition via *M*.	.16	[.04, .28]		-
IE Control Condition via *M*.	-.24	[-.43, -.06]		-
Frustration Post-Test				
Intercept	.15	[-.03, .33]	13.21	24970
Communal Sharing	-.04	[-.11, .03]	58.21	32089
Kama Muta Video	-.10	[-.21, .02]	21.60	24964
Pre-test	.84	**[.79, .89]**	0.00	43079
IE Kama Muta Condition via *M*	-.06	[-.15, .04]	-	-
IE Control Condition via *M*	.09	[.07, -.05]	-	-
Lexical Label mediator (M)				
Model: X -> M				
Intercept	-2.38	**[-2.60, -2.16]**	0.00	30192
Kama Muta Condition	1.59	**[1.45, 1.73]**	0.00	29971
Full Relatedness Model (Y_{Sat};				
Satisfaction Post-Test				
Intercept	-.22	[-.48, .03]	7.58	24974
Lexical Label	.06	[.04, .16]	39.62	30031
Kama Muta Video	.14	[-.02, .31]	11.47	24713
Pre-test	.74	**[.68, .80]**	0.00	46252
IE Kama Muta Condition via *M*.	.10	[-.06, .26]	-	-
IE Control Condition via *M*.	-.15	[-.39, .09]	-	-
Frustration Post-Test				
Intercept	.16	[-.04, .37]	12.06	25851
Lexical Label	-.03	[-.10, .05]	74.31	30055
Kama Muta Video	-.11	[-.24, .03]	19.03	25662
Pre-test	.84	**[.79, .89]**	0.00	43710
IE Kama Muta Condition via *M*	-.04	[-.16, .08]	-	-

IE Control Condition via *M*	.06	[-.13, .24]	-	-
Prosocial Motive mediator (M)				
Model: X -> M				
Intercept	-1.57	**[-1.88, -1.26]**	0.00	26975
Kama Muta Condition	1.05	**[.86, 1.25]**	0.00	26800
Full Relatedness Model (Y_{Sat};				
Satisfaction Post-Test				
Intercept	-.26	[-.48, -.05]*	0.03	25254
Prosocial Motive	.05	[.03, .13]	49.70	35292
Kama Muta Video	.17	[.04, .31]*	1.53	25061
Pre-test	.74	**[.70, .80]**	0.00	43383
IE Kama Muta Condition via *M*.	.05	[-.04, .14]	-	-
IE Control Condition via *M*.	-.08	[-.21, .05]	-	-
Frustration Post-Test				
Intercept	.18	[.01, .35]*	4.29	24646
Prosocial Motive	-.02	[-.08, .04]	83.92	34965
Kama Muta Video	-.12	[-.23, -.01]	8.81	24017
Pre-test	.84	**[.79, .89]**	0.00	46609
IE Kama Muta Condition via *M*	-.02	[-.09, .05]	-	-
IE Control Condition via *M*	.03	[-.07, .13]	-	-
Physiological Signs mediator (M)				
Model: X -> M				
Intercept	-1.85	**[-2.10, -1.56]**	0.00	27163
Kama Muta Condition	1.23	**[1.05, 1.42]**	0.00	27173
Full Relatedness Model (Y_{Sat};				
Satisfaction Post-Test				
Intercept	-.28	**[-.50, -.06]**	0.00	24732
Physiological Signs	.03	[-.05, .12]	64.37	34127
Kama Muta Video	.18	[.04, .33]*	1.13	24563
Pre-test	.74	**[.68, .81]**	0.00	46348
IE Kama Muta Condition via *M*.	.04	[-.07, .15]	-	-
IE Control Condition via *M*.	-.06	[-.22, .10]	-	-
Frustration Post-Test				
Intercept	.18	[.00, .36]	5.22	24771
Physiological Signs	-.02	[-.08, .05]	85.58	32439
Kama Muta Video	-.12	[-.23, -.00]	10.09	24472
Pre-test	.84	**[.79, .89]**	0.00	44721
IE Kama Muta Condition via *M*	-.02	[-.10, .06]	-	-
IE Control Condition via *M*	.03	[-.10, .15]	-	-
Single-Item Positive Affect mediator				
Model: X -> M				
Intercept	-1.51	**[-1.82, -1.20]**	0.00	26820
Kama Muta Condition	1.01	**[.81, 1.21]**	0.00	26981
Full Relatedness Model (Y_{Sat};				
Satisfaction Post-Test				

Intercept	-.19	[-.40, .03]	8.44	25112
Positive Affect	.13	[.05, .21]*	.71	34757
Kama Muta Video	.12	[-.02, .26]	13.72	24797
Pre-test	.73	**[.66, .79]**	0.00	42768
IE Kama Muta Condition via *M*.	.13	[.04, .22]	-	-
IE Control Condition via *M*.	-.20	[-.33, -.06]	-	-
Frustration Post-Test				
Intercept	.14	[-.02, .31]	12.24	23295
Positive Affect	-.06	[-.12, .01]	39.26	34517
Kama Muta Video	-.09	[-.20, .02]	20.50	23197
Pre-test	.84	**[.79, .88]**	0.00	42588
IE Kama Muta Condition via *M*	-.06	[-.12, .01]	-	-
IE Control Condition via *M*	.09	[-.01, .18]	-	-

Note. Standardized estimates with 95% HDI reported by [lower, upper] limits. ESS = Effective Sample Size. IE = Indirect Effect. Bolded intervals do not overlap with ROPE. * denotes HDIs with 5% or less overlap with ROPE.

12 Appendix 2: Chapter 4

Study 2

On Changes to Pre-Registration Analytic Plan

The original preregistered analytic plan of Study 2 focused on multi-level modeling, however the author of this thesis later learned the original multilevel modeling option was unnecessarily complicated for this analysis. As such, the analyses of Study 2 reverted to a simpler single-level model rather than force through the previous analytic plan due to the technical difficulties of a multi-level method for these data. We present a more thorough explanation of the reasoning for this change below.

The distinction between the originally proposed multi-level method and eventual single level method is perhaps best shown through the paired t-test. Two-time point data as a multi-level model is directly related to the paired samples t-test (t_p). This is because the paired samples t-test's key feature is computing the difference between two group means or scores against the overall standard error (Coman et al., 2013) which, when the groupings reflect an individual at two time points, simply is the difference between T2 and T1 accounting for within-person covariance as seen in Equation 8 (Kim, 2015):

$$t_p = \frac{x_1 - x_2}{\sqrt{\frac{s_1^2 s_2^2 - 2\rho s_1 s_2}{n}}}) \quad (8)$$

In other words, a paired samples t-test is simply a multilevel modeling of the difference score between two time points. Leveling up this frame to multilevel modeling seems appropriate on first glance, because a linear model approach accommodates multiple predictors rather than just the single scores/means (as in Equation 7). However, not all predictors can be treated the same, especially when considering longitudinal design. Predictors measured at a single time point can still be relevant assuming they remain constant throughout the study time period, e.g. experimental condition, race/ethnicity, sex etc. In this case however, since participants only recorded their kama muta and positive affect experience after the experimental manipulation (i.e. Time 2 post-test), those scores are definitionally NA at the Time 1 pre-test. Since these mediator data are inherently missing *not* at random for Time 1 and also of just a single observation, most missingness techniques (e.g. multiple imputation, Bayesian imputation) that could allow for analyses consistent with the multilevel model first preregistered are also unavailable due to missingness assumption violations (Carpenter & Smuk, 2021; Schafer & Graham, 2002). This is all to say, while there may be opportunities to retain functionally similar analyses to those pre-registered, doing so would either be too reductionist to test the relationships of interest (i.e. a paired t-test) or would require advanced techniques (e.g.

imputation) to resolve inherent missingness issues that may not even be appropriate anyway. Coincidentally, using a similar paradigm to the previous study's analysis also has the added benefit of also directly implementing several of the priors used from Study 1, making the most of the Bayesian integration of previous beliefs. For clarity and expediency, the author of this thesis decided to instead return to the residual change score method used in Study 1 to analyze these data (see previous section for justification of residual change scores versus difference scores).

Priors of Study 2

Table 12.1

Priors specification for Study 2: Autonomy

		M		Autonomy T2	
		Kama Muta	Positive Affect	Satisfaction	Frustration
X	Intercept	N(-2.16, .09)*	N(0,2)**	N(0,2)**	N(0,2)**
	Amusement Cond.	N(0,2)**	N(0,2)**	N(0,2)**	N(0,2)**
	Kama Muta Cond.	N(1.4, .10)*	N(0,2)**	N(0,2)**	N(0,2)**
M	Positive Affect	-	-	N(0.1,1)†	N(-0.1,1)†
	Kama Muta	-	-	N(0,2)**	N(0,2)**
	T1 Y	-	-	N(0,2)**	N(0,2)**

