Visualizing Compassion: Episodic Simulation as Contemplative Practice

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Abstract

Contemplative interventions designed to cultivate compassion are receiving increasing empirical

attention. Accumulating evidence suggests that these interventions bolster prosocial motivation

and warmth towards others. Less is known about how these practices impact compassion in

everyday life. Here we consider one mechanistic pathway through which compassion practices

may impact perception and action in the world: *simulation*. Evidence suggests that vividly

imagining a situation simulates that experience in the brain as if it were, to a degree, actually

happening. Thus, we hypothesize that simulation during imagery-based contemplative practices

can construct sensorimotor patterns in the brain that prime an individual to act compassionately

in the world. We first present evidence across multiple literatures in Psychology that motivates

this hypothesis, including the neuroscience of mental imagery and the emerging literature on

prosocial episodic simulation. Then, we examine the specific contemplative practices in

compassion-based interventions that may construct such simulations. We conclude with future

directions for investigating how compassion-based interventions may shape prosocial perception

and action in everyday life.

Keywords: Compassion, Prosocial, Compassion-based Intervention, Simulation, Imagery,
Episodic Simulation

There is growing interest in the efficacy of compassion-based interventions (CBIs). Most CBIs share a focus on contemplative practices designed to cultivate compassion for diverse others (as well as compassion for oneself) (Kirby, 2017). A meta-analysis of 21 CBI randomized controlled trials indicated consistent training-related increases in self-reported compassion (Kirby et al., 2017). Furthermore, this meta-analysis and other recent meta-analytic findings reported training-related reductions in psychological distress and mood disorder symptoms (of the practitioner) (Kirby et al., 2017; Lv et al., 2020). Consistent with these findings, neuroimaging studies suggest that CBIs improve individuals' ability to engage with the suffering of others (Weng et al., 2018) and that this training up-regulates neural systems underlying positive affect and affiliation in response to others' suffering (Klimecki et al., 2013, 2014; Singer & Klimecki, 2014; Weng et al., 2013). A handful of studies have also demonstrated that CBI training increases prosocial behavior (Böckler et al., 2018; Condon et al., 2013; Weng et al., 2013).

Taken together, existing literature suggests that CBIs increase prosocial motivation and positive feelings directed towards others. An important question is the degree to which these practices impact compassionate perception and action in the real world. Initial evidence suggests that CBIs impact prosocial behavior in normative helping situations (e.g., charitable giving) (Böckler et al., 2018). One clever study also showed that individuals who engaged in a CBI were more likely to give up their seat for an injured individual, even in the presence of an unresponsive bystander (Condon et al., 2013). Here we build on this work to further examine *how* contemplative practices may impact perception and action in everyday life, especially in ways that employ a "skillful means" that translates our biased form of compassion into one that is more universal. Evidence suggests that vividly imagining a situation simulates that experience

in the brain as if it were, to a degree, actually happening (Moulton & Kosslyn, 2009; J. Pearson, 2019). Thus, skillful simulation during compassion meditation may establish patterns that prime an individual to engage in prosocial perception and action out in the world. We first review theory and evidence that supports the plausibility of this hypothesis. We then examine the specific compassion-based practices that tap into this mechanism. Finally, we present future directions for research on, and delivery of, CBIs based on this hypothesis.

Voluntary Mental Imagery: Constructing Top-down Simulations

The human brain can mentally project into an alternative situation, imagining experiences beyond those afforded by the immediate environment (Buckner & Carroll, 2007; Moulton & Kosslyn, 2009). Although in many instances mental projection occurs unintentionally, this capability can also be harnessed to voluntarily imagine situations (J. Pearson, 2019), and some contemplative practices involve this type of voluntary imagery, in that practitioners aim to construct and manipulate imagined situations.

Grounded cognition theories (Barsalou, 1999, 2008; Kosslyn et al., 2003) and accounts of predictive processing (Barrett & Simmons, 2015; Bastos et al., 2012; Friston, 2010; Rao & Ballard, 1999) propose that vividly imagining an experience involves the same neural systems as would be involved if the experience were to actually happen. In other words, the brain constructs a "top-down" simulation. The neural patterns implicated in an imagined simulation are not exactly the same as those that would occur during the experience out in the world, but the resemblance is such that there is a level of functional equivalence (for example, visual imagery functioning as a weak form of visual perception). As we will briefly review next, evidence across a variety of mental imagery paradigms support this hypothesis (Ji et al., 2016; Kosslyn et al., 2001; Moulton & Kosslyn, 2009; J. Pearson, 2019; J. Pearson et al., 2015).

Simulating sensations

Research on the classic sensory systems suggests that imagining a sensation simulates that experience in the relevant sensory system. A comprehensive meta-analysis examined studies of mental imagery in each of the exteroceptive sensory systems (visual, auditory, somatosensory, gustatory, olfactory) and reported evidence of neural activity in the corresponding sensory system, which typically included the primary sensory cortex (McNorgan, 2012). For example, imagining tactile sensations involved in touch was associated with neural activity in the somatosensory system, including primary somatosensory cortex. Imagined experiences can also involve a focus on the bodily sensations (e.g., heart pounding, stomach flutters); that is, mental imagery of *interoceptive* sensory experience. Recent evidence suggests that, like the exteroceptive sensory systems, imagery of bodily sensations is associated with neural activity in the corresponding interoceptive system, including primary interoceptive cortex (Wilson-Mendenhall, Henriques, et al., 2019).

