

Meditation Effects in the Social Domain: Self-Other Connectedness as a General Mechanism?

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Abstract Recent theories and findings in psychology and neuroscience suggest that *self* and *other* are interconnected, both on a conceptual and on a more basic bodily-affective representational level. Such self-other connectedness is supposed to be fundamental to empathy, social bonding and compassion. Meditation techniques – in particular mindfulness and loving-kindness meditation – have been found to foster these social capacities. Therefore, this contribution brings together both fields of research. In a first step, we examine self and other from the perspective of psychology and neuroscience, integrating findings from these fields into a dimension of mental functioning anchored to self-centeredness and self-other-connectedness, respectively. In a second step, we explore how mindfulness and loving-kindness meditation may act differentially upon this dimension. Finally, by referring to a recent experiment from our lab, it is illustrated how research hypotheses can be derived from this framework. Such investigations could help to comprehend meditation effects in the social domain, and more generally, further the scientific understanding of self and other.

Introduction

Meditation can be characterized as a kind of attention regulation which involves focusing on one's inner experience while refraining from social interactions. During the last decade, the practice of meditation has attracted considerable research interest,

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primarily investigating effects on attentional, emotional and cognitive processes (for a recent review, see Sedlmeier et al. 2012). However, there is increasing evidence that meditation also shapes intersubjective experience and behavior, intensifying empathy, compassion, and altruism (e.g. Birnie et al. 2010; Klimecki et al. 2012; Leiberger et al. 2011). Thus, it seems an important question, how such a solitary practice as meditation can foster these social capacities (cf. Kristeller and Johnson 2005).

Especially in the Buddhist tradition, a core aim of meditation is to gain experiential insight into the purportedly illusory nature of the self – often referred to as wisdom. Interestingly, according to this contemplative tradition, the cultivation of prosocial mental qualities such as loving-kindness and compassion is closely related to the development of wisdom: both are said to naturally support and complement each other.

This chapter will draw on psychological and neuroscientific research as well as contemplative accounts of the *self* and its relation to the *other*. An important notion will be their interconnected nature, both in subjective experience and on neuronal and functional levels. Thus, our aim is to incorporate both a first person perspective and a third person perspective on these phenomena. This will provide a theoretical background in order to understand the intertwined nature of a change in the experience of the self and the capacity to connect more closely with others. This will also give an answer to the puzzling question how the solitary retreat into meditation may bring about interpersonal benefits.

Self and Other

The nature of the *self* and its relation to the *other* have been of long-standing interest in philosophy and, more recently, in psychology and neuroscience. While the focus in Western philosophy has often been on being individualistic, separated, and autonomous, some authors have considered self and other as intimately connected, for example in humanistic and phenomenological approaches (cf. Buber 1923/2009; Husserl 1950/1991; Zahavi 2006). The individualistic view is reflected in a wealth of Western psychological research, which has drawn a picture of the self as a central, or even “totalitarian” (Greenwald 1980) cognitive construct (for a review, see Mischel and Morf 2003). However, the second view – self and other as intimately connected – has recently been endorsed by developmental, social, and intercultural psychology and neuroscience (Han et al. 2011; Decety and Sommerville 2003). Accordingly, on a bodily and affective level of representation, sensations, actions, and emotions of self and other are represented within common representational networks, which could provide a basis for social capacities such as empathizing with and taking the perspective of others (Decety and Chaminade 2003; Gallese 2003). Furthermore, based on ample evidence, some authors have claimed that self and other also overlap on a conceptual level of representation (Aron et al. 2004; Cross et al. 2002). In this view, individuals tend to integrate their social context, and especially close others, into their self concept.

In the following, we will review evidence for self-other connectedness on both levels, starting with the conceptual level of the self. Furthermore, we will point out

that considerable interindividual variability exists in self-other connectedness and also that conceptual and bodily-affective levels of self-other representation are closely interwoven. As a result, we integrate these findings into a framework which assumes a single dimension of mental functioning, spanned between self-centeredness on the one end, and self-other connectedness on the other.

The Conceptual Level: Self as a Cognitive Construct

The term *self* is used in manifold ways, that include diverse but interrelated aspects such as self-awareness, identity, and regulation of behavior (for a recent review see Leary and Tangney 2011). A widely accepted view is that one aspect of the self, named the “me self” by William James (1890), can be conceived as a constructed cognitive entity – an organized knowledge, or theory of self-related information – which is reflected in the perception of having a particular identity (e.g. Epstein 1973; Higgins 1996).

In the last decade, neuroimaging studies pointed to certain areas within the cortical midline of the brain to be activated when reflecting upon the self, for example when rating whether certain trait adjectives are descriptive of oneself or not (Qin and Northoff 2011; van der Meer et al. 2010). Furthermore, imaging studies consistently found a set of brain areas which are active during the resting state (i.e. when no task engagement is required). These have been labeled the “default mode of brain function” (Fox et al. 2005; Raichle et al. 2001). These areas include the medial prefrontal cortex (MPFC) and anterior and posterior cingulate cortex., whose activity is correlated to mind-wandering (Christoff et al. 2009). Interestingly, they strongly overlap with those areas recruited during explicit self-reflection (Gusnard et al. 2001; Qin and Northoff 2011; Whitfield-Gabrieli et al. 2011). Thus, the default mode of brain function seems to be closely tied to the perception of “being a self”.