Priors specification for Study 2: Relatedness

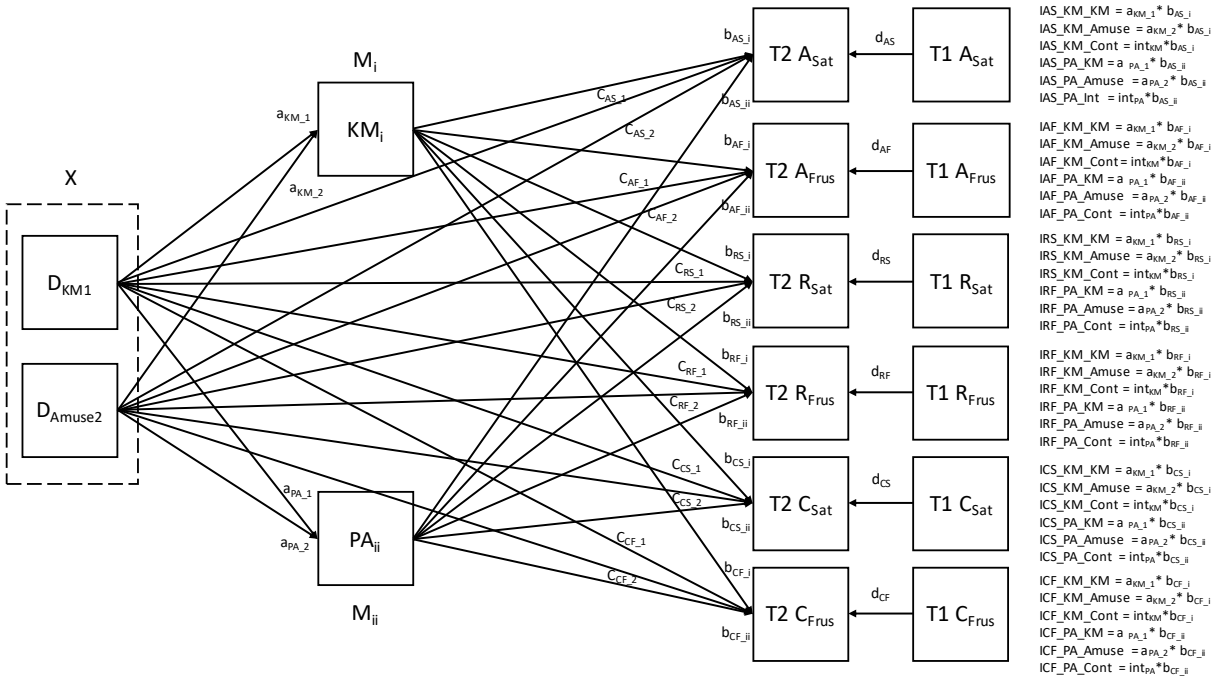
		M		Relatedness T2	
		Kama Muta	Positive Affect	Satisfaction	Frustration
X	Intercept	N(-2.16, .09)*	N(0,2)**	N(-.24, .12)*	N(.18,.09)
	Amusement Cond.	N(0,2)**	N(0,2)**	N(0,2)**	N(0,2)**
	Kama Muta Cond.	N(1.4, .10)*	N(0,2)**	N(.16,.08)*	N(-.05,.04)*
M	Positive Affect	-	-	N(.10,1)†	N(-.10,1)†
	Kama Muta	-	-	N(.05, .04)*	N(-.01, .3)*
	T1 Y	-	-	N(.74,.03)*	N(.84,.02)*

Priors specification for Study 2: Competence

		M		Competence T2	
		Kama Muta	Positive Affect	Satisfaction	Frustration
X	Intercept	N(-2.16, .09)*	N(0,2)**	N(0,2)**	N(0,2)**
	Amusement Cond.	N(0,2)**	N(0,2)**	N(0,2)**	N(0,2)**
	Kama Muta Cond.	N(1.4, .10)*	N(0,2)**	N(0,2)**	N(0,2)**
M	Positive Affect	-	-	N(0.1,1)†	N(-0.1,1)†
	Kama Muta	-	-	N(0,2)**	N(0,2)**
	T1 Y	-	-	N(0,2)**	N(0,2)**

Note. * informed by previous studies within thesis, ** weakly informative priors, † informed by previous literature

Figure 12.1

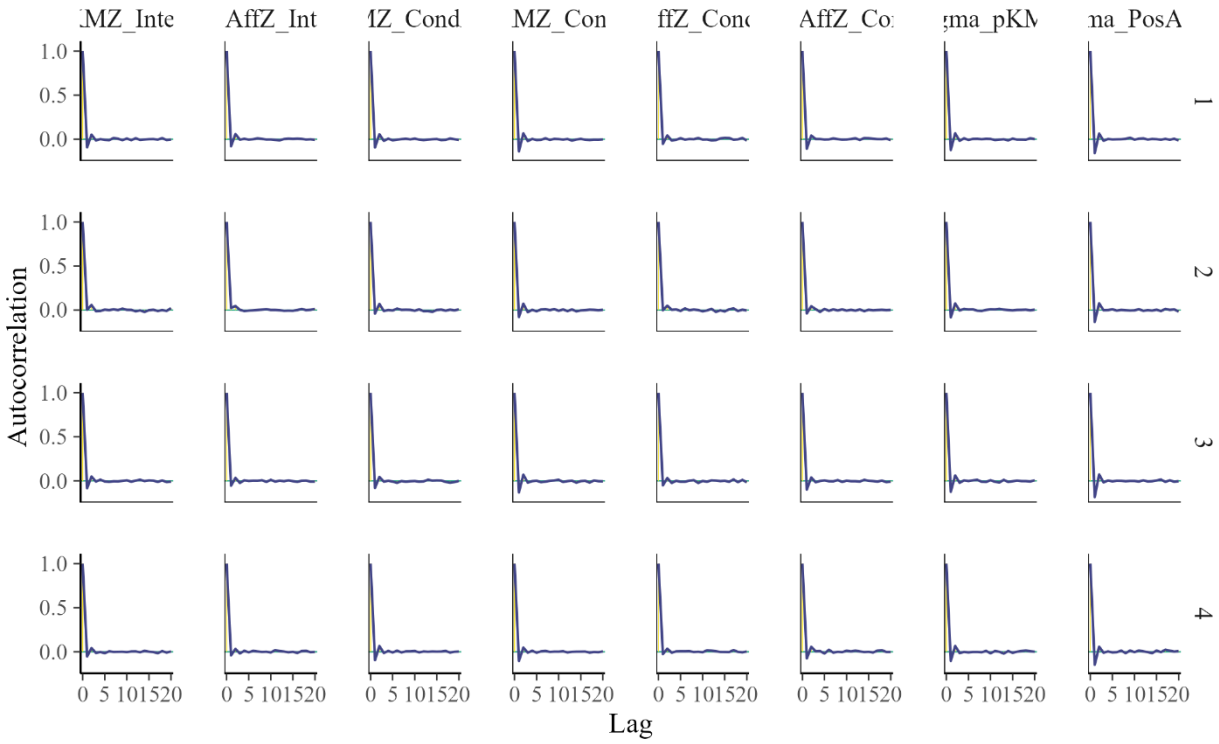


Note. Full model specification for Study 2. All paths are notated as outcome via predictor, e.g. path a_{KM_1} reflects the KM mediator as predicted by dummy 1. All six indirect effects, noted with "I" prefix, for a given outcome are listed on the right of the model. Intercept i_0 is omitted in the X variable for clarity.

Diagnostic Plots: Study 2

Figure 12.2

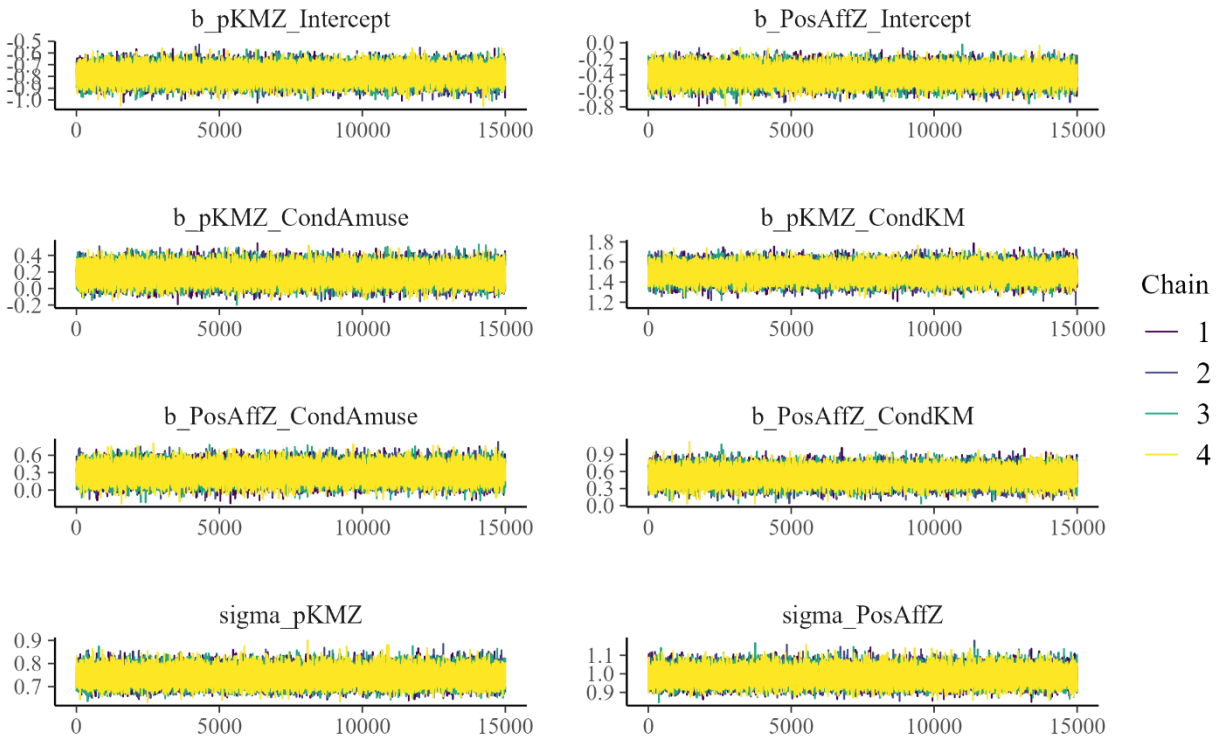
Autocorrelation of chains in Mediating (PA and pKM) Parameters in Model



Note. Autocorrelation of lagged sampling draws.