Visual imagery has received the most empirical attention in terms of assessing functional equivalence with visual perception. Many studies have examined the degree to which visual imagery constructs simulations as "vision in reverse" (J. Pearson, 2019). These studies have shown that activity in the visual system during visual imagery reflects the functional organization of visual perception (Kosslyn et al., 2001; Levine et al., 1985; McNorgan, 2012; J. Pearson, 2019). Primary visual cortex (V1) is implicated when imagery involves high-resolution visualization of the details, parallel to V1's function during perception (Kosslyn & Thompson, 2003; J. Pearson & Kosslyn, 2015). In early visual areas, the retinotopic organization and coding of low-level visual features during visual perception is also evident during visual mental imagery (Naselaris et al., 2015; Slotnick et al., 2005). Visual imagery of higher-order visual features, such

as form, location, and color, selectively activates the extrastriate areas involved in perception of those features (Kosslyn et al., 2001; Levine et al., 1985; J. Pearson, 2019). In sum, the literature on visual imagery provides strong evidence of top-down simulation (J. Pearson & Kosslyn, 2015).

Simulating motor actions

Evidence similarly suggests that motor imagery engages neural systems involved in motor control without executing the final motor output (Crammond, 1997; Hardwick et al., 2018). The multiple neuroimaging meta-analyses conducted on motor imagery identified neural regions involved in movement (Hardwick et al., 2018; Hétu et al., 2013; McNorgan, 2012). The most recent meta-analysis compared spatial maps of the neural regions consistently active during motor imagery and during movement execution (Hardwick et al., 2018). Overlap between motor imagery and movement execution was observed in bilateral premotor cortex, supplementary motor area, mid-cingulate, and primary somatosensory cortex. Overlap was also observed subcortically in the bilateral putamen, which is a critical node of the cortico-striatal sensorimotor circuit, and the cerebellum.

Activity in primary motor cortex has been reported during motor imagery in some studies, but meta-analyses indicate that activity in this region is not consistently observed across studies (Hardwick et al., 2018; O'Shea & Moran, 2017). Although there is clear overlap between motor imagery and execution across many of the systems involved in motor planning and control, the precise operational details of how simulation occurs in the motor system remains a question, including inhibition of final motor output (O'Shea & Moran, 2017).

Recruitment of primary somatosensory cortex during motor imagery suggests simulation of the sensations associated with performing the action (Hardwick et al., 2018). Prevailing

models of motor control specify that a copy of the motor command (efference copy) is used to predict the sensory consequences of an action during motor execution (Kilteni et al., 2018; O'Shea & Moran, 2017; Teuber, 1960). Because incoming sensory signals are delayed and noisy, combining predictions with actual sensory feedback provides a more reliable estimate of the state of the body (Wolpert & Flanagan, 2001). This "internal forward model" is central to motor execution. A recent study presented evidence that internal forward models also operate to predict the sensory consequences of imagined movement (Kilteni et al., 2018). This novel study demonstrated the "computational equivalence" between imagined and executed actions, providing further evidence for top-down simulation of motor actions.

Situated, multimodal immersion

While mental imagery studies often isolate specific sensory or motor systems for precise hypothesis testing, most experiences in real life involve cascades of sensorimotor activity (including interoception and visceromotor activity) in a specific situation. Because this is the way we typically experience the world, patterns of neural activity tend to reflect a "situated" multimodal context (Barsalou, 2009). Studies that induce emotional experiences through immersive multimodal imagery show neural activity distributed across sensory and motor systems, including primary sensory and motor cortices (Wilson-Mendenhall, 2017; Wilson-Mendenhall et al., 2013; Wilson-Mendenhall, Henriques, et al., 2019). These studies also show neural activity in systems underlying affect (e.g., amygdala) (Ji et al., 2016; Wilson-Mendenhall et al., 2013), including somatic and sensory representation of affect (Damasio et al., 1996; Wilson-Mendenhall, Henriques, et al., 2019). Immersive emotional imagery is also consistently associated with changes in behavior, experience, and peripheral physiology (Ji et al., 2016; Lench et al., 2011).

Generating complex, temporally extended, imagined experiences involves distributed activity across the brain, including the frontoparietal executive and the default mode networks (Moulton & Kosslyn, 2009; J. Pearson, 2019). These networks support constructing simulations, including sustaining and manipulating them. Episodic simulation refers to imagining personal events that unfold in time and place (Schacter & Addis, 2007). By combining aspects of past experience in new ways, it is possible to simulate plausible future episodes. Neural evidence suggests that constructing future scenarios engages similar processes as reconstructing past episodes (Schacter et al., 2007). For example, the medial temporal lobe subsystem of the default mode network (Andrews-Hanna et al., 2010), especially the hippocampus, parahippocampal gyrus, and retrosplenial cortex, is known to play a role in episodic memory (Schacter et al., 2007). This subsystem is also implicated in constructing scenes during imagined experiences of plausible personal events (Hassabis et al., 2007) and immersing in imagined, multimodal emotional situations (Wilson-Mendenhall et al., 2013).

Summary: Neural Evidence of Simulation

Taken together, neural evidence suggests that analogous to episodic reconstruction of the past, episodic simulation can construct the possible future. When imagined experiences involve vivid sensory and motor details, the resulting top-down simulations are implemented or "run" in the corresponding sensory and motor systems. Moreover, multimodal immersion in imagined situations can evoke affective feelings, as shown by heightened neural activity in affective circuitry and changes in peripheral physiology during imagined emotional episodes. Next, we turn to evidence that such simulations can be harnessed to promote compassion and prosociality.

Prosocial Impact of Episodic Simulation

A functional implication of top-down simulation is that it is possible to establish neural patterns, through imagination, that then shape life out in the world. For example, evidence suggests that visual imagery functions as a weak form of perception, including facilitating perception of similar stimuli and inducing visual perceptual learning (J. Pearson, 2019). Intentional simulation is thus being studied in many applied settings, from psychotherapy to athletic performance (J. Pearson et al., 2015; Taylor et al., 1998). Of interest here is whether top-down simulations impact compassion and prosociality. An emerging literature suggests that vividly imagining positive interactions with others and helping in specific situations bolsters prosocial intention and behavior (Gaesser, 2013; Gaesser & Fowler, 2020).