As evidenced by a long history of behavioral experiments, mental functioning appears to be centered on the cognitive construct of the self in several ways. Regarding attention, it is well known that self-relevant information is preferentially processed in a highly automatic mode (Bargh 1982; Geller and Shaver 1976; Moray 1959; Wood and Cowan 1995). In memory, the superiority of self-related material is well supported (for a review see Symons and Johnson 1997). Finally, much evidence has been reported on the motivation to protect and aggrandize the self in order to feel valuable (reviewed in Crocker and Park 2011). In the pursuit of self-esteem, individuals distort reality by means of self-serving biases, which led Greenwald (1980) to speak of the “totalitarian ego”. Well known examples are biased causal attributions (Campbell and Sedikides 1999) and unrealistically optimistic self-judgments (e.g. Alicke et al. 1995; Weinstein and Lachendro 1982). All this literature supports the notion of the self as a “special” cognitive construct, that reinforces and aggrandizes itself pervasively, while differentiating itself from others. Some have taken this as a fundamental characteristic of healthy and effective human functioning (Greenwald 1980; S. E. Taylor 1988).

However, some authors have stressed the social origin of the self (e.g. Higgins 1996; Mead 1934; Neisser 1988; Tomasello 1993). Concordantly, depending on the cultural context, people relate to the self in different ways (Heine 2001; Oyserman et al. 2002). Markus and Kitayama (1991) stated that in some cultures – most prominently east Asian cultures – people tend to perceive themselves as interdependent, connected to others and part of a collective, striving to fit-in and relate harmoniously to the social context. This view of the self has been termed the *interdependent self construal*. In contrast, American and other Western cultures are characterized by an *independent self construal*, which emphasizes autonomy, consistency, and distinctiveness of the self.¹ Markus and Kitayama (1991, p. 224) posited that “these construals can influence, and in many cases determine, the very nature of the individual experience, including cognition, emotion and motivation”. Indeed, there is increasing evidence for an influence on various self-related processes, for example, the need to have a positive view of the self (reviewed in Heine et al. 1999), the use of self-serving attributional biases (reviewed in Mezulis et al. 2004), and the effect of self-relevance on memory (e.g. Zhu and Zhang 2002). Strengthening the assumption of a causal role of self-construal and demonstrating its dynamic nature, studies that prime a specific kind of construal show effects on perceived closeness, self-concept, cognition, and emotion (reviewed in Oyserman and Lee 2008).

Recently, fMRI studies demonstrated neural correlates of stronger interconnectedness in self-definition characteristic of interdependent cultures (reviewed in Han et al. 2011): In Chinese participants, higher activity in the medial prefrontal cortex – a region typically linked to self-referential processing – was consistently associated with trait judgments regarding oneself and a close other compared to judgments regarding a familiar other. In Westerners, this was only the case for self judgments but not for judgments regarding close others (Zhu et al. 2007). Furthermore, a recent meta-analysis integrated results from 25 brain imaging studies, which investigated trait evaluation related to self and others. The meta-analysis systematically controlled for the degree of self-relatedness of the other, that is, whether a personally close other or a familiar, but not personally close other was used in a study. The results yielded significant differences in MPFC activation between self and familiar others, but not between self and close-others (Murray et al. 2012).

This indicates that also Westerners do not only define themselves as isolated individuals but also, even if to a smaller extent, in terms of their relationships and group memberships. This has been pointed out in detail by social psychologists (Brewer and Gardner 1996; Chen et al. 2006; Turner 1986). Concerning close relationships, Aron and colleagues have argued and demonstrated convincingly that the other becomes, to some extent, integrated into the self (Aron et al. 1991, 1992, 2004). Furthermore, considerable individual variability exists in the extent to which individuals define themselves in terms of their relationships by including others into the self (Cross et al. 2000, 2002, 2003). Cross et al. (2002, p. 414) concluded that for some individuals “the relational self seems to be the default level of

¹For a comparison of Eastern and Western concepts of the ‘self’ see also the chapter by Edge in this volume.

self-representation”. This has persistent effects on cognitive processes. For example, Cross et al. (2002) compared participants high in interdependent-relational self-definition to highly independent individuals and found that the former group had a better memory for relational information about others and described themselves and a close friend more similarly.

Depending on the situation, state shifts occur at the conceptual level of self-other connectedness: For example, intentionally taking the perspective of another person has been found to involve a conceptual self-other overlap (Davis et al. 1996, 2004; Laurent and Myers 2011). In general, the idea that people include others and groups of others into the self is widely supported (Coats et al. 2000; Goldstein and Cialdini 2007; Smith and Henry 1996; Smith et al. 1999) and discussed as a mechanism for reducing social biases (Galinsky and Moskowitz 2000), fostering social bonds (Galinsky et al. 2005), and acting prosocially (Cialdini et al. 1997).

The Bodily-Affective Level: Self as Embodied Agent

Various authors have suggested that a “minimal self” (Gallagher 2000) or “core self” (Damasio 2010) underlies and precedes the development of the conceptual self. This notion of the self refers to the “consciousness of oneself as an immediate subject of experience, unextended in time” (Gallagher 2000, p. 15).² According to Damasio (2010), the core self involves four aspects: a specific spatial standpoint anchored to one’s body, a sense of agency, a sense of ownership, and primordial bodily feelings. Thus, this self is closely linked to the body and, by that, to the experience of affective states.

As will be outlined below, research in diverse fields, including phenomenology, developmental psychology, and neuroscience, indicates that this level of selfhood is characterized by a coupling, or connectedness with others. This link seems to be a hard-wired basis of various human social abilities. According to phenomenological accounts, the perception of the other as a bodily being is inherently linked to the experience of one’s own self on this minimal, or bodily level. (Thompson 2001; Zahavi 2006). That is, the perception of the other’s lived body differs from the perception of mere physical objects, because we directly experience the other “as an embodied subject of experience like oneself” (Thompson 2001, p. 17). Put differently, the perception of the other’s body always conveys the sense that this body is another center of orientation in space, that it is a source of voluntary action, and that it is infused with sensations and feelings. Thus, the perception of the other is always, in a very basic sense, empathic, because we experience the other as a sentient, expressive, and intending being.

²“Unextended in time” is meant here in opposition to accounts of the self on the conceptual level, which also involve the notion of being an autobiographically extended self. However, as phenomenologists have pointed out, also the moment-to-moment subjective experience does involve temporality, in the sense of being aware of the immediate past and future (Zahavi 2006).