Figure 12.3

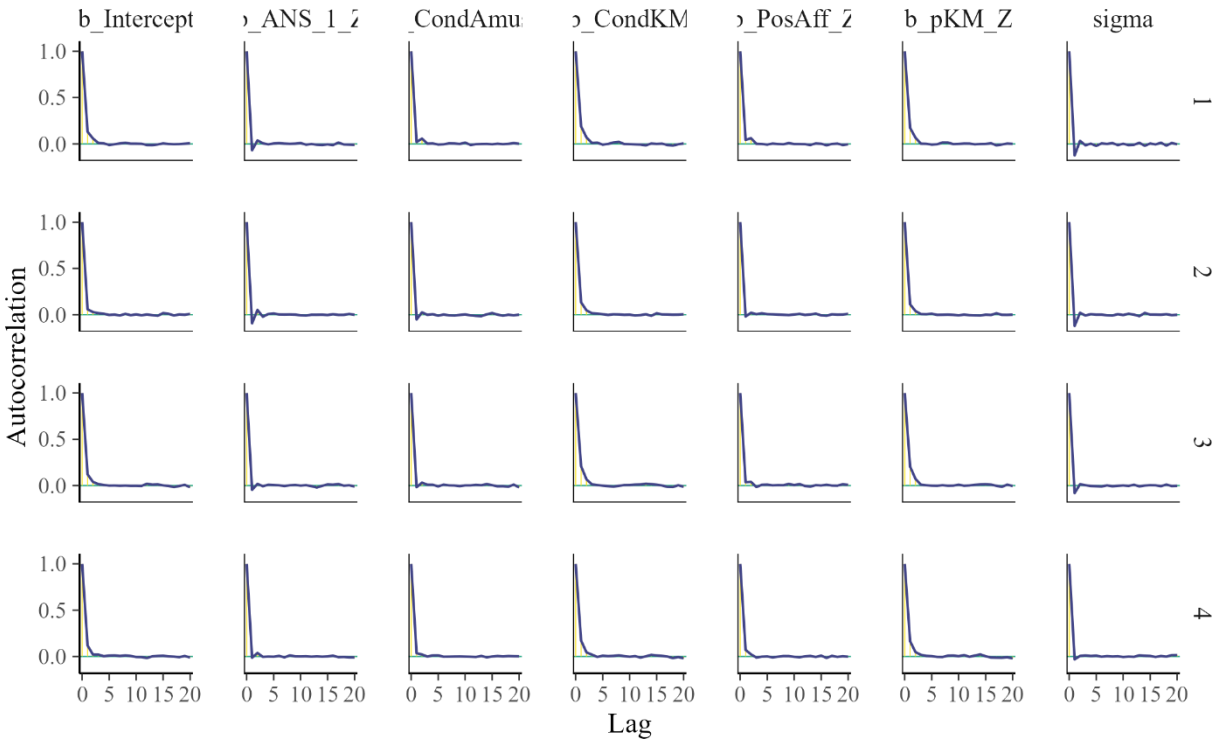
Trace plots of Mediating (PA and pKM) Parameters in Model



Note. Chain mixing plot of the posteriors' chains.

Figure 12.4

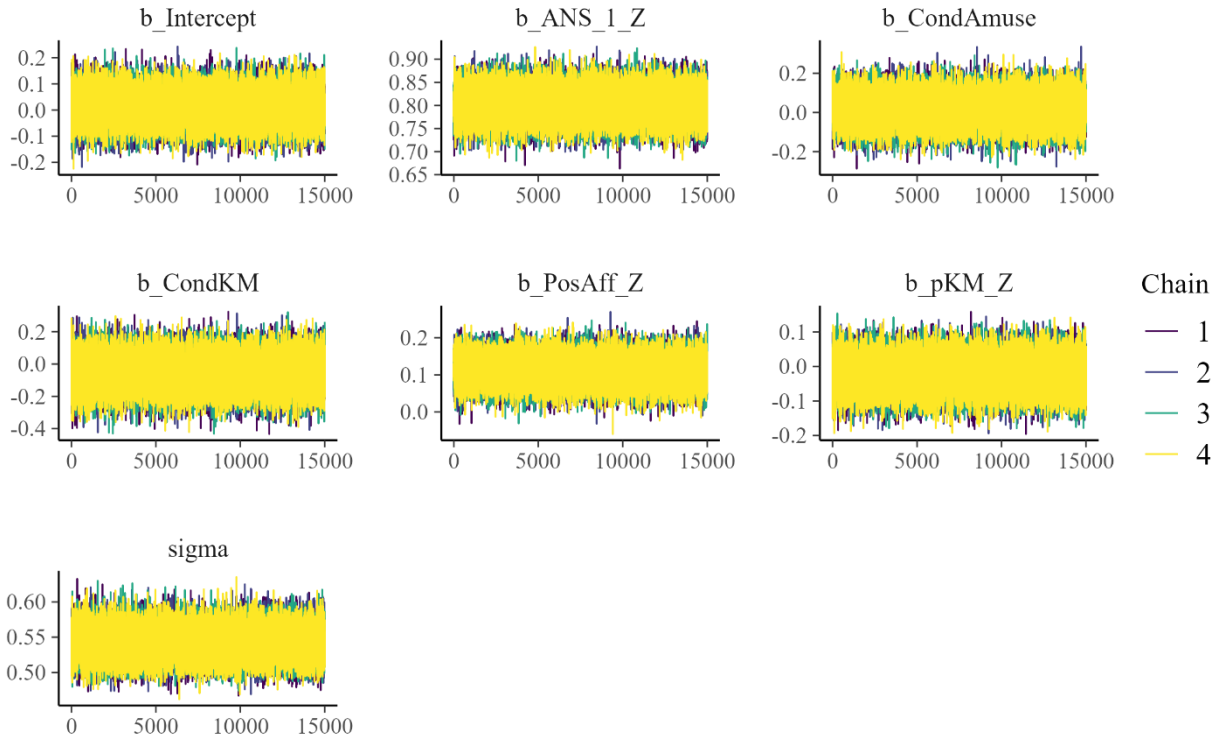
Autocorrelation of chains for Autonomy Satisfaction Parameters in Model



Note. Autocorrelation of lagged sampling draws.

Figure 12.5

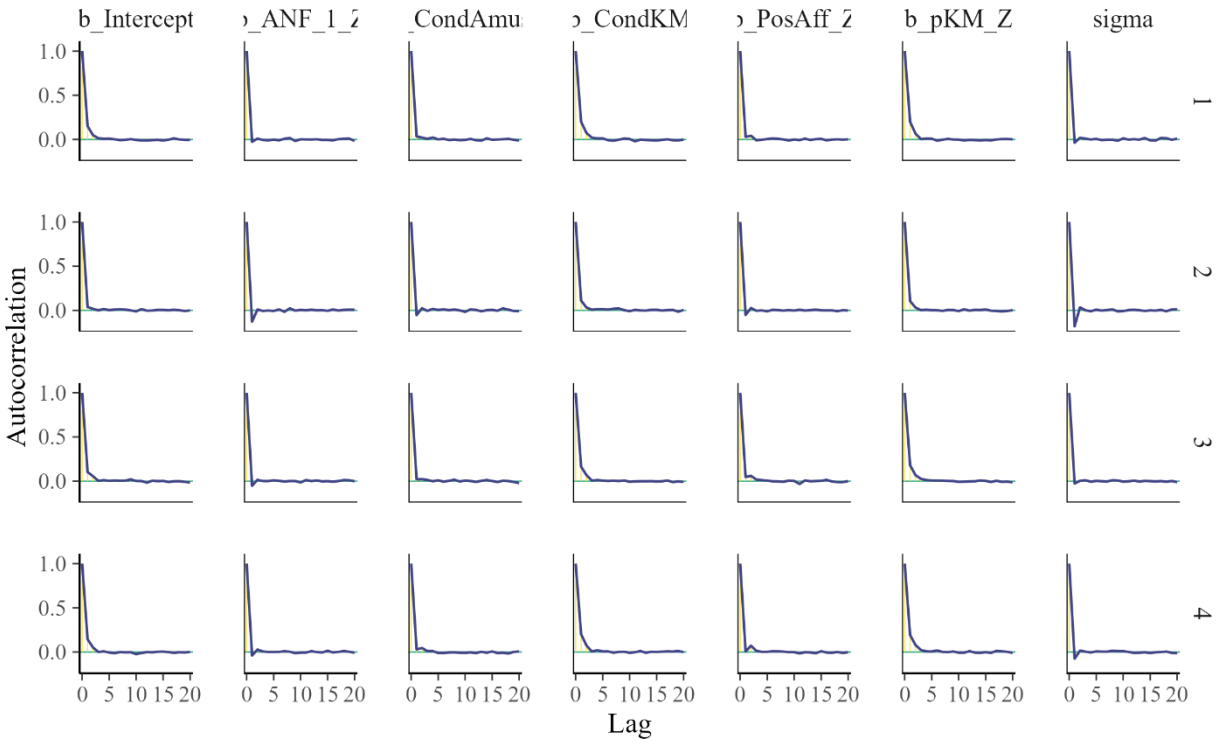
Trace plots of Autonomy Satisfaction Parameters in Model



Note. Chain mixing plot of the posteriors' chains.

Figure 12.6

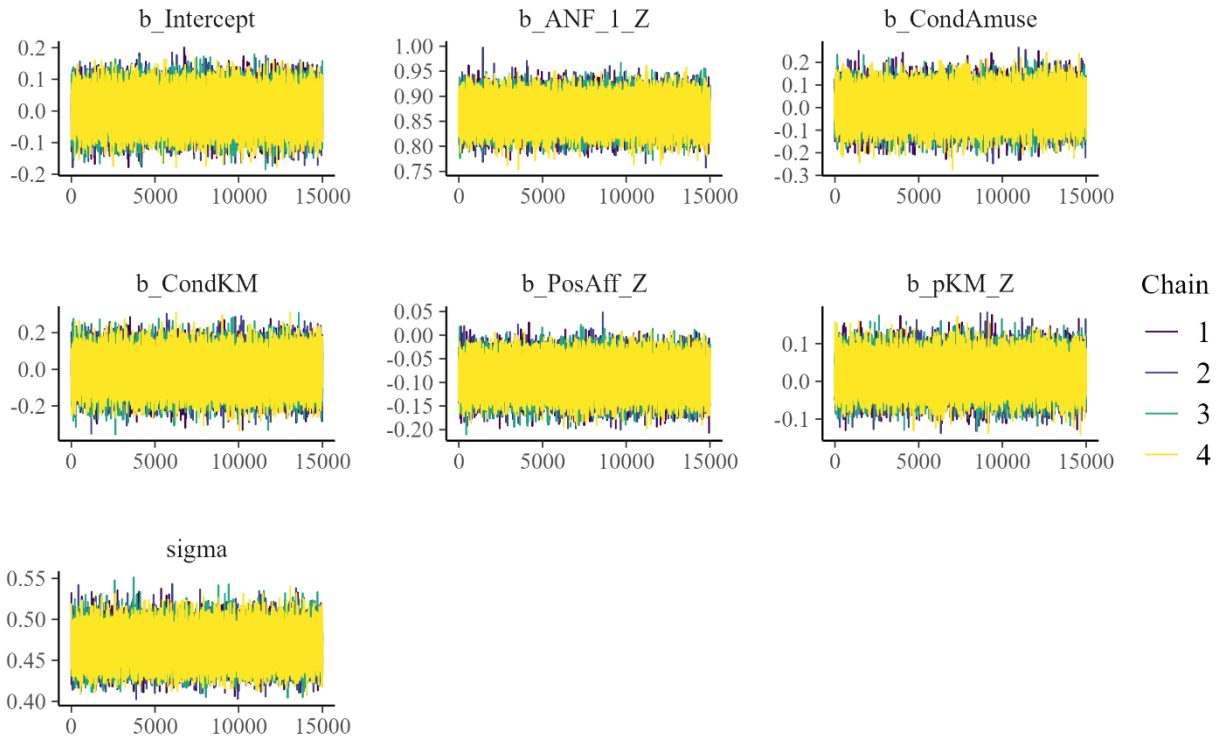
Autocorrelation of chains in Autonomy Frustration Parameters in Model



Note. Autocorrelation of lagged sampling draws.