Prosocial Intention and Behavior

Recent research examined whether vividly imagining helping someone impacts prosocial intention. In a series of studies, participants first read a scenario depicting an everyday event in which a person was in need of help (e.g., because they were locked out of their house, lost their dog, etc.) (Gaesser & Schacter, 2014). On some trials, participants then imagined helping the person described in vivid detail. On other trials in the within-subjects design, participants engaged in a control condition. The control conditions varied across studies, but collectively controlled for semantic retrieval, social cognition, generation of helping examples, and basic mental imagery. Unique to the imagine helping condition was simulating a temporally and contextually specific episode of helping.

After reading and engaging with the stories as described above (across imagine helping and control trials), participants were then presented with the scenarios again and rated their willingness to help the person in need. Participants were more willing to help the individual in need if they had previously imagined, in detail, helping the person (relative to the control

conditions). Upon being debriefed, none of the participants guessed that this was the hypothesis, suggesting that the findings were not simply the result of demand characteristics (with regard to what the participants thought the experimenters wanted them to do). Moreover, on a trial-by-trial basis, imagined helping that was more detailed and coherent was associated with greater willingness to help. Subsequent studies have also shown that the positive affect experienced during imagined helping contributes to willingness to help, as instructing participants to imagine a negative helping experience instead resulted in decreased willingness to help (Gaesser et al., 2017).

The finding that the vividness of imagined helping, particularly the subjective sensory quality, is associated with willingness to help has been replicated several times (Gaesser & Fowler, 2020). Because initial findings were correlational, a recent series of studies used an experimental design to manipulate the vividness of the visuospatial context (Gaesser et al., 2018). In these experiments, the familiarity of the location in which the helping scene was imagined to take place varied across conditions. Grounding the helping situation in a familiar visuospatial context resulted in greater willingness to help relative to a less familiar visuospatial context and a no help control condition. Furthermore, this effect remained significant when controlling for theory of mind of the person in need, individual differences in prosocial and empathic traits, and attributions of the person in need's capacity for experience and agency.

Although an individual may indicate that they are willing to help, intention does not always result in action (Gollwitzer, 1999). In the series of studies just described, the final study also examined costly prosocial *behavior* using an adapted economic dictator game. In this version of the task, participants also made a decision to keep a monetary endowment for themselves or to donate it to the person who needed help on each trial (Gaesser et al., 2018). The

results showed that participants donated more money to individuals in need when they had previously imagined helping them (vs. no helping control), and that they also donated more money when they imagined helping in a familiar location relative to imagining helping in an unfamiliar location. This evidence suggests that episodic simulation also impacts prosocial behavior.

A carefully controlled study of compassion training further suggests that episodic simulation impacts prosocial behavior. In this study, participants were randomly assigned to engage in two weeks of compassion meditation training or reappraisal training (Weng et al., 2013). During the compassion meditation training, participants vividly imagined situations in which a specific individual was suffering and extended compassion to relieve that individual's suffering. A variety of situations were imagined during training, which ranged in terms of how emotionally close the participant was to the person suffering. In contrast, the reappraisal training involved vividly imagining a stressful experience that remained upsetting to the participant, and then labeling and using reappraisal strategies to make it less upsetting. Following training, participants made a decision in a redistribution economic game. After witnessing a "dictator" unfairly distribute money between themself and another person (the "victim"), the participant could give up actual money that they were separately allocated to compel the dictator to given more to the victim. Participants who engaged in compassion training spent more money to redistribute funds to the victim, as compared to participants who engaged in the reappraisal training.

Positive Intergroup Relations

The degree to which a person feels empathy and compassion for another individual, and decides to help them, tends to diminish when that individual is perceived to be a member of a

dissimilar "outgroup" (Cikara et al., 2011). Research is beginning to examine whether episodic simulation, specifically, may be a strategy to increase prosocial intention and behavior during interactions with perceived outgroup members (Gaesser et al., 2020).

Intergroup bias and prejudice often reduces or eliminates prosocial engagement with outgroup members (Cikara et al., 2011; Stanley et al., 2011). Meta-analytic evidence from a large literature indicates that contact between groups is effective in reducing prejudice (Pettigrew & Tropp, 2006). More recently, researchers have examined imagined intergroup contact, as a means of preparing people for future contact, and as an option when contact is prevented by physical or psychological barriers (Crisp & Turner, 2009; Miles & Crisp, 2014). A meta-analysis was recently conducted to examine whether imagined contact reduces intergroup bias, as measured via attitudes, emotions, intended behavior, and actual behaviors toward the outgroup (Miles & Crisp, 2014). Significant reduction in intergroup bias was observed on all four variables. The positive impact of imagined contact was observed across different outgroups (e.g., based on nationality, mental illness, age, religion) and across imagined contact that was positive and neutral in tone. Notably, the only design characteristic that significantly moderated the impact of social contact on intergroup bias was level of elaboration. The more participants were instructed to elaborate the context in which the imagined interaction occurred, the stronger the effect of imagined contact on intergroup bias. This finding is consistent with the proposal that vivid and detailed episodic simulation is most impactful.

A recent series of studies focused on whether episodic simulation, specifically, reduces intergroup bias in prosocial intentions and behavior (Gaesser et al., 2020). In these studies, each participant's ingroup vs. outgroup was defined by their U.S. political affiliation (democrat or republication). To create an intergroup context, participants were informed that they would be

participating in a competitive problem-solving tournament in which the winning group would receive a bonus payment. In other words, Democrats were competing against Republicans. Participants then engaged in the helping scenario task described above, during which participants read about people who need help and then either imagine helping them in vivid detail or do a control activity. In this case, a cover story indicated that the scenarios were about the other players in the problem-solving challenge. Thus, on each trial, the person in need of help in the scenario was identified as a Republican or Democrat.