These phenomenological observations are supported by findings from developmental psychology. A primordial coupling of the bodily perception of self and other is strikingly demonstrated by the ability and proneness of newborns less than 72 h old to imitate facial expressions (Meltzoff and Moore 1989). Because in doing so infants use body parts not visible to themselves, their inborn body schema must be structured in a way that allows to map the other's bodily appearance to their own bodily self. According to Meltzoff (2007), this self-other equivalence in perception and action soon develops into the capability to understand others as having mental states such as intentions and emotions. Therefore, Meltzoff (2007, p. 126) argued that "the like me" nature of others is the starting point for social cognition". This embodied link between self and others and its contribution to creating social connections has also been demonstrated in adults: Imitation of gestures and expressions occurs automatically and has therefore been termed the "chameleon effect". It fosters affiliation, empathic responses such as emotional contagion, and prosocial behavior (Chartrand and Bargh 1999; Lakin and Chartrand 2003; Stel et al. 2008; van Baaren et al. 2004).

Pointing to an underlying neural mechanism, brain imaging studies on perspective taking, empathy, and imitation have demonstrated an overlap of brain areas – so-called "shared networks" – involved in representing one's own intentions, emotions, and actions and those of others (reviewed in Decety and Sommerville 2003; Hein and Singer 2008). Echoing Meltzoff's "like me" notion, it has been argued that psychological identification – the (innate) notion that others are like the self – is fundamental to shared neuronal networks and thus lays the ground for human social capacities (Decety and Chaminade 2003; Gallese 2003). Most importantly, a range of empathy related phenomena are supposed to be based on self-other overlap, both on the neuronal and the psychological level (Preston and Hofelich 2012; Preston and de Waal 2002; de Waal 2008). These phenomena include emotional contagion, which refers to the automatic sharing of emotions, empathy in the sense of understanding emotions of others, and compassion as the resulting concern for the wellbeing of others. The role of neuronal self-other overlap in empathic concern for suffering others has been demonstrated by a recent fMRI study: When seeing others in pain, activity in the anterior insula, a part of the network that is also active during first-hand experience of pain, was correlated with self-reported empathic concern and predicted costly helping (Hein et al. 2010).

Evidently, complex social phenomena such as the empathic understanding of others and compassionate concern for others must also, at some level, involve differentiations of self and other in order to avoid a complete conflation. Otherwise, being confronted with suffering would result only in distress, impeding effective communication, prosocial motivation, and action. Some evidence points to the right temporoparietal junction (TPJ) as a crucial node for self-other differentiations (Decety and Lamm 2006). However, little is known about the involved mechanisms. For example, which point of reference is used to create a self/no-self distinction? Nor have the phenomenological dimensions of these differentiations been thoroughly investigated.

Nevertheless, our aim here is to show that at a very basic level an individual must establish a connection to the other as being “like the self” (Decety and Chaminade 2003). But under which conditions does this occur? On the one hand, the situational context seems to have an influence, for example when it allows for cognitive reappraisal (Lamm et al. 2007). On the other hand, individual characteristics play a role: In a study by (Chartrand and Bargh 1999, experiment 3), participants high in trait perspective taking (Davis 1983), compared to those low on that measure, tended to display more automatic imitation. Similarly, neuroscientific studies of empathy yielded higher resonance in shared networks in individuals with high self-reported trait empathy (Avenanti et al. 2009; Jabbi et al. 2007; Lamm et al. 2007). Thus, self-other connectedness at this bodily-affective level seems to vary between persons and situations.

Interactions Between Embodied and Conceptual Levels

Self-other coupling on the bodily level seems to interact with conceptual forms of self-other connectedness. For example, several experiments (reported in Ashton-James et al. 2007) indicated that, when being unobtrusively mimicked by another person, self-construals shifted towards interdependence (see above), and perceived closeness with others increased (as measured by the Inclusion of Other in the Self Scale; Aron et al. 1992). Conversely, in another study, interdependent self-construal was associated with more non-conscious mimicry compared to independent self-construal (van Baaren et al. 2003). Hence, bidirectional interactions seem to occur between the bodily-affective and the conceptual level. Interestingly, the above mentioned study by Hein et al. (2010) revealed different neuronal patterns in response to another person in pain depending on whether a shared social identity existed. Participants of this study were recruited from a local soccer team, while the person in pain was a confederate who posed as an ingroup member, i.e. as a fan of the same group, or as an outgroup member, i.e. as a fan of a rival team. When the person belonged to the outgroup compared to the ingroup, reduced activity in the anterior insula, a part of the shared pain network, and enhanced activity in the nucleus accumbens, a reward related area was observed. Thus, when participants conceptually differentiated between themselves and the person in pain based on group membership, they seemed to reduce empathic responding to the pain while deriving pleasure from the situation. Similarly, a recent study found activity in the shared pain network when seeing a close other experiencing social exclusion, but not in response to a stranger’s social suffering (Meyer et al. 2012). Moreover, the shared pain activity in the close other condition was correlated with self-reported self-other overlap. From our point of view, these studies indicate that self-other connectedness at the conceptual level modulates connectedness of self and other at the bodily-affective level, and vice versa.