Figure 12.7

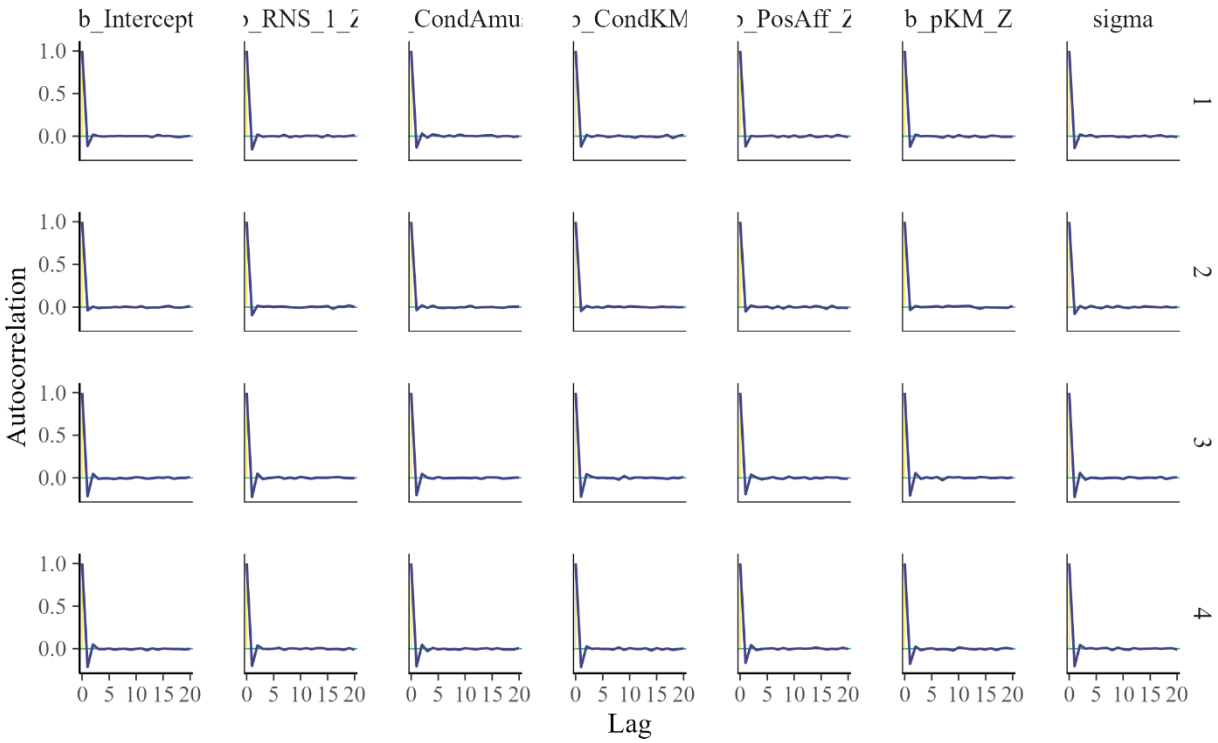
Trace plots of Autonomy Frustration Parameters in Model



Note. Chain mixing plot of the posteriors' chains.

Figure 12.8

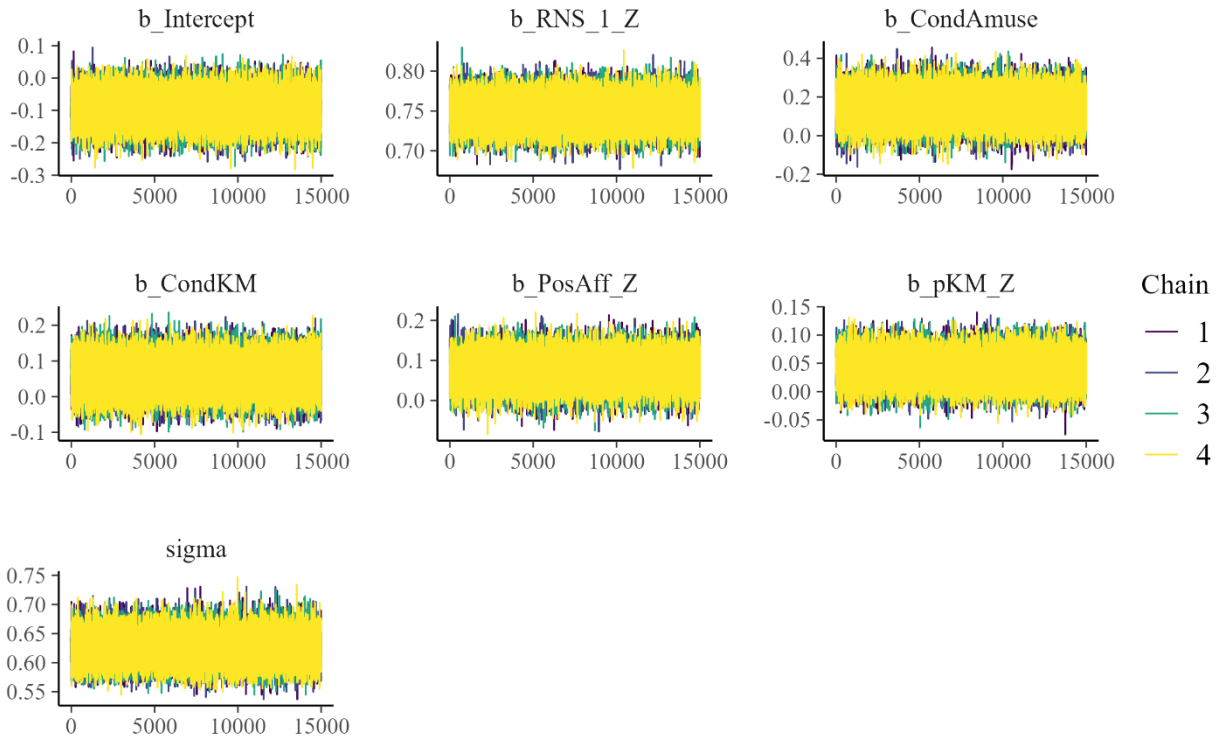
Autocorrelation of chains in Relatedness Satisfaction Parameters in Model



Note. Autocorrelation of lagged sampling draws.

Figure 12.9

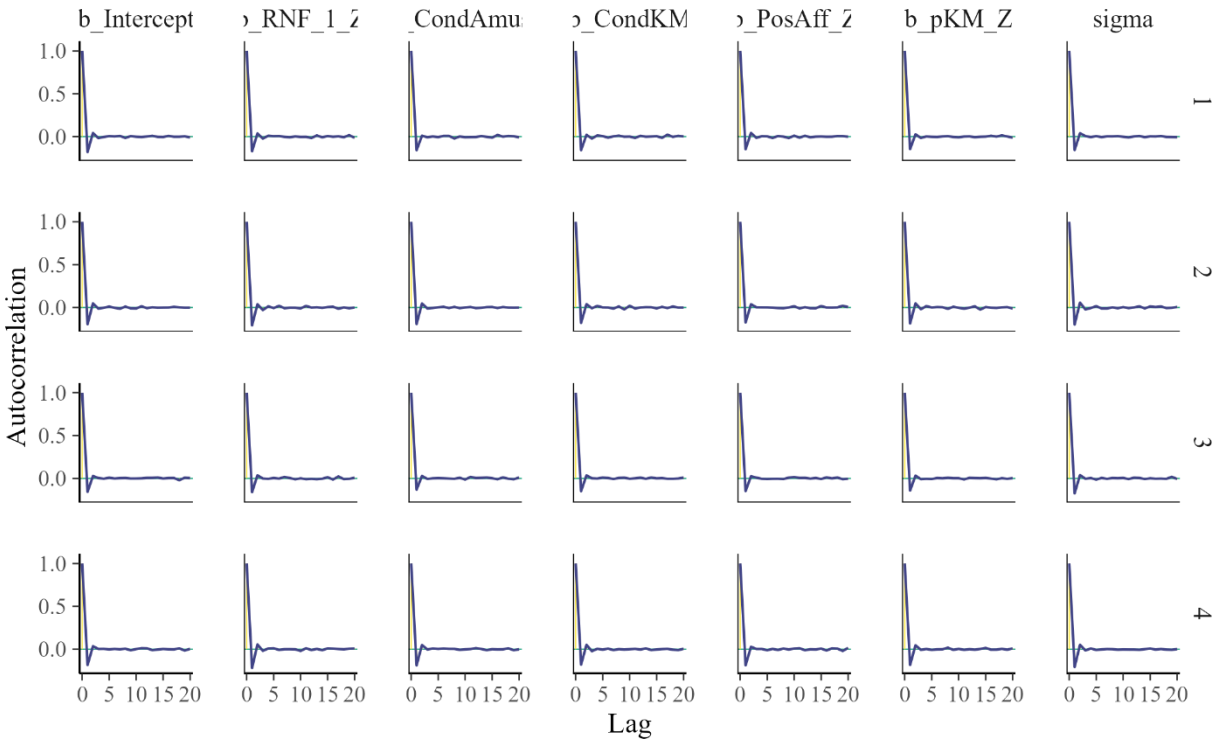
Trace plots of Relatedness Satisfaction Parameters in Model



Note. Chain mixing plot of the posteriors' chains.