The results replicated the finding that imagining a helping situation increases willingness to help (relative to no help control). Moreover, across several studies, imagining a helping situation reduced intergroup bias. Whereas willingness to help ingroup targets was greater than willingness to help outgroup targets in the no help control, this gap was significantly reduced in the episodic, imagine helping condition. Additional manipulations in the series of studies demonstrated that these effects were due to imagining a specific helping episode, by controlling for imagining only the person involved (without interacting with them) and imagining interacting with the person in a different situation.

This pattern of results was also observed in prosocial behavior (Gaesser et al., 2020). In a between-subjects design, participants were presented with a scenario in which an individual experienced a misfortune that was not their fault (garage burning down due to neighbor's fireworks). Participants learned during the scenario, as in the aforementioned studies, that the target individual was either in their ingroup or their outgroup. They then either imagined helping the individual or engaged in the no helping control task. Finally, participants were told that the target individual was still upset and distressed a few days later and were asked to write a letter of support to them. Prosocial behavior was measured as the effort put into writing this letter.

Participants who imagined helping wrote more words than those in the no help control.

Moreover, for participants who engaged in the no help control, more words were written when

the target individual in the scenario was identified as a member of their ingroup than when the

individual was identified as a member of the outgroup. This ingroup-outgroup difference was

eliminated in the imagine helping condition. This pattern of results was also observed when

prosocial behavioral was operationalized as monetary donation to the person in need. Thus, these

studies suggest that episodic simulation reduces intergroup bias in prosocial behavior as well.

Summary: Evidence of Prosocial Impact

Recent studies suggest that episodic simulation impacts prosocial intention and behavior.

Several studies have demonstrated that vivid and detailed simulation of helping a person in need

augments prosocial intent and actual helping behavior. Moreover, studies consistently show that

imagining contact with an individual in a dissimilar outgroup reduces prejudice and intergroup

bias. Initial evidence further suggests that episodic simulation of helping an outgroup member

may promote positive intergroup relations, facilitating prosocial engagement with the outgroup

and significantly reducing the gap between how those in the ingroup and outgroup are treated.

Episodic Simulation in Compassion-based Contemplative Practices

Contemplative practices for the cultivation of compassion (Sanskrit, *karuṇā*) and loving-

kindness (Sanskrit, *maitrī;* Pali, *mettā*) are found in nearly every Buddhist tradition, but practices

specifically targeting compassion are especially emphasized by Tibetan traditions, in part

because these traditions maintain that a form of universal compassion is essential for achieving

"awakening" (Sanskrit, *bodhi*) or buddhahood (Powers, 2007). Although sometimes conflated

with loving-kindness practices in contemporary contexts, Tibetan practices for compassion have

certain features that make them distinct. In Buddhist contemplative literature, loving-kindness

refers to a caring attitude that wishes for someone's happiness, while compassion refers to an attitude that wishes to relieve suffering (Makransky, 2012). This somewhat minor distinction becomes more clearly delineated by two other aspects of these practices. First, Tibetan styles of compassion meditation are focused entirely on benefitting another; there is no historical evidence that these Tibetan practices have ever involved a focus on oneself as the explicit object of self-directed compassion. It is crucial to note, however, that a typical meditation session will include some phase in which one is the recipient of compassion, usually from a spiritually realized being such as a buddha (Condon & Makransky, 2020b; Makransky, 2012). Moreover, in the specific case of the compassion practice that we examine at length below, an important step is the visualization of receiving kindness not just from a realized being, but also from a loved one. Nevertheless, in terms of one's own cultivation of compassion, the instruction sets for these practices do not include any step in which one beholds oneself as the object of compassion and then directs one's own compassion toward oneself. This is undoubtedly one reason why Anālayo and Dhammadinā maintain that "self-compassion is conspicuous by its absence in any of the constructs inherited or developed by the Mahāyāna traditions," including Tibetan Buddhism (Anālayo & Dhammadinnā, 2021, p. 1355). In contrast, the form of loving-kindness meditation that is most commonly found in contemporary contexts' (Salzberg & Kabat-Zinn, 2002) usually starts with oneself as the object of self-directed loving kindness—a style that is rooted in traditional accounts of the practice in Theravāda Buddhism, albeit in ways that may not align with contemporary motivations for self-directed loving kindness (Anālayo & Dhammadinnā, 2021; Makransky, 2012).

Another crucial distinction of Tibetan compassion practices is the emphasis on a "special intention" (Tib, *lhag bsam,* Skt., *adhyatiśaya*) that Tibetan theorists hold to be a key element in

the specific kind of compassion that is necessary for the achievement of full buddhahood (Wangchuk, 2007). This special intention, which is not found as an explicit step in typical accounts of loving kindness practice, requires the practitioner to take personal responsibility for relieving the suffering of others, such that one is thereby strongly motivated to achieve buddhahood for the sake of all sentient beings (Wangchuk, 2007). As such, the special intention is the central element of the "awakening mind" (Tibetan, *byang chub sems;* Sanskrit, *bodhicitta*), the final goal of all Tibetan compassion practices, and it consists essentially in the strong motivation to relieve the suffering of all sentient beings (Anālayo & Dhammadinnā, 2021; Makransky, 2012; Wangchuk, 2007). Traditional Tibetan sources maintain that the special intention is what makes this form of compassion superior to a mere wish that others be free of suffering, and it is a central element in the overall rhetoric about the alleged superiority of Mahāyāna Buddhist practices (Mi-pham-rgya-mtsho, 2002; Tsoṅ kha pa Blo bzaṅ grags pa, 2004; Williams, 2009). It is important to note that this motivational aspect of Tibetan compassion practices may be relevant to their psychological and behavioral effects.