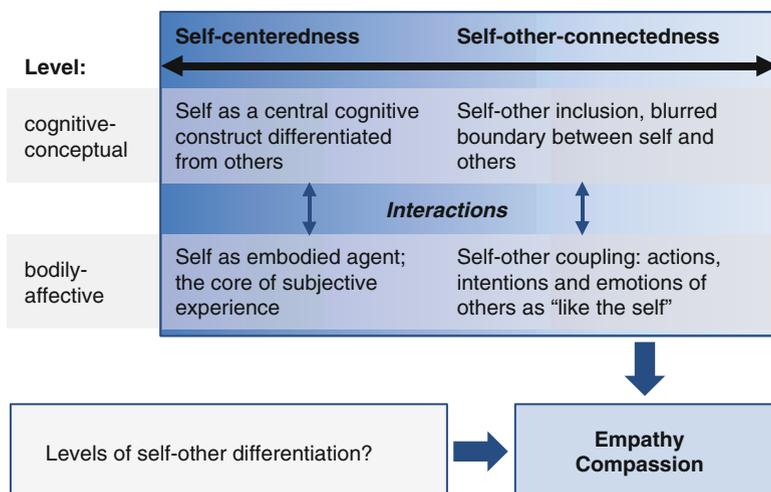


Fig. 1 A framework of mental functioning based upon a common distinction of a cognitive-conceptual and bodily-affective level of self representation. Because of their tight interactions, both levels can be conceptualized as a dimension which is anchored to self-centeredness on one side and to self-other-connectedness on the other side. Self-other-connectedness is necessary for the experience of empathy and compassion; however, self-other differentiation at a different level might also contribute to the experience of these states

Self-Centeredness and Self-Other-Connectedness

Taken together, the presented literature indicates that the conceptual self as a cognitive unit sharply delimited from others may be, at least in its extreme form, a particular characteristic of Western cultures. However, considerable situational and individual variability does also exist within Western culture. Also at a more basic, embodied level, the tendency to identify with others, to connect, and to empathize with them seems to involve individual variability. Hence, we integrate both levels into a framework of mental functioning (see Fig. 1).

Similar suggestions have been made by others. As an umbrella concept, (Wayment and Bauer 2008) introduced the term *quiet ego* and contrasted it to a loud ego. They see in the quiet ego “a self-identity that is not excessively self-focused but also not excessively other focused – an identity that incorporates others without losing the self” (p. 8). According to the authors, characteristics of a quiet ego include non-defensive awareness in terms of a detachment from egoistic appraisals, interdependence, i.e. conceptual integration of self and others, and compassion for self and others. A related concept is *self compassion* (Neff 2003b). According to Neff, de-emphasizing the individual self in favor of interdependent and shared aspects of identity reduces the importance of self-esteem and opens the possibility for self-compassion – taking a kind and understanding attitude towards the self. Thus, in self-compassionate individuals “the boundaries between self and other are softened” (Neff 2008, p. 95).

Dambrun and Ricard (2011) have proposed a theory, which assumes that psychological functioning varies between self-centeredness and selflessness. In self-centered functioning, the self is perceived as existing continuously and independently from others, and serves as a central point of reference for many psychological activities. High importance is given to the self relative to others, resulting in cognitive biases and the need to aggrandize and protect the self. Thus, this conception of self-centeredness is highly similar to the one we have provided above. Dambrun and Ricard (2011) state that the more psychological functioning shifts towards selflessness, the more the self is perceived as a changing, impermanent, and interdependent element of its social and natural environment. Therefore, motivation and cognition is directed more towards achieving harmony within the elements of this context, resulting in altruism and benevolent emotion and motivation (e.g. kindness, empathy, compassion). Hence, the conception of selflessness in this model involves interdependence or connectedness of self and other, as we have described it. Based on the literature discussed above we complement this notion of selfless functioning by highlighting the non-conceptual levels of self-other connectedness, which have been linked to empathy and compassion in recent research (reviewed in Decety and Sommerville 2003; Hein and Singer 2008).

By drawing on Buddhist philosophy, Dambrun and Ricard (2011) describe another feature of selflessness, i.e. impermanence of the self in the sense that the self is not regarded as a “real”, permanently existing entity. This Buddhist view of the self will be discussed in the next section. We will point out that loving-kindness meditation (LKM) and mindfulness meditation (MM) can be differentiated by their aim to either foster self-other connectedness (LKM) or to dis-identify from a reified, permanent self (MM). In order to comprehend the effects of both practices and their interplay from a scientific point of view, we will now apply the framework of self-centeredness and self-other connectedness developed above.

Buddhist Meditation and the Self

Mindfulness Meditation

At the core of Buddhist teachings lies the idea that there is no such thing like a permanent, truly existing entity called “a self” (Olendzki 2006). Instead, the ordinary experience of having a self that “owns” one’s body, emotions, and perceptions and which is the origin of one’s thoughts and actions is the outcome of certain mental processes.³ These processes involve grasping, i.e. the craving for pleasant and the rejection of unpleasant feelings, both of which seem to imply a permanent self which could actually be affected by these feelings. Through repeated grasping, the

³In this respect the Buddhist approach to the self resembles the view of cognitive science, however, it takes another step and tries to transform the everyday experience of a “real” self through meditative practice, an endeavor not approached by Western science (cf. Varela et al. 1991).

perception of having a personal identity is instantiated, which results into a style of mental functioning similar to what we have described above as self-centered functioning: “Grasping merely consists of regarding any aspect of experience with the stance This is mine; this is me; this is my self” (Olendzki 2006, p. 257). According to Buddhism, grasping unavoidably leads to psychological distress.

To achieve enduring happiness, one needs to become aware of these processes and to suspend them by disidentifying from the ordinary sense of self. To this aim, MM can be employed. Typically, this practice involves focusing on current somatosensory and mental events in a non-conceptual, non-judgmental manner, thereby suspending ongoing self-referential thoughts (Farb et al. 2007).

While most of the research devoted to this practice focused on processes of attention and emotion regulation, some support is available that this practice does, as suggested by Buddhist theory, involve a change in the self (see also the chapter by Edge in this volume). One example involves the concept of *decentering* (or *reperceiving*), which refers to a dis-identification from mental contents and has been suggested as a core mechanism of MM (Shapiro et al. 2006). Specifically, the concept designates a shift from “being immersed in the drama of our personal narrative or life story” towards being able “to stand back from (witness) our story’ about who and what *we* ultimately are” (Shapiro et al. 2006, p. 379). Decentering, as assessed with self-report scales (Fresco et al. 2007; Lau et al. 2006), has been found to be an outcome of MM, both in terms of trait and state changes (Feldman et al. 2010; Orzech et al. 2009).