Figure 12.10

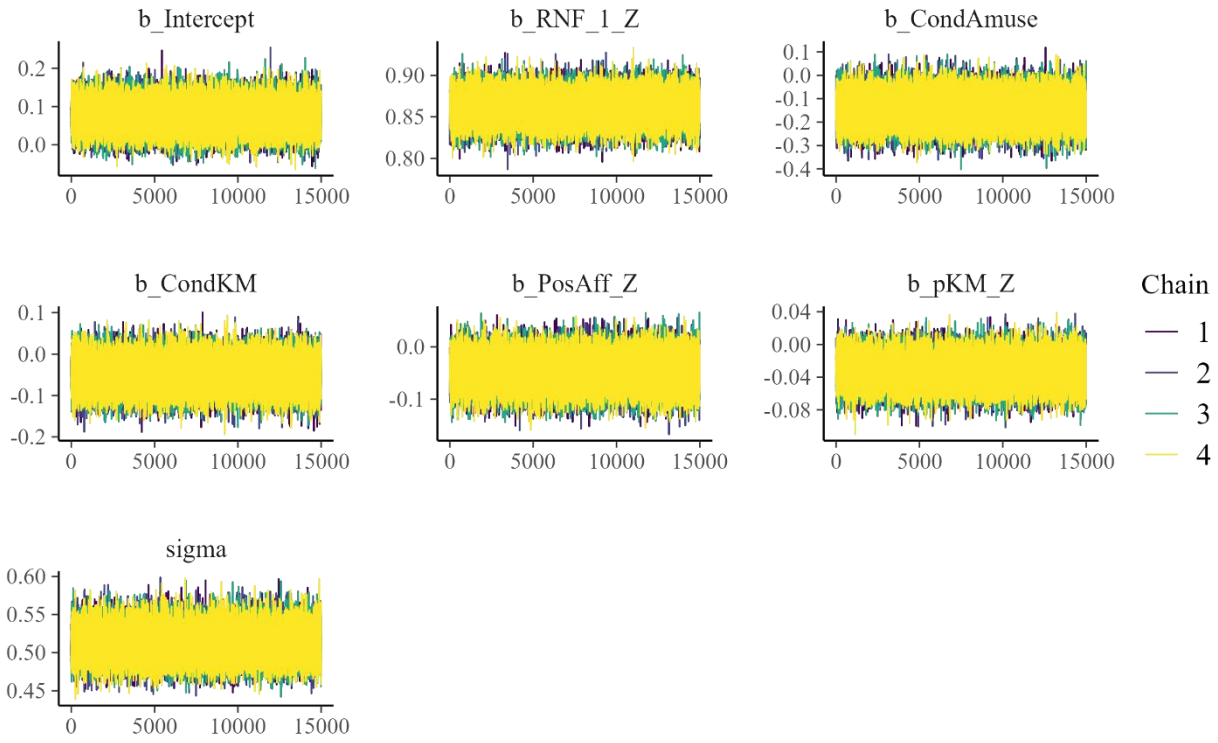
Autocorrelation of chains in Relatedness Frustration Parameters in Model



Note. Autocorrelation of lagged sampling draws.

Figure 12.11

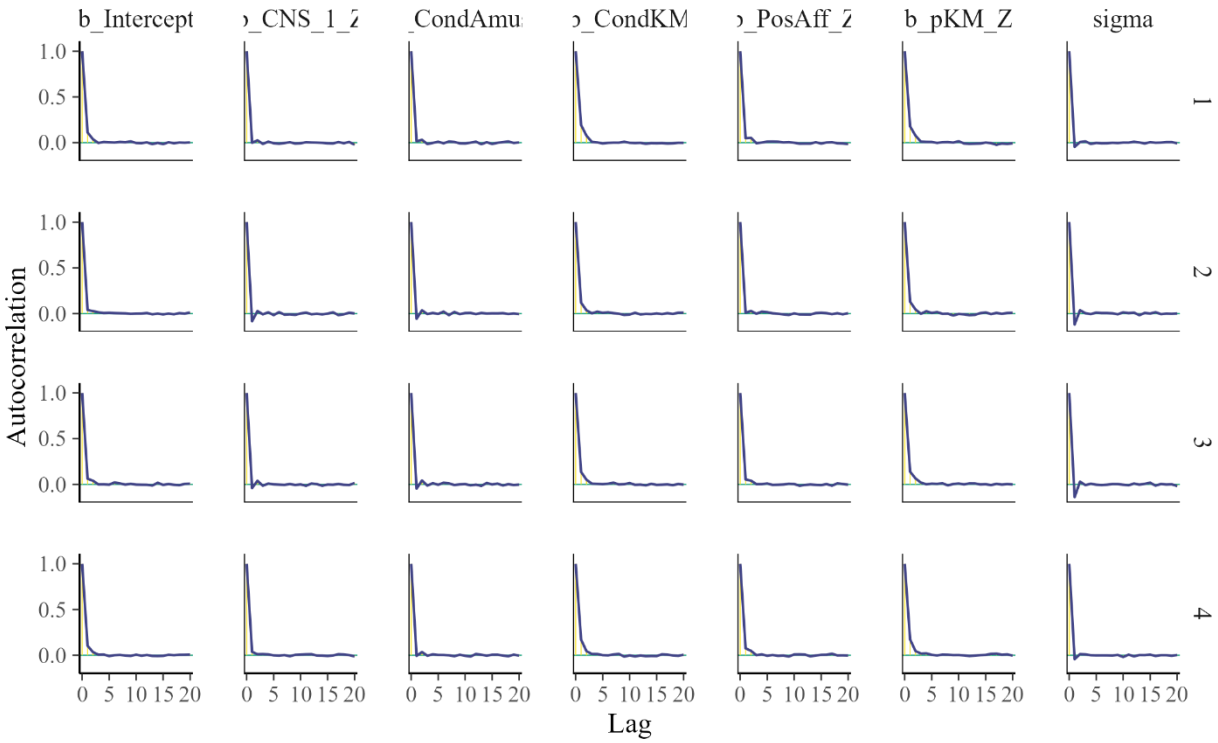
Trace plots of Relatedness Frustration Parameters in Model



Note. Chain mixing plot of the posteriors' chains.

Figure 12.12

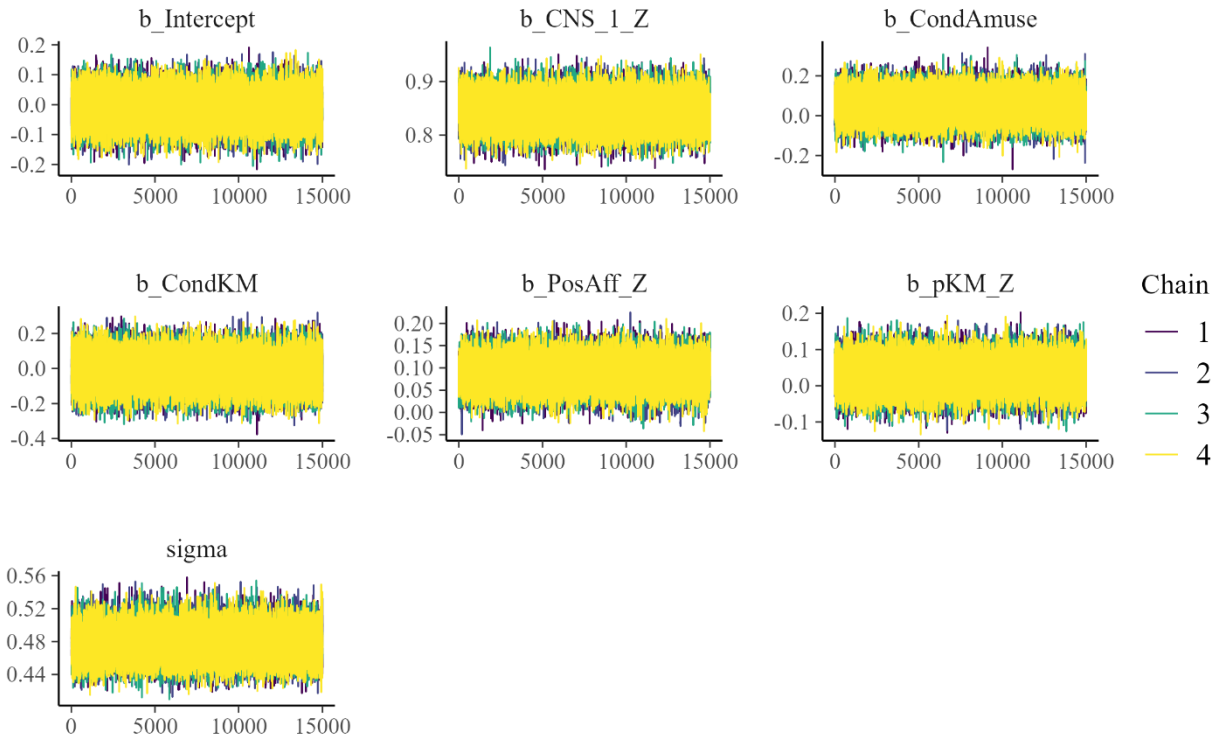
Autocorrelation of chains in Competence Satisfaction Parameters in Model



Note. Autocorrelation of lagged sampling draws.

Figure 12.13

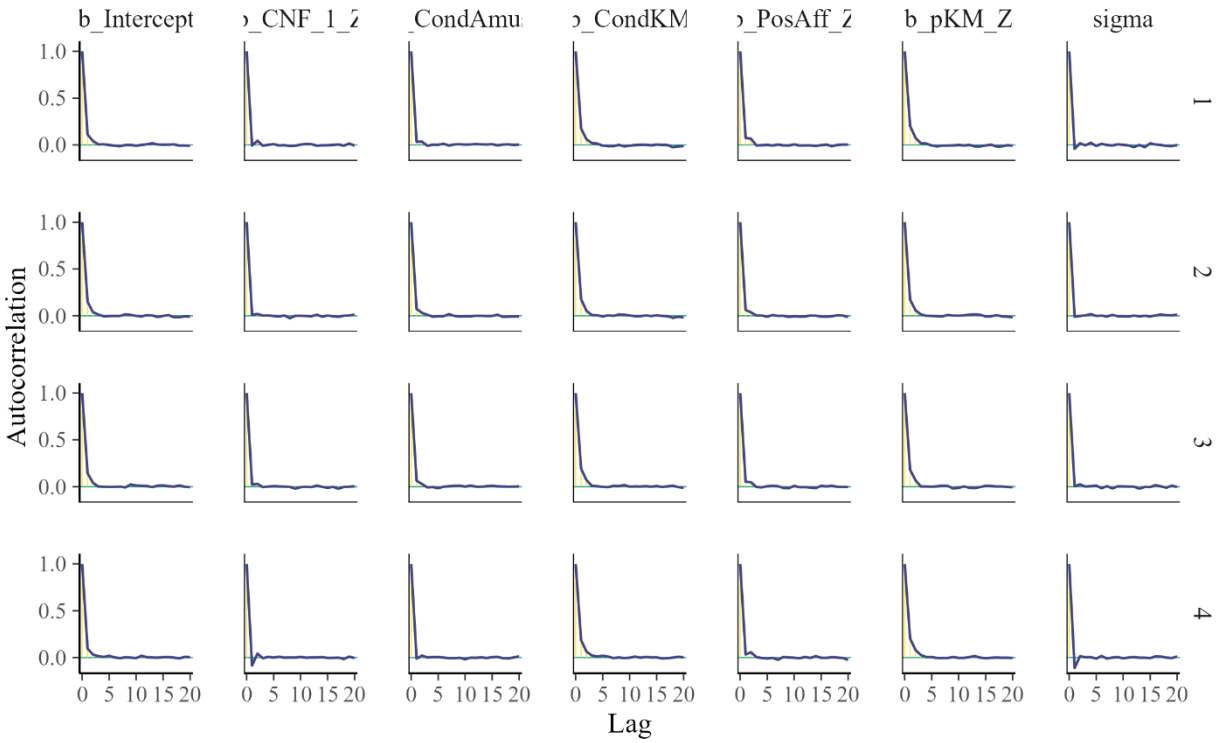
Trace plots of Competence Satisfaction Parameters in Model



Note. Chain mixing plot of the posteriors' chains.