While based on precedents in Indian Buddhism, Tibetan compassion meditations, all of which are attested in Tibetan literature by the 13th century, have developed distinctive features, and the practices themselves fall into four overall types: 1) the Sevenfold Cause-Effect Practice (Tibetan, *rgyu 'bras man ngag bdun*) (e.g., Tsoṅ kha pa Blo bzaṅ grags pa, 2004); 2) Giving-and-Taking (Tibetan, *gtong len*) (e.g., Gźon nu rgyal mchog & Dkon mchog rgyal mtshan, 2006); 3) Equalizing and Exchanging Self and Other *(*Tibetan, *bdag bzhan mnyam brje)* (e.g., Tsoṅ kha pa Blo bzaṅ grags pa, 2004); and 4) Immeasurable Compassion (Tibetan, *tshad med rnying rje*), as part of the contemplation of the Four Immeasurables (Tibetan, *tshad med bzhi*) (e.g., Patrul Rinpoche, 2011). The references provided for these practices point to typical

presentations in traditional Tibetan literature of these practices' instruction sets, which remain

quite stable even into more recent publications by Tibetans considered to be accomplished

practitioners and teachers of meditation (e.g., Dalai Lama XIV, 2003). While each of these

practices has a distinct instruction set, they overlap considerably, often using the same imagery

and techniques for visualization. The importance of eliminating biases is present in all these

practices, and the use of imagery about family members—especially one's mother—is also

typical across all practices. Nevertheless, we choose to focus on the Sevenfold Cause-Effect

Practice (7CEP) as especially relevant, along with closely related material from the Giving-and-

Taking practice. One reason for doing so is simply practical, in that an account of all these

practices would be overly long for the present context. But additionally, the 7CEP is notable for

its emphasis on the aforementioned "special intention" and also for the central role played by the

visualization of receiving kindness and compassion from others, as well as directing kindness

and compassion to others.

Episodic Simulation in 7CEP

As its name suggests, the 7CEP style of meditation involves 6 phases that culminate in

the "effect" that is the aforementioned "awakening mind." Since this effect requires as its cause a

type of compassion that is universal and unbiased, the first phase of 7CEP is the cultivation of a

form of equanimity in which attachment to those "close" (Tibetan, *nye*) or intimately and

positively connected to one, and aversion to those "far" (Tibetan, *ring*) or opposed to one are

reduced or eliminated. In short, to use the language of social psychology, this initial phase of

practice seeks to reduce the impact of ingroup/outgroup distinctions, even though, as a skill in

means, one will use precisely one's attachment to the ingroup (paradigmatically illustrated by

one's mother) as a springboard to universal compassion. Here, the current Dalai Lama's account

of this practice, which closely follows the textual tradition from the 14th century (e.g., Tsoṅ kha

pa Blo bzaṅ grags pa, 2004, pp. 28–49), offers a readily accessible instruction set. As the Dalai

Lama notes (Dalai Lama XIV, 2003, p. 150):

> The foundation for practicing the seven-point cause and effect method is
>
> cultivating a mind of equanimity. Without this foundation you will not be able to
>
> have an impartial altruistic view, because without equanimity you will always have
>
> partiality towards your relatives and friends. Realize that you should not have
>
> prejudice, hatred, or desire towards enemies, friends, or neutral persons, and thus
>
> lay a very firm foundation of equanimity.

To eliminate the bias noted here, a meditation session will begin with a visualization of

three persons: someone with a strongly positive social connection to the meditator, someone

considered an "enemy" (Tibetan, *dgra*) of the meditator, and someone who is neutral and barely

known by the meditator. Focusing on each of these visualized individuals in turn, one observes

one's reactions to positive and negative events that are imagined to be occurring (through

episodic simulation) to the three visualized individuals. For example, one imagines that praise is

being heaped on each individual in turn, and one observes the biased reaction of feeling joy for

the "close" one, aversion for the "far" one, and indifference for the neutral one (Gźon nu rgyal

mchog & Dkon mchog rgyal mtshan, 2006). Using a variety of cognitive strategies, the meditator

then seeks to break down the differences among the categories of "near," "far," and "neutral."

For example, one strategy encourages one to contemplate the contingent nature of these

relationships, such that under other circumstances, individuals in one category might easily have

been in another. Here, the Dalai Lama refers poignantly to the trauma that Tibetans have faced in

their conflict with the Chinese government and its "totalitarian methods," and he notes, "Because

of being under the influence of ignorance, hatred, and so forth, they have these faults; it is not their essential nature" (Dalai Lama XIV, 2003, p. 151). A parallel strategy is to contemplate how, regardless of whether they are "near" or "far," all individuals share a type of common humanity, in that they all seek happiness and avoid suffering (Dalai Lama XIV, 2003, pp. 157–158). Using these and other strategies, the practitioner again visualizes various scenarios (such as witnessing the "far" enemy receiving praise) to assess whether the cognitive strategies are reducing the bias. In principle, one continues until the bias is eliminated, although in practice one may do so only until the bias is at least somewhat reduced (Dalai Lama XIV, 2003; Tsoṅ kha pa Blo bzaṅ grags pa, 2004).

The cultivation of equanimity targets intergroup bias, but the goal is not to reduce all affective response. Instead, this phase of the session culminates in visualizing all three individuals in a way that provides the basis for an unbiased sense of deep fondness or affection (Tibetan, *yid 'ong gi byams pa*) toward them. As part of the method for doing so, when one selects someone with a strong positive social connection as one of the three persons to visualize in the first phase, one is instructed to choose someone who evokes a high degree of positive affect, even when one simply thinks of that person. Tibetans paradigmatically choose one's mother as this individual, and the initial phase of cultivating equanimity thus ends with visualizing all three persons as being "my mother." This is usually preceded by a cognitive strategy that, drawing on Buddhist notions of reincarnation, presents the notion that all sentient beings have actually been one's mother over the course of the beginningless multiverse, but this cognitive strategy is secondary to the active re-imagining of the neutral person and the (now former) enemy as also "my mothers" (Dalai Lama XIV, 2003; Gźon nu rgyal mchog & Dkon mchog rgyal mtshan, 2006; Tsoṅ kha pa Blo bzaṅ grags pa, 2004).