More direct evidence comes from brain imaging research. In an fMRI study (Farb et al. 2007), participants who had attended an 8-week mindfulness training were compared with novices. Brain activity was recorded while reading trait words in a mindful self-focus (being aware of body sensations, i.e. the embodied self) or in a narrative self-focus (reflecting upon what the trait words meant for oneself, i.e. the conceptual self). During experiential self-focus, reduced activity in the medial prefrontal cortex, an area associated with self-referential processing, and enhanced activity in viscerosomatic areas was observed in comparison to the narrative self-focus in participants trained in MM. In contrast, this dissociation of narrative and experiential self-focus was weaker in untrained participants. In another study, trait mindfulness scores were negatively correlated with resting state activity in the medial prefrontal cortex, indicating that mindfulness does habitually attenuate self-referential mental activity (Way et al. 2010). In a similar vein, changes in default mode network connectivity have been associated to intensive MM (V. A. Taylor et al. 2013; J. A. Brewer et al. 2011).

In summary, this evidence suggests that MM does in fact lead to a decrease in self-centered functioning. However, these results hardly reflect the radical transformation of one’s sense of self, which is the ultimate goal of Buddhist meditation practices.⁴ Rather, they seem to reflect dis-identification from some mental contents on the conceptual level, which is likely to occur already after less meditation practice.

⁴Several authors have approached these states of advanced or even complete spiritual transformation from a scientific stance. However, they differ in their scientific approach and in the phenomenologies assumed to be present in these states (for examples, see Albahari 2011; and chapters by Austin and Edge in this volume).

Loving-Kindness Meditation

In Buddhism, the insight into the illusory nature of the self is regarded as wisdom, while compassion and loving-kindness are regarded as necessary complements to it (Wallace 2001b). This is often expressed by a metaphor: “Wisdom and compassion are like the two wings of a bird: Both are necessary for the bird to soar” (C. Feldman 2005, p. 15). While MM is aimed at wisdom, with loving-kindness meditation (LKM) one intends to cultivate unconditional and impartial kindness towards the self and others.⁵ This quality, originally named *mettā* in Pali and *maitrī* in Sanskrit, and often translated as *loving-kindness*, is described by feelings of connectedness to others and a heartfelt wish for their well-being. The experience of this state is said to result in prosocial motivation and behavior (Wallace 2001b).

Usually, loving-kindness is cultivated together with three other qualities, namely compassion, empathetic joy and equanimity (Salzberg 1995). These qualities constitute the *four immeasurables*. They can be practiced separately, but because of their interrelated nature, development in one will also advance the others. While loving-kindness yearns for the well-being of others, compassion is understood as the strong wish to end the suffering of others (Wallace 2001b). Evidently, both are strongly related and thus “really two sides of the same coin” (Wallace 2001a, p. 219). Empathetic joy means taking part in other people’s delight. Finally, equanimity means dismantling separations between self, friends, or enemies so that loving-kindness and compassion can be experienced without bias. Typically, in LKM one directs positive wishes at specific persons, including oneself, groups, human beings in general, or even at all sentient beings. The practitioner can also imagine the warmth or light of the “radiated” love or visualize the person whom it is “sent” to. Typical wishes are: “May you be free from danger”, “may you have mental and physical happiness”. These wishes are thought to help establish feelings of love and kindness. Thus, the core of the practice is not the recitation of these phrases but the mindful awareness of the feelings connected to them. Practitioners often begin by focusing on themselves. With further progress in the meditative development and also during the course of one meditation session, the practitioner expands the feelings, usually in the following order: (1) self, (2) close other, (3) neutral person (4) difficult person or “foe” (5) groups of others, (6) all sentient beings. The aim is to experience the same degree of loving-kindness in all of these instances.

Based on the phenomenology of the practice, we suggest that a core element of it is to increase self-other connectedness, both at the conceptual and at the bodily-affective level. Impacting the conceptual level, the practice involves the realization

⁵ Across Buddhist traditions, several techniques exist which are aimed at cultivating compassion and loving-kindness (e.g. Rinpoche and Mullen 2005). We focus on an account from Theravada Buddhism, which is based on the *Mettā Sutta* of the Pali Canon and taught in the modern Vipassana movement (Buddharakkhita 1995; Salzberg 1995). Beginning research on these practices is reviewed in (Hofmann et al. 2011).

that all humans, and eventually, all sentient beings, strive to gain happiness and reduce suffering. However, a strengthening of the embodied link between self and other might even be more important. This assumption is based on two observations: (i) Developing loving-kindness for oneself involves looking at the self from the perspective of another person. Thus, during this practice a kind of exchange of self and other occurs, or as Wallace (Wallace 2001b, p. 10) puts it: “one has entered into an I-you relationship with oneself”. (ii) When developing loving-kindness for a widening circle of others until extending it to all sentient beings, one empathizes with their striving for happiness and their wish to be free of suffering. By that, we assume, meditators extend and generalize the “like me” link of empathy discussed above. Even though this might involve conceptual “top-down” influences, for example by thinking of a shared humanity, the core is a bodily-affective resonance – often described as a “*heartfelt wish*” – with imagined others. Thus, this practice seems to involve an empathic coupling of self and an extending range of others, increasingly blurring distinctions between them.