Figure 12.14

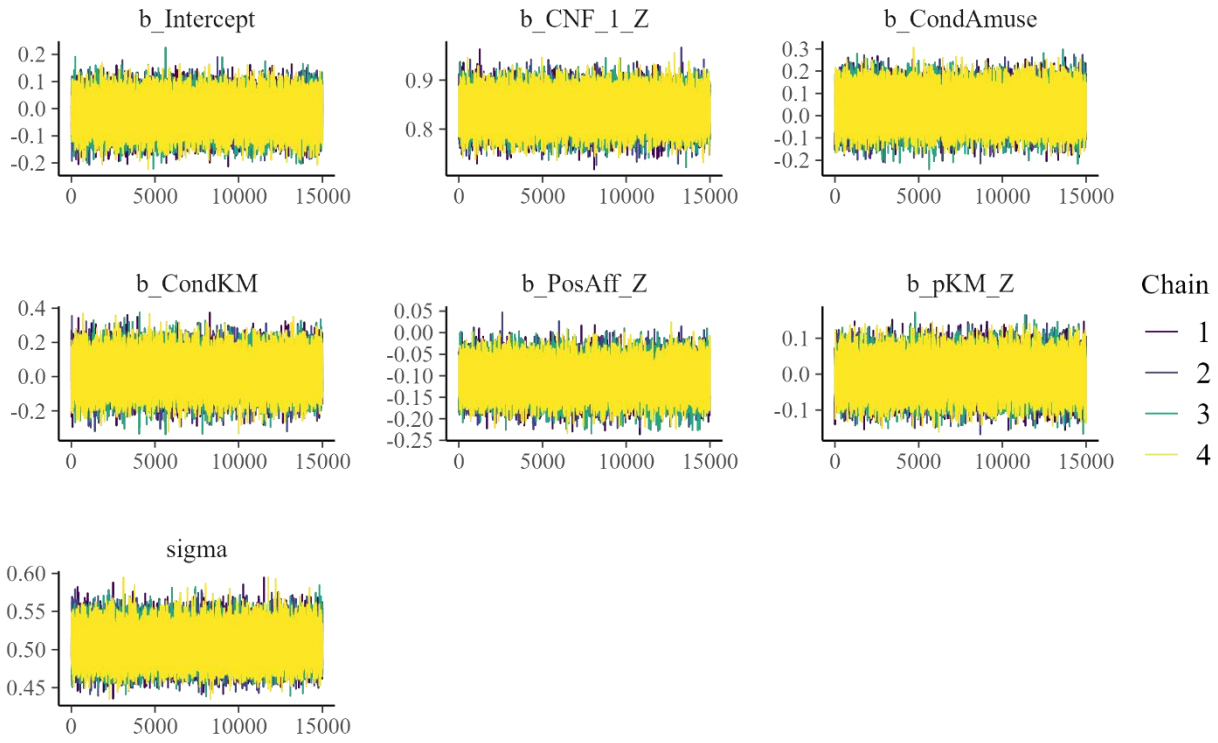
Autocorrelation of chains in Competence Frustration Parameters in Model



Note. Autocorrelation of lagged sampling draws.

Figure 12.15

Trace plots of Competence Frustration Parameters in Model



Note. Chain mixing plot of the posteriors' chains.

On Exploratory Condition Comparison Results

To compare the effects of the amusement condition relative to the kama muta condition (rather than the control as per the original analyses), the mediation model was re-run with the kama muta condition as the new reference group. As per the analytic plan of the primary analyses, unknown priors were set to weakly informative *N(0,2)*. Priors from previous results used the same point estimates, though used wider standard deviations (updated to 2, like the weakly informative priors) to reflect greater uncertainty in effects given the change to the underlying reference group. The model was run in Stan with 4 chains using default estimation parameters for expediency (500 burn-in and 1000 for further sampling). Overall, the model results showed that the amusement condition had a credibly smaller effect on the self-reported kama muta mediator and positive affect relative to the kama muta condition (Table 12.2). Direct effects from the amusement condition did not have credibly different effects from those of the kama muta condition across all psychological needs (Table 12.3).

Table 12.2

Estimates and Modeling Diagnostics of Study 2: X->M Parameters of Exploratory Model

	Estimate	[95% HDI]	% in ROPE	ESS
Kama muta mediator (M_i)				
Intercept	.96	**[.83, 1.08]**	0.00	2879
Amusement Condition	-1.35	**[-1.53, -1.18]**	0.00	3305
Neutral Condition	-1.58	**[-1.75, -1.40]**	0.00	3249
Positive Affect mediator (M_{ii})				
Intercept	.27	**[.09, .44]**	0.00	2841
Amusement Condition	-.25	[-.50, -.00]*	3.26	3324
Neutral Condition	-.57	**[-.82, -.32]**	0.00	3459

Note. Standardized estimates with 95% HDI reported by [lower, upper] limits. ESS = Effective Sample Size. IE = Indirect Effect. Bolded intervals do not overlap with ROPE. * denotes HDIs with 5% or less overlap with ROPE. All PSRFs were between .999 and 1.001.

Table 12.3

Estimates and Modeling Diagnostics of Study 2: Condition Direct Effects Relative to Kama Muta Condition

	Satisfaction				Frustration			
	Estimate	95% HDI	% in ROPE	ESS	Estimate	95% HDI	% in ROPE	ESS
Autonomy (Y_{Sat}; Y_{Frus})								
Intercept	-.04	[-.17, .08]	46.68	2041	-.01	[-.12, .10]	66.08	1936
Kama Muta	-.02	[.05, .19]	71.26	2358	.02	[-.06, .10]	76.42	2248
Positive Affect	.12	**[.05, .19]**	0.00	3705	-.10	[-.15, -.04]*	3.66	3993
Amusement Condition	.07	[-.11, .25]	32.55	2065	.01	[-.14, .17]	48.47	2111
Control Condition	.06	[-.13, .26]	33.05	2188	.01	[-.15, .18]	47.26	2117
Pre-test	.78	**[.72, .84]**	0.00	4893	.85	**[.80, .90]**	0.00	6220
Relatedness (Y_{Sat}; Y_{Frus})								
Intercept	-.03	[-.17, .12]	50.21	2030	-.05	[-.17, .07]	49.16	2215
Kama Muta	-.02	[-.13, .08]	64.87	2326	.06	[-.03,.14]	45.82	2558
Positive Affect	.13	[.04, .21]*	1.03	3681	-.10	[-.16, -.03]	6.11	3811
Amusement Condition	.08	[-.14, .28]	30.55	2085	.00	[-.17, .17]	45.58	2360
Control Condition	.00	[-.22, .23]	35.29	2109	.15	[-.03, .33]	12.68	2278
Pre-test	.71	**[.64, .78]**	0.00	4801	.78	**[.72, .84]**	0.00	4739
Competence (Y_{Sat}; Y_{Frus})								
Intercept	-.03	[-.14, .08]	58.71	1977	-.00	[-.12, .12]	63.66	1800
Kama Muta	.03	[-.06,.11]	69.74	2353	.01	[-.07, .10]	77.68	1941
Positive Affect	.10	[.04, .16]*	2.63	3882	-.13	**[-.19, -.06]**	0.00	3269
Amusement Condition	.07	[-.09, .23]	35.66	2025	.02	[-.15, .19]	44.76	1864
Control Condition	.02	[-.15, .19]	44.87	2025	-.02	[-.20, .16]	43.29	1814
Pre-test	.82	**[.77, .87]**	0.00	5411	.79	**[.73, .84]**	0.00	5194

Note. Standardized estimates with 95% HDI reported by [lower, upper] limits. ESS = Effective Sample Size. IE = Indirect Effect. Bolded intervals do not overlap with ROPE. * denotes HDIs with 5% or less overlap with ROPE. All PSRFs were between .999 and 1.001.

On Exploratory Subscale Results: Study 2

Table 12.4

Estimates and Modeling Diagnostics of Study 2: X->M Parameters of Exploratory Subscale Model

	Estimate	[95% HDI]	% ROPE Overlap	ESS
Physiology Subscale				
Intercept	-.78	**[-.89, -.67]**	0.00	5883
Kama Muta Condition	1.50	**[1.37, 1.62]**	0.00	6831
Amusement Condition	.56	**[.38, .73]**	0.00	6045
Communal Sharing Subscale)				
Intercept		**[-.73, -.48]**	0.00	6085
Kama Muta Condition	1.53	**[1.40, 1.66]**	0.00	5861
Amusement Condition	.44	**[.26, .63]**	0.00	7094
Motive Subscale				
Intercept	-.61	**[-.73, -.48]**	0.00	4961
Kama Muta Condition	1.22	**[1.08, 1.36]**	0.00	5694
Amusement Condition	.32	**[.12, .52]**	0.00	6308
Label Subscale				
Intercept	-.98	**[-1.08, -.89]**	0.00	6220
Kama Muta Condition	1.83	**[1.73, 1.94]**	0.00	6622
Amusement Condition	.60	**[.44, .76]**	0.00	6910
Positive Affect mediator				
Intercept	-.31	**[-.49, -.13]**	0.00	4543
Kama Muta Condition	.58	**[.33, .82]**	0.00	4887
Amusement Condition	.32	**[.07, .57]**	0.00	4902

Note. Standardized estimates with 95% HDI reported by [lower, upper] limits. ESS = Effective Sample Size. IE = Indirect Effect. Bolded intervals do not overlap with ROPE. * denotes HDIs with 5% or less overlap with ROPE.