After the first phase of "recognizing my mothers," the second phase of 7CEP, which is identical to a similar phase in Giving-and-Taking meditation, focuses now just on one's mother. One proceeds to vividly visualize various scenarios that depict the great kindness one has received from one's mother, but that also are typical of mothers in general, including even non-human animals. A main goal of this phase is to enhance the deep fondness mentioned above, although it also serves to rehearse a form of human relationship in which reciprocal care and concern are the norm. Here, the main technique is to visualize one's present mother sitting in front of one. The instructions, which are quite similar in their various versions, offer the meditator a variety of motifs to visualize. For example:

First, visualize your real-life mother in front of you and reflect, "Her kindness toward me has been extremely great. [For instance] by offering her own body to conceive me she has placed me among the ranks of the humans. While I was in her womb for nine months, approaching ten, she nurtured me with loving and kind thoughts. With the wish "May my child be unexcelled by anyone," she had all kinds of activities undertaken for my sake…. Even when I was a newborn, merely the size of a hand, a bundle of hair and wrinkles, so fragile that if left unattended for a single moment—the duration of a fingersnap—it could have proved fatal, she protected [me,] her child, from death. She drew me close to her warm flesh, cleaned my waste with her hands, broke my food by chewing it, and wiped my runny nose with her tongue…." (Gźon nu rgyal mchog & Dkon mchog rgyal mtshan, 2006, p. 248).

This list of motifs enables the meditator to choose a particularly evocative one for the simulation. For example, if the imagery about one's infancy is especially salient, one would intently

visualize a scene in front of one where oneself as an infant is on one's mothers lap as she lovingly cleans away waste or feeds her dear infant. Using this type of imagery, and settling on motifs that are particularly evocative, the meditator should visualize this type of scene in a "one-pointed" fashion (Gźon nu rgyal mchog & Dkon mchog rgyal mtshan, 2006; Tsoṅ kha pa Blo bzaṅ grags pa, 2004) and continue "until tears flow from your eyes and the hair stands up from the pores of your body" (Gźon nu rgyal mchog & Dkon mchog rgyal mtshan, 2006, p. 249).

This visualization of one's "kind mother" is a key feature of Tibetan compassion practices, especially 7CEP and the Giving-and-Taking practice. At points the meditator also extends the visualization to include all sentient beings as "my mothers," sometimes by engaging in similar visualizations of non-human animals engaged in great acts of kindness toward their offspring. The 7CEP style continue with two phases, both implicit in the other practices, in which the meditator continues to hold the visualization of the mother while contemplating cognitive scripts that are intended, for the third phase, to elicit a strong sense of reciprocity toward the mother's kindness, and for the fourth phase, a desire to make "my mothers" happy.

Episodic simulation again plays a central role in the fifth phase of the 7CEP—usually with instructions that are often identical to the Giving-and-Taking practice—as a technique for producing intense compassion in the face of suffering. Here again, the visualization focuses on one's own mother as representing all sentient beings, and one imagines various scenes in which one's mother suffers. The sense of reciprocity and personal responsibility cultivated in the previous phases is a key component of this phase, but its effectiveness also depends on the affective intensity of the visualizations, such that one feels strongly compelled to act in order to eliminate the suffering one witnesses in the visualization. To this end, the imagery often involves seeing one' s mother in an elderly, decrepit state. One text says, "In brief, your mother is crazed,

unable to remain composed. She is blind, has no guide, and stumbles with every step as she approaches a frightful precipice. If she cannot place hope in her child, in whom can she place hope?" (Tsoṅ kha pa Blo bzaṅ grags pa, 2004, p. 41). Drawing on traditional Buddhist cosmology, another text instructs the meditator to clearly visualize the rather gruesome tortures that beings are said to undergo when they are reborn in hell, and seeing one's mother in such agony, the meditator is then told to bring body and speech into the simulation: "Place your two palms to your cheeks and your elbows on your thighs. Then, in a squatting position, hold your head down and contort your face into a somber expression. Then shout, 'My mother, my mother!'" (Gźon nu rgyal mchog & Dkon mchog rgyal mtshan, 2006, p. 250).

Building on the strong sense of fondness and reciprocity developed in earlier phases, the intense visualization of motherly suffering in this fifth phase of the 7CEP is said to engender an unbearable sense of compassion, which is again universalized by extending the visualization to all beings as "my mothers." The meditation than moves into the more cognitive sixth phase, in which various strategies are used to compel the meditator to embrace the responsibility to eliminate the suffering of "my mothers," and with a "special intention" (Tibetan, *lhag bsam*) to do so in place, a 7CEP session concludes with its "effect," namely, the aforementioned "awakening mind": the intention to achieve awakening or buddhahood as the most effective way to eliminate the suffering of all sentient beings.

Summary: Key Features of Compassion-based Contemplative Practices

Several key features characterize the use of episodic simulation in Tibetan compassion practices such as 7CEP. First, by focusing on one's mother, the visualizations are deliberately centered on an individual that is extremely familiar and that is presumed to have strongly positive affective salience. Indeed, if these features are lacking in regard to one's mother, one is

encouraged to choose a different person for the focus of the simulation (Dalai Lama XIV, 2003; Gźon nu rgyal mchog & Dkon mchog rgyal mtshan, 2006; Tsoṅ kha pa Blo bzaṅ grags pa, 2004). Second, the meditator is encouraged to monitor the affective intensity of the simulation by looking for various physical indications, such as tears and horripilation. Third, while providing an overall structure and goal, the instructions generally offer a range of possible motifs or situations for the simulation, such that individual meditators can construct simulations that will be especially effective for themselves. And fourth, a meditation session often includes some simulations from a third-person perspective—where the meditator may see themselves in the scene as, for example, an infant in the mother's lap—or from a first-person perspective, where the meditator is watching and even physically reacting as they see the mother about to fall off a cliff. While Tibetan visualization practices have many other aspects, including the use of lights and colors, these four features are especially central to the episodic simulations used in Tibetan compassion practices.