A recent study (Colzato et al. 2012) yielded evidence for the embodied nature of this process by employing the social Simon task, a spatial compatibility task performed jointly by two persons (Sebanz et al. 2003). Response costs induced by joint action in this task have been taken to evidence shared representation of others and one’s own actions. In Colzato et al. (2012), practicing Buddhists demonstrated stronger interferences in the joint task compared to matched controls. The authors suggested that this effect represents a larger self-other integration and relate it to the concepts of compassion and connectedness endorsed by Buddhists. However, it is not possible to relate this finding to specific meditative practices, as these are not reported by the authors. More conclusive in this respect is a laboratory experiment with meditation novices (Hutcherson et al. 2008). A short, guided LKM was compared to a neutral imagery task. LKM lead to larger increases in explicit ratings of connectedness and positivity and in implicit positive evaluations measured with an affective priming task. A recent experiment addressed the question whether LKM would actually increase prosocial behavior (Leiberg et al. 2011). The latter was assessed during an interactive computer game in an implicit and ecologically valid manner. Relative to baseline, helping behavior increased after a 1-day training in LKM, but not after 1-day training in a memorization technique. Finally, an fMRI study (Lutz et al. 2008) measured neuronal responses to neutral and emotional sounds in expert meditators (10,000–50,000 h of meditation practice including compassion meditation) and in age-matched controls. During a loving-kindness-compassion state versus a resting state, responses in networks associated with the experience and sharing of affective states were increased. This effect was stronger in meditators than in controls. In conclusion, when assuming that LKM increases bodily-affective resonance between self and others, these results are in line with recent accounts of empathy, compassion and altruism, which regard self-other coupling as the basis of these prosocial phenomena (Preston and Hofelich 2012; Preston and de Waal; de Waal 2008).

The Interplay Between Mindfulness and Loving-Kindness

Reflecting the close relationship of mindfulness and loving-kindness, or compassion, in Buddhist thought, there seems to be a bidirectional interplay between them. On the one hand, mindfulness is said to naturally result in connectedness with others (Salzberg 2011). On the other hand, the practice of LKM supposedly helps to refrain from engaging in self-referential thought and thus supports mindfulness (Hofmann et al. 2011).

Our theoretical framework allows conceiving both directions of the interplay. Firstly, conceptual boundaries between self and other seem to prevent individuals from experiencing empathy (as indicated by the studies from Hein et al. 2010; Meyer et al. 2012). Simply reducing self-referential mental activity may therefore increase empathic receptivity (for detailed discussion of a similar point, see Schuster 1979). Secondly, the focus on somatosensory sensations often involved in MM presumably leads to an increase of connectedness between self and others through awareness of the bodily coupling. For example, when perceiving others' suffering, mindfulness may increase awareness of co-perceived bodily and affective empathic reactions. By being mindfully open the meditator's own potential for suffering can resonate with the other person's suffering (see also Schmidt 2004). Lastly, mindfulness does already entail an attitude which exchanges self and other: "By *observing* one's own body, rather than simply *identifying* with it, one cultivates a kind of self-alterity, by experiencing one's own body simply as a matrix of phenomena, rather than as a self" (Wallace 2001b, p. 6). Taken together, these mechanisms might explain why mindfulness contributes to changes in the social domain: Mindfulness inhibits self-centeredness, primarily on the conceptual level, thereby enabling to experience connectedness to others at the bodily-affective level. In fact, some correlational and longitudinal studies suggest that both, trait mindfulness and MM, are associated with empathy, concern for others, and interpersonal closeness (summarized in Block-Lerner et al. 2007; see also Dekeyser et al. 2008). Moreover, the concept of self-compassion comprises the separate but intercorrelated subcomponents self-kindness, mindfulness, and common humanity or a sense of connectedness with others (Neff 2003a, b). In line with our suggestions, self-compassion was correlated with greater self-reported compassion for humanity, empathic concern, perspective taking, and altruism in meditators and community adults; however, some of these correlations were not observed among college students (Neff and Pommier 2013).

Our theoretical suggestions agree with a 2-stage model of the effects of meditation on empathy, compassion and altruism proposed by Kristeller and Johnson (2005). The first step involves heightening awareness of and disengaging from dysfunctional reaction patterns through basic meditation practice. This includes disengagement from self-centered and self-protective patterns, facilitating the ability to experience needs of others. Thus, this step entails the effects of MM described above. According to the model, a second step is necessary to increase empathy and

compassion: an explicit focus on love and compassion towards others as in LKM. As explained in detail above, the framework of self-other connectedness and its application to LKM allows to propose an underlying mechanism.

Additionally, the framework also allows for conceiving the other direction of the interplay between LKM and MM: According to interactions between conceptual and embodied levels, an increase in self-other connectedness in the affective, embodied domain through LKM should reduce self-centeredness on the conceptual level. Indirect evidence comes from a randomized, longitudinal field experiment on LKM (Fredrickson et al. 2008). Over the course of a LKM training, a range of daily assessed positive emotions increased in the meditation group but not in the control group. These gains in positive emotions were associated with increases in trait mindfulness.

More direct evidence for a close relationship between the development of loving-kindness and a change in the self comes from a recent study conducted at our lab (Trautwein et al., submitted). In the next section we will shortly discuss this study in order to illustrate how the conception of a dimension of self-other connectedness can be used to derive research hypotheses on meditation effects in the social domain.

Investigating the Impact of Loving-Kindness Meditation on Self-Other Connectedness

Is the cultivation of loving-kindness through LKM accompanied by a decrease in self-centeredness and an increase in self-other connectedness? We addressed this question, which is a consequence of the framework developed above, in a recent experiment (Trautwein et al., submitted). As an indicator of self-other connectedness, event-related potentials (ERP) of the EEG elicited by one's own and a close other's face were assessed in long-term practitioners of LKM and in a closely matched control group. Of specific interest for our study was the P300 component in the ERP, which is usually assessed in oddball paradigms, i.e. in response to stimuli, which appear infrequently against a background of standard stimuli. The P300 is a positive potential in the EEG occurring approximately 300–500 ms after presentation of stimuli which engage an individual's attentional resources; and it has maximal amplitudes at frontal to parietal midline sites (Comerchero and Polich 1999; Polich 2007). Previous studies consistently found larger P300 amplitudes for self-related stimuli including one's own name, face, autobiographical information and self-referent pronouns compared to not self-related stimuli (e.g. Gray et al. 2004; Tacikowski and Nowicka 2010; Zhao et al. 2009, 2010, 2011). Therefore, the self-relevance effect, defined as the difference between self- and other-related P300 amplitudes, might reflect the high priority given to the individual self, which is characteristic of self-centered functioning, at an implicit level. Thus, if LKM leads to a stronger integration, or connectedness, of self-other representations, a smaller self-relevance effect in terms of reduced differences between self- and other-related P300 should be associated with this practice. This hypothesis was tested in our study.