Table 12.5

Estimates and Modeling Diagnostics of Study 2: Autonomy Parameters of Exploratory Subscale Model

	Satisfaction				Frustration			
	Estimate	95% HDI	% ROPE	ESS	Estimate	95% HDI	% ROPE	ESS
Autonomy (Y_{Sat}; Y_{Frus})								
Intercept								
Physiology Subscale	-.04	[-.15, .08]	53.61	8733	.04	[-.06, .14]	57.47	6772
CSR Subscale	-.00	[-.11, .11]	63.87	7202	-.08	[-.18, .02]	25.55	6478
Motive Subscale	-.05	[-.15, .05]	48.47	8023	.09	[.00, .17]	19.00	6501
Label Subscale	.07	[-.07, .21]	35.95	6387	-.04	[-.15, .08]	54.45	5831
Positive Affect	.13	**[.06, .20]**	0.00	6901	-.10	[-.15,-.04]*	4.55	7336
Kama Muta Condition	-.08	[-.28, .13]	49.58	5445	.04	[-.14, .21]	40.13	4008
Amusement Condition	.03	[-.12, .17]	29.29	5623	.00	[-.12, .13]	59.76	4278
Pre-test	.78	**[.72, .84]**	0.00	7618	.85	**[.80, .90]**	0.00	7525
Kama Muta Cond. via PA	.07	[.02, .12]	-	-	-	-	-	-
Amusement Cond. via PA	.04	[.00, .08]	-	-	-	-	-	-
Kama Muta Cond. via	-	-	-	-	.10	[.00, .20]	-	-
Control Cond. via Motive	-	-	-	-	-.05	[-.10, -.00]	-	-
Kama Muta Cond. via PA	-	-	-	-	-.06	[-.10, -.01]	-	-
Control Condition via PA	-	-	-	-	.03	[.00, .05]	-	-

Note. Standardized estimates with 95% HDI reported by [lower, upper] limits. ESS = Effective Sample Size. IE = Indirect Effect. Bolded intervals do not overlap with ROPE. * denotes HDIs with 5% or less overlap with ROPE. This table reports the effects relevant for autonomy from the larger model which included all needs. For brevity of the 30 indirect effects for each need, the table only reports credible indirect effects that have HDIs with consistent signs (i.e. do not change from positive to negative or vice versa).

Table 12.6

Estimates and Modeling Diagnostics of Study 2: Relatedness Parameters of Exploratory Subscale Model

	Satisfaction				Frustration			
	Estimate	95% HDI	% ROPE	ESS	Estimate	95% HDI	% ROPE	ESS
Relatedness (Y_{Sat} ; Y_{Frus})								
Intercept	-.10	[-.19, -	12.16	6645	.11	[.04, .18]	2.45	5214
Physiology Subscale	-.01	[-.07, .06]	91.08	8856	.01	[-.04, .06]	97.79	8430
CSR Subscale	.03	[-.05, .10]	76.66	9303	-.02	[-.07, .04]	90.79	7873
Motive Subscale	-.01	[-.07, .05]	93.08	7405	.00	[-.05, .05]	99.66	10290
Label Subscale	-.01	[-.09,.06]	84.18	8248	.01	[-.05, .07]	92.42	7872
Positive Affect	.10	[.02, .17]	9.42	6393	-.07	[-.13, -.00]	27.00	7212
Kama Muta Condition	.10	[-.02, .22]	18.89	7455	-.13	[-.22,-.03]*	3.03	7187
Amusement Condition	.16	[.02, .31]*	4.61	6078	-.18	**[-.30, -.06]**	0.00	5772
Pre-test	.73	**[.69, .78]**	0.00	8940	.82	**[.78, .85]**	0.00	8795
Kama Muta Cond. via PA	.06	[.00, .11]	-	-				

Note. Standardized estimates with 95% HDI reported by [lower, upper] limits. ESS = Effective Sample Size. IE = Indirect Effect. Bolded intervals do not overlap with ROPE. * denotes HDIs with 5% or less overlap with ROPE. This table reports the effects relevant for relatedness from the larger model which included all needs. For brevity of the 30 indirect effects for each need, the table only reports credible indirect effects that have HDIs with consistent signs (i.e. do not change from positive to negative or vice versa).

Table 12.7

Estimates and Modeling Diagnostics of Study 2: Competence Parameters of Exploratory Subscale Model

	Satisfaction				Frustration			
	Estimate	95% HDI	% ROPE	ESS	Estimate	95% HDI	% ROPE	ESS
Competence (Y_{Sat} ; Y_{Frus})								
Intercept	-.02	[-.13, .08]		4487	.02	[-.09, .12]		3999
Physiology Subscale	-.04	[-.14, .07]	59.71	7123	-.00	[-.11, .10]	67.89	5979
CSR Subscale	.01	[-.09, .11]	70.05	8031	-.12	[-.22, -	7.53	6436
Motive Subscale	-.00	[-.09, .08]	78.24	7043	.03	[-.05, .12]	65.63	6826
Label Subscale	.06	[-.07, .18]	45.24	6480	.11	[-.02, .24]	14.79	5660
Positive Affect	.10	[.04, .17]*	2.89	6484	-.12	**[-.18, -.05]**	0.00	6154
Kama Muta Condition	-.00	[-.18, .19]	44.34	4617	-.04	[-.24, .14]	37.87	4145
Amusement Condition	.07	[-.06, .20]	38.79	5046	.01	[-.12, .14]	55.71	4228
Pre-test	.81	**[.76,.86]**	0.00	7423	.79	**[.74, .84]**	0.00	8244
Kama Muta Cond. via PA	.06	[.01, .11]	-	-				
Control Cond. via PA	-.03	[-.06, -.00]	-	-				
Kama Muta Cond. via CSR					-.18	[-.34, -.02]	-	-
Amusement Cond. via CSR					-.05	[-.10, -.00]	-	-
Control Cond. via CSR					.09	[.01, .17]	-	-
Kama Muta Cond. via PA					-.07	[-.12, -.02]	-	-
Amusement Cond. via PA					-.04	[-.07, -.00]	-	-
Control Condition via PA					.04	[.01, .07]	-	-

Note. Standardized estimates with 95% HDI reported by [lower, upper] limits. ESS = Effective Sample Size. IE = Indirect Effect. Bolded intervals do not overlap with ROPE. * denotes HDIs with 5% or less overlap with ROPE. This table reports the effects relevant for competence from the larger model which included all needs. For brevity of the 30 indirect effects for each need, the table only reports credible indirect effects that have HDIs with consistent signs (i.e. do not change from positive to negative or vice versa).

13 Appendix 3: Chapter 5

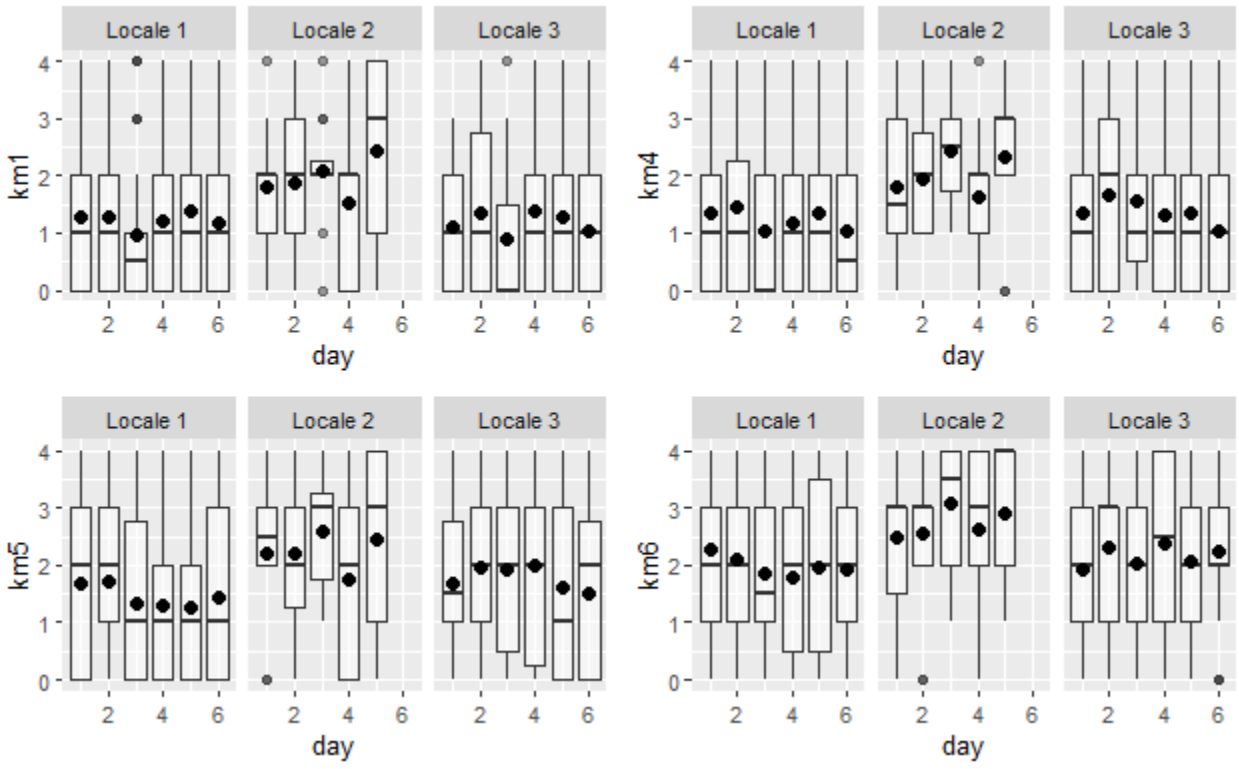
Study 3

On Differences Across Data Collection Sites

Scores from the 2nd sampling location (14 individuals) were somewhat discordant from the others in kama muta scores. As seen in Figure 13.1, across all 4 items of the kama muta measure, data from the 2nd institution noticeably varied from the others. However, this institution effect only seemed present for kama muta scores, as distributions from PPR items appeared consistent with the other sampling locations (Figure 13.2).