Future Directions and Open Questions

Scientific evidence and Tibetan texts point to the importance of vivid and detailed simulations during compassion practices. Neural evidence suggests that immersing in imagined details of the situation – perceiving one's body and the surrounding world as an episode unfolds – is necessary for a pattern of neural activity to extend into primary sensory cortices (Kosslyn & Thompson, 2003; Wilson-Mendenhall, Henriques, et al., 2019), and that multimodal immersion can evoke vivid emotional experiences (Lench et al., 2011; Wilson-Mendenhall et al., 2013). In studies that examine imagined helping situations, the vivid sensory quality of the episodic simulation is associated with higher levels of prosocial intention and behavior (Gaesser et al., 2018, 2020; Gaesser & Schacter, 2014). In Tibetan Buddhist traditions, texts describe

constructing detailed and vivid episodic simulations involving one's mother in order to strongly

(and intentionally) evoke compassionate motivation to act that can then be applied in situations

with more distant others (Dalai Lama XIV, 2003; Gźon nu rgyal mchog & Dkon mchog rgyal

mtshan, 2006; Tsoṅ kha pa Blo bzaṅ grags pa, 2004).

We propose that skillful simulation during compassion practice is a means of establishing

neural patterns that facilitate compassionate intention and action in everyday life. In this final

section, we present future directions and highlight open questions for research on the role of

episodic simulation in compassion-based interventions (CBIs). This discussion emerges from

interdisciplinary examination of the neuroscience, psychology, and contemplative approaches to

imagined experiences of compassion and prosociality presented earlier.

Functions of Episodic Simulation

We hypothesize that episodic simulation during imagery-based contemplative practices

can construct patterns in the brain that implicitly prime prosocial perception and action in the

world. To stimulate future research, we consider how these neural patterns may function to

cultivate compassion that translates into action in the real world. Table 1 provides a concise

overview of these proposed functions.

Motivational feeling

Compassion is often characterized as involving warmth, care, and concern for someone

who is suffering that is coupled with the motivation to alleviate their suffering and promote their

well-being (Mascaro et al., 2020; Singer & Klimecki, 2014). Consistent with this

characterization, neural systems involved in affiliation, positive affect, and reward are implicated

during experiences of compassion (Ashar et al., 2017; Kim et al., 2020; Singer & Klimecki,

2014) and this pattern of activity has been shown to predict prosocial behavior (Ashar et al.,

2017). Episodic simulation may be a means of cultivating such motivational feelings that urge an individual to act (see Table 1). Meta-analytic evidence indicates that immersing in imagined scenarios is a highly effective technique for inducing emotions (Lench et al., 2011). The Tibetan meditation practices described above emphasize using this technique to cultivate the compassionate motivation to alleviate others' suffering.

Compassion involves perceiving that someone else is suffering, which can be challenging due to the tendency to simulate that person's experience of distress in oneself (i.e., experience sharing) (Ashar et al., 2017; Lamm et al., 2019; Singer & Klimecki, 2014). Such "empathic distress" can easily initiate self-focused coping to reduce the discomfort one is experiencing, during which affiliative feelings of compassion dissipate (Batson et al., 1987; Gilbert, 2014; Klimecki & Singer, 2012). Episodic simulation may provide experiential practice intentionally cultivating other-focused compassion when faced with another's distress, instead of becoming consumed by that distress in a self-absorbed manner. Because this experiential practice occurs in specific situations, it establishes multimodal patterns in the brain that facilitate experiencing compassion in similar situations out in the world.

Calibrated Mentalizing

The capacity to engage with another person's distress opens the door to considering more deeply what another person believes, feels, wants, and needs (Gilbert, 2014). Mentalizing refers to the ability to understand and think about the mental states of other people (i.e., to infer hidden mental states such as beliefs, desires, feelings) (Kliemann & Adolphs, 2018). In many situations, acting compassionately requires overcoming reductive assumptions about others, especially others perceived to be in a dissimilar outgroup (Condon & Makransky, 2020b). Engaging in mentalizing during imagined episodes may provide the opportunity to experientially practice the

process of deeply considering what another person may be experiencing (see Table 1). Moreover, through episodic simulation, an individual can practice seeking out the perspective of another, interacting with the other person (in the imagined situation) to better understand what they may believe, feel, want, and need. Calibrating one's inferences about another's experience helps to prevent misperception and thus facilitates action that is more likely to be effective in alleviating their suffering.

In several of the studies reviewed above in which participants vividly imagined helping another, heightened mentalizing for the person in need was observed during episodic simulation (relative to control conditions); that is, participants were more likely to consider the thoughts and feelings of the person in need (Gaesser & Fowler, 2020). This effect was also observed when the person in need was a member of a perceived outgroup (Gaesser et al., 2020). Path modeling in these studies suggests that heightened mentalizing during episodic simulation contributes to bolstering prosocial motivation (i.e., willingness to help the person in need) and behavior (Gaesser et al., 2018, 2020; Gaesser & Fowler, 2020). Furthermore, imagined episodes of helping that involved positive feelings facilitated mentalizing (Gaesser et al., 2017), consistent with the idea that mentalizing is more likely to occur when an individual can experience affiliative compassion in response to others' suffering.

Precise action

Motivational feelings and mentalizing are ultimately in the service of acting compassionately to improve another's well-being. Research on implementation intentions highlights the importance of connecting intentions to situational action plans (Gollwitzer, 1999; Schacter, 2012). Similarly, situated approaches to the mind suggest that behaving compassionately in everyday life involves tailoring action to the specific situation, instead of

reacting in simple and stereotyped ways across many different situations (Barrett, 2013; Wilson-Mendenhall et al., 2013; Wilson-Mendenhall & Dunne, 2021). Giving money to charity, listening attentively to a distressed friend, shoveling snow for an elderly neighbor—different, situated actions underlie successfully enacting compassion in these situations.