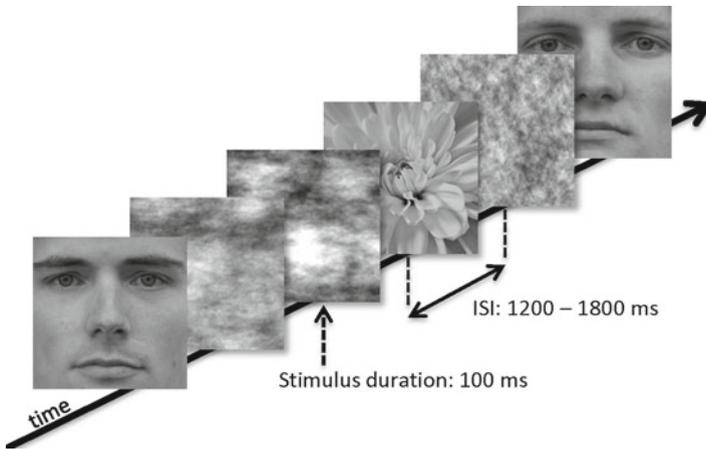


Fig. 2 The oddball task in Trautwein et al. (submitted) consisted of a fast stimulus sequence, containing a flower (20 % of the trials) which required a button press (the target stimulus), self and close other's face (distracter stimuli, 20 % of the trials), and scrambled versions of these stimuli (standard stimuli, 60 % of the trials). Two blocks of a total of 375 trials were presented. ISI = inter-stimulus-interval

Specifically, the study investigated trait and state effects of LKM on self-other connectedness. State effects refer to transient shifts in self-other connectedness which may occur during and directly after the meditative practice, whereas trait effects correspond to lasting changes due to long-term practice of LKM. As the study's main variable of interest, P300 amplitudes in response to self and a close other's face were measured during an oddball task (see Fig. 2 for a description). To measure trait effects, 11 long-term practitioners of LKM were compared to 11 control participants matched for age, sex, handedness, and education. Meditators came from different Buddhist traditions, but all had a regular LKM practice of, on average, 9 years ($SD=8$ years) and they had practiced meditation on average for 12 years ($SD=9$ years). In order to investigate state effects of LKM, meditators were measured additionally after a short LKM state and after a closely matched control state. The former involved 10 min of LKM directed at the close other, whose picture was used to assess P300 amplitudes. In the control task, participants were asked to think about the close other in a neutral manner. The order of these two priming tasks was counterbalanced and they were always followed by P300 assessments.

As additional outcomes of LKM, the study assessed self-compassion (Bartel 2009; Neff 2003a) and compassionate love (Sprecher and Fehr 2005) with questionnaires. Compassionate love is a concept resembling the Buddhist notion of compassion and loving-kindness. It is defined as "an attitude toward other(s), either close others or strangers or all of humanity; containing feelings, cognitions, and behaviors that are focused on caring, concern, tenderness, and an orientation toward supporting, helping, and understanding the other(s)" (Sprecher and Fehr 2005, p. 630).

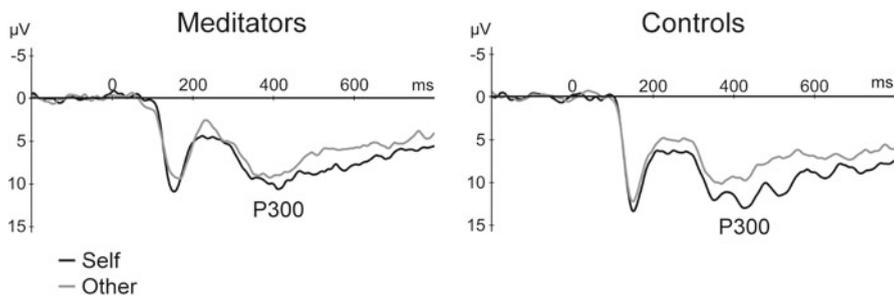


Fig. 3 Exemplary illustration of results: event-related potentials elicited by self-face and other-face at Pz electrode site for meditators and controls

The results of the study yielded significant differences in questionnaire scores: compared to the control group, meditators reported to experience more compassionate love towards strangers and all of humanity. Similarly, meditators described themselves as being more compassionate towards themselves. In agreement with these results, other studies found associations between meditation practice and compassionate love (Leiberg et al. 2011; Sprecher and Fehr 2005) and self-compassion (reviewed in Barnard and Curry 2011).

As an indicator of self-centeredness vs. self-other connectedness, the study assessed P300 amplitudes. A three factorial ANOVA of P300 amplitudes [group (meditators, controls) \times stimulus (self, other) \times electrode (Fz, FCz, Cz, CPz, Pz)] yielded a significant main effect for stimulus. Thus, concurring with previous studies (e.g. Gray et al. 2004), larger P300 amplitudes were elicited by self faces compared to close other faces (see Fig. 3 for an exemplary illustration). Most importantly, a significant group \times stimulus \times electrode interaction supported the hypothesis that a change in self- and other-related processing is associated with meditation practice. Post-hoc analysis indicated that at frontal and central sites, differences between self and other tended to be similar in both groups (or slightly higher in controls). At a posterior site (Pz), however, the self-relevance effect was more pronounced in controls than in meditators.