Figure 13.1

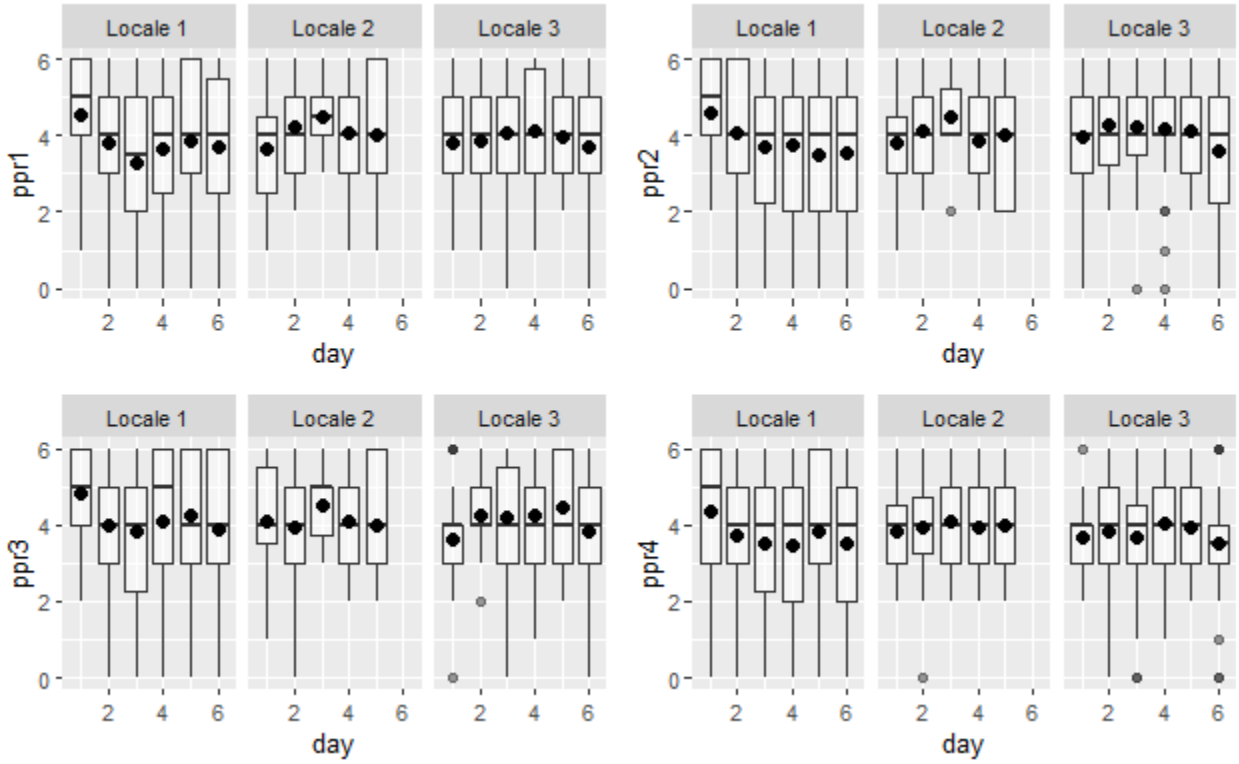
Item distributions of kama muta (km) across sampling locations for each day



Note. Locales 1 and 3 had relatively consistent kama muta item variation profiles across the period, however the 2nd sampling location had more inconsistencies.

Figure 13.2

Item distributions of PPR (ppr) across sampling locations for each day



Note. Item variation profiles of PPR remained consistent across institutions across the period.

14 Appendix 4: Chapter 6

Study 4

On Study 4's Analytic Method: Reaching for SEM but Reverting to MLM

The originally intended pre-registered analyses involved fitting a longitudinal version of the Actor-Partner Interdependence Model (L-APIM) in SEM with disaggregated within/between latent variables (Hamaker, Kuiper, et al., 2015). SEM was the first-choice plan because it was a direct analytic extension of the RI-CLPM used in Study 3 and included all of the previously discussed advantages of SEM (e.g., full integration of latent factors, model precision, full-information maximum likelihood handling of missingness) which tend to favor SEM as a statistical model of cross-lagged change (Falkenstrom et al., 2022). However, while long understood as an analytic option (Kenny, 1996; Olsen & Kenny, 2006), APIMs in SEM (and especially longitudinal extensions) have been relatively rare in literature, likely due to their computational and statistical complexity (Ledermann & Kenny, 2017) and lack of documentation for implementation (Gistelinck & Loeys, 2019). For example, while the use of latent (rather than observed) variables is a longstanding and powerful advantage of structural equation modeling (Bollen, 2003), only recently have researchers published techniques to implement them in L-APIMs using widely accessible coding structures like lavaan in R (Kim & Kim, 2022; Rosseel, 2012). Other robust sources at the time of writing are either unfinished, for example some eagerly awaited tools from Sakaluk et al. (2021), or represent the most cutting edge (and unfortunately gated by expensive software like *Mplus*) advancements in quantitative methods, for example *dynamic structural equation modeling* (Asparouhov et al., 2017; Iida et al., 2023; Savord et al., 2022; Zhou et al., 2019), that have started integrating hierarchical multi-level data with structural and latent measurement modeling capabilities (Sorensen et al., 2023).

The author of this thesis attempted to piecemeal an implementation of the L-APIM with latent constructs by combining knowledge from longitudinal SEM work (e.g. Mulder & Hamaker, 2020), theoretical understanding of the RI-CLPM (e.g. Hamaker et al., 2015) and APIM (e.g., Cook & Kenny, 2005), and referring to somewhat similar implements (e.g., Gistelinck & Loeys, 2019; Kim & Kim, 2022). Final models encountered gross identification errors and, considering both the time of computation (e.g., how long to run each model, regardless of its actual convergence and fit, could span hours) and model adjustments (i.e., learning and correctly identifying the modeling code in a relatively novel methodological area), the author of this thesis decided to engage the fallback option MLM included in the pre-registration. The backup analytic plan sought to mimic as close as possible to the original, but using a more accessible MLM version of the L-APIM. To that end, the primary author of this thesis separately extracted factor loadings of kama muta and PPR with lavaan's CFA to fit MLMs using latent,

rather than observed, variables to approach some level of latent attendance. Doing so also makes for as near as possible comparison to the variable constructions used in Study 3. Similarly, to mimic Study 3's RI-CLPM disaggregation of between and within variability, we used between- and within-centered versions of the variables in the MLM as recommended by Bolger and Laurenceau (2013).

On Exploratory Positive Affect Covariate

Table 14.1

MLM Exploratory Model Parameters of Study 4

	Estimate [95% CI]	p
Outcome: Actor Kama Muta		
Intercept	.06 [.02, .10]	.007**
Intervention Condition	-.01 [-.04, .03]	.74
Day	-.01 [-.01, -.00]	<.001***
Within-Person		
Previous Day PPR	.02 [-.01, .04]	.14
Previous Day PPR Partner	.04 [.01, .06]	.005**
Previous Day KM	.16 [.11, .21]	<.001***
Previous Day KM Partner	.02 [-.03, .07]	.49
Previous Day PA	-.01 [-.06, .03]	.64
Previous Day PA Partner	.02 [-.02, .07]	.31
Between-Person		
PPR	-.01 [-.01, .06]	.45
PPR Partner	-.00 [-.03, .04]	.71
KM	.03 [-.03, .01]	.17
KM Partner	.01 [-.03, .02]	.77
PA	.01 [-.02, .04]	.59
PA Partner	-.00 [-.03, .03]	.92
Outcome: Actor PPR		
Intercept	-.08 [-.14, -.01]	.02*
Intervention Condition	-.01 [-.07, .04]	.66
Day	.01 [.00, .02]	.002**
Within-Person		
Previous Day PPR	.15 [.11, .19]	<.001***
Previous Day PPR Partner	-.01 [-.05, .03]	.58
Previous Day KM	.00 [-.07, .07]	.95
Previous Day KM Partner	.11 [.03, .18]	.006**
Previous Day PA	.01 [-.06, .08]	.71
Previous Day PA Partner	-.01 [-.08, .06]	.76
Between-Person		
PPR	.00 [-.03, .03]	.92
PPR Partner	-.00 [-.03, .03]	.79
KM	.02 [-.04, .08]	.46
KM Partner	.00 [-.05, .06]	.90
PA	-.00 [-.05, .05]	.97
PA Partner	.00 [-.05, .05]	.91

*Note. *p < .05,**p<.01, ***p <.001.* Decimals rounded to the hundredths place for clarity, though extended further to convey precision in some cases (e.g. when hundredths place constitutes a gross rounding bias, e.g. .0009 to .01). KM is used as shorthand for "kama muta." Positive affect factor was comprised of the 5 daily positive items from the PANAS. Notably, all findings from the original model analyses remain the same (the partner kama muta effect on actor PPR becomes slightly more pronounced) and no positive affect effects were significant.

Table 14.2

Correlations of Between-Person Centered Variables

	Variable	1	2	3	4	5	6
	1. Kama Muta (a)	-					
	2. Kama Muta (p)	.37***	-				
	3. PPR (a)	.63***	-	-			
	4. PPR (p)	.31***	-	.45***	-		
Exploratory	5. Positive Affect (a)	.55***	-	.46***	-	-	
	6. Positive Affect (p)	.11***	-	.19***	-	.16***	-

Note. (a) and (p) refer to actor and partner distinctions.*p <.05, **p <.01, ***p <.001. Diagonals and partner cells are nor reported due to redundancy. A new three-construct CFA model was run using kama muta, PPR, and now including a 5-indicator general daily positive affect construct for exploratory correlation analyses. Correlations between factors from this new CFA model show minute differences from the primary 2-construct model used in Study 4 (e.g., actor/partner kama muta was r = .38 in the primary model while r = .37 in this new model).

Table 14.3

Correlations of Within-Person Centered Variables

	Variable	1	2	3	4	5	6
	1. Kama Muta (a)	-					
	2. Kama Muta (p)	.26***	-				
	3. PPR (a)	.42***	-	-			
	4. PPR (p)	.16***	-	.23***	-		
Exploratory	5. Positive Affect (a)	.62***	-	.28***	-	-	
	6. Positive Affect (p)	.22***	-	.17***	-	.24***	-

Note. (a) and (p) refer to actor and partner distinctions.*p <.05, **p <.01, ***p <.001. Diagonals and partner cells are nor reported due to redundancy. A new three-construct CFA model was run using kama muta, PPR, and now including a 5-indicator general daily positive affect construct for exploratory correlation analyses. Correlations between factors from this new CFA model show minute differences from the primary 2-construct model used in Study 4 (e.g., actor/partner kama muta was r = .25 in the primary model while r = .26 in this new model).