At Pz electrode location, P300 differences (self minus other) were correlated with the individual duration of meditation experience, suggesting that this effect was in fact an outcome of meditation practice. Furthermore, in agreement with the framework developed above, a close relationship between decentering of the self and a stronger affective connectedness with others was indicated by a negative correlation between the self-relevance effect and self-reported compassion for others. This correlation was driven by P300 amplitudes elicited by the self face, that is, they tended to be smaller in those participants who reported experiencing more compassion for strangers and humanity.

A crucial point of our theoretical framework was that individuals may differ depending on whether they represent themselves more in a way that is inherently connected to others (self-other-connectedness), or rather as an entity separate from others (self-centeredness). If the self-relevance effect is regarded as a particular

characteristic of self-centeredness, these findings give support to the idea that LKM shifts an individual's mode of representation towards self-other connectedness.

However, an alternative explanation of this finding must be considered: As the P300 component elicited by distracter stimuli (P3a) presumably reflects attentional resource allocation (Polich 2007), and meditation training has been associated with changes in attentional processes (Brefczynski-Lewis et al. 2007), one might argue that this finding reflects a change in attentional domains, but not in the self. In fact, effects of a meditative state on auditory P3a have been reported and interpreted as a decreased attentional engagement elicited by distracting stimuli (Cahn and Polich 2009). The counter-argument to this alternative explanation is that the change in P300 amplitudes in our study was specific to the type of stimulus (self vs. other) as indicated by the group \times stimulus \times electrode interaction. A general reduction in attention allocation to distracters would have been reflected in a main effect of group and not mediated by the stimulus type. Therefore, it is likely that the findings of the study do represent a reduced self-centeredness in meditators.

Furthermore, as predicted by the framework, the results suggest that reduced self-centeredness is related to increased empathic and compassionate connectedness with others. This assumption is supported by the finding that the reduction in self-centeredness, as assessed by the ERP data, was accompanied by increased compassion for strangers and humanity, as measured by the compassionate love scale (Sprecher and Fehr 2005). More specifically, one implication of our framework was that sharp conceptual boundaries between self and other (self-centeredness) might inhibit the hard-wired bodily-affective coupling between them. The inverse relationship between P300 amplitudes elicited by one's own face and unspecific compassionate love provide support for this assumption.

However, due to their cross-sectional nature these findings do not provide direct evidence for a causal link between LKM and increased self-other connectedness. In order to test for such a causal effect of LKM, the study also assessed P300 components directly after two priming conditions (LKM and a control task). However, the results did not yield evidence for a state effect of LKM: After meditators had completed a short LKM, P300 amplitudes did not differ from measurements taken after a structurally similar control task involving other-related thinking. Several explanations may account for this lack of state effects: For example, the P300 measure might not be sensitive enough to the bodily-affective connectedness induced by LKM; or the state effect might be too transient in order to be captured by the paradigm, which was applied only after the meditation itself. Future studies could clarify this by employing measures which can be taken during the meditation or which tap more into the embodied level of the self.

Taken together, the results in the group comparison of our study must be interpreted carefully with regard to their causal nature. Although both groups were matched closely regarding potentially confounding factors, the relationship between LKM practice, reduced self-centeredness and increased engagement with others might not be as direct as assumed, but moderated by other variables. Similarly, the direction of causality cannot be derived from these findings. Finally, another reason for cautious interpretation of the results is the small sample size of this study.

Nevertheless, it seems a promising endeavor to further investigate the relationship between neurophysiological and behavioral measures that tap into the structure of the self – its centrality or openness to others – and outcomes in the interpersonal domain, including empathy, compassion and prosocial behavior.

Conclusion

In this chapter we integrated findings on the structure of the self and its connectedness with others and pointed out how this theoretical background can improve the understanding of meditation effects in the social domain. Converseley, we hope that the consideration of contemplative accounts may also complement the scientific understanding of self and other.

According to recent work in social psychology and neuroscience, connectedness, or the overlap of self and other representations, is vital for a variety of interpersonal capabilities such as empathy, compassion, and the creation and maintenance of social bonds. Buddhist contemplative accounts highlight how the concept of a permanent, individual self causes distress, while disengagement from it through MM will increase happiness and a loving and caring connectedness with others. The proposed framework allows for conceiving aspects of both of these approaches at once: While, on a conceptual level, mental functioning tends to be centered on an individual self, people do also include others – to some extent – into their concept of self. Furthermore, a hard-wired bodily and affective link provides a basis for intersubjective sharing of mental states. Because both of these levels seem to be closely interconnected, the centeredness on the conceptual self does also limit the ability to affectively connect with others. Thus, a decrease in self-centeredness regarding the conceptual self leads to increased affective self-other-connectedness. Inversely, reinforcing the affective link to others does also foster self-other connectedness on the conceptual level.

Based on this framework, we suggest that meditation practices such as MM and LKM lead to a change in the self via two intertwined roads:

- MM decreases self-centeredness primarily on the conceptual level; or in other words, helps disengaging from conceptual self-related contents.
- LKM increases self-other connectedness on the bodily-affective level; that is, LKM increases identification with others building upon a hard-wired bodily-affective link between self and other.

A recent study from our lab (Trautwein et al., submitted) was discussed in order to illustrate how empirical research questions can be derived from this framework. The results of this study support our theoretical considerations, however they must be regarded as preliminary due to their cross-sectional nature and the small sample size of that study.

In order to comprehend phenomena such as empathy and compassion, which essentially contribute to individual and societal well-being, the investigation of the self-other relation seems to be a worthwhile endeavor. The meeting of psychological and neuroscientific approaches with contemplative techniques such as MM and LKM might contribute here, especially to understanding processes involved in

constructing and dissolving boundaries between self and other. From a theoretical perspective, the scrutiny of these dynamics is a crucial challenge towards a more unified view of selfhood and intersubjectivity. From a practical stance, this might contribute to the development of scientifically informed strategies for reducing social conflict and fostering human flourishing in relation to others.

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