We propose that episodic simulation during which one imagines navigating a specific situation establishes sensorimotor patterns involved in mobilizing one's body to act (see Table 1). This experiential practice grounds compassion in the sensorimotor details that are needed for episodic simulation to be useful during daily life. The vivid sensory quality of the imagined episode is instrumental to precisely imagining actions– tailoring them to the situation at hand. Sensorimotor precision during episodic simulation establishes the functional equivalence needed to prime perception and action out in the world. To the extent that episodic simulation during CBIs reflect situations that an individual encounters during daily life, it prepares the individual to engage compassionately out in the world. Moreover, taking action that successfully alleviates another's suffering during the simulation may elicit reinforcing affective states (e.g., the "warm glow of giving"; (Harbaugh et al., 2007; Moll et al., 2006)).

Characterizing episodic simulation in CBIs

Taken together, this discussion points to studying specific qualities of episodic simulation during CBIs, including the affective feelings, perceptions of others and mentalizing, and specific actions experienced during the imagined situation. For immersion to occur that simulates experience as it would occur in the out in the world, the imagined episode must also be rich in sensory details that construct a scene and cohere as an episode. We propose quantifying these dimensions of imagined experience using subjective, behavioral, and neural methods in future

research to investigate the degree to which individuals differ along these dimensions and if they mediate prosocial outcomes of CBIs.

Practice of Episodic Simulation

Building on proposed functions of episodic simulation, we consider episodic simulation as a guided practice in CBIs, discussing implications for designing and implementing CBIs. As part of this discussion, we address guided practice of episodic simulation for those who may be experiencing particular barriers to cultivating compassion.

Setting

CBIs are implemented in a variety of settings, including in psychotherapy, small group classes, and via mobile phone apps. Vivid episodic simulation requires shifting one's attention internally and minimizing external input (e.g., closing one's eyes). To fully immerse in an imagined episode, an individual must feel that they are in a safe space that does not require vigilant monitoring of the external environment. Because episodic simulation in CBIs is intended to induce emotion, the space must also be emotionally safe in terms of expressing and exploring feelings that arise. These aspects of an individual's experience in a given setting may moderate engagement in compassion practices involving episodic simulation.

Personalization

A key feature of Tibetan compassion practices is that the practitioner "fills in" personal details, such that individual meditators construct imagined simulations that will be especially effective for themselves. Thus, these practices involve a delicate balance between guided instruction and the individual practitioner generating personally relevant details.

Recent research suggests that language is a tool for constructing episodic simulations during imagined experiences (Wilson-Mendenhall, 2017; Wilson-Mendenhall, Henriques, et al.,

2019). Verbal instruction during compassion practice would ideally offer precise and easily comprehended guidance about generating episodic details, while still allowing the practitioner to tailor the imagined situation in ways that make it personally relevant. Future research is needed to understand how guided instruction shapes the construction of personally relevant episodes in ways that enhance or hinder the qualities of episodic simulation described above.

For many individuals, focusing on a loved one (such as one's mother or whomever that person might be for the practitioner) is a natural starting point for guided immersion in an imagined experience. Due to familiarity and affiliation with the close other, it is likely that detailed episodes are relatively easy for the practitioner to imagine, and instruction can point to common experiences of close relationships in the culture. Moreover, the affect associated with these episodic details is typically readily accessible and easy to hold in mind (i.e., constituting a form of affective working memory) (Mikels & Reuter-Lorenz, 2019). We note that an assumption here is that the practitioner is able to draw on experiences of a mutually caring relationship. As we discuss further in the next section, feeling cared for and supported is thought to be an important foundation for compassion practice (Condon & Makransky, 2020a, 2020b; Gilbert, 2014).

It is likely more difficult, without specific guidance, for most individuals to imagine personally relevant and detailed episodes that involve extending care and compassion to more distant others. Thus, one implication for secular CBIs is tailoring compassion practices for groups of practitioners who engage in similar situations out in the world, such as CBIs for healthcare professionals or for educators. It may be of benefit, at least initially, for instruction to guide practitioners through real-world situations known to be relevant for them (e.g., at the bedside of a scared patient, in the classroom with a disruptive student). A further consideration

for such an approach is the background and experiences of the instructor(s), in terms of having relevant situational expertise, as well as being able to guide a practitioner through imagined interactions with diverse others. In theory, tailored instruction would facilitate practitioners constructing detailed multimodal simulations that are then impactful out in the world. It is an open question whether more tailored approaches would improve CBI outcomes.

Barriers

Individuals enter into CBIs with widely varying prior experiences and skillsets. For some individuals, certain barriers may make it more difficult to cultivate compassion. It is important to consider and investigate how episodic simulation may address such barriers to compassion.

Mental Imagery. A barrier specific to the practice of episodic simulation is that some individuals may find it more difficult to construct and immerse in imagined situations. Evidence suggest that the vividness of imagined experiences varies across individuals (Borst & Kosslyn, 2010; D. G. Pearson et al., 2013; J. Pearson, 2019), including imagined experiences of helping a person in need (Gaesser & Schacter, 2014). Unlike many of the scientific paradigms used to study mental imagery, however, Tibetan compassion practices intentionally anchor on simulation involving a familiar, trusted other with which one has a close relationship. This practice is thus designed to be easier to immerse in. Nevertheless, imagining an episode as it unfolds over time may be more challenging for some individuals than for others. To address this potential barrier, guided practices might be adapted such that they slowly build up to more complex imagery, with particular attention to finding language that is intuitive and resonates with the practitioner. Another intriguing possibility is whether virtual reality could be leveraged as a support for engaging in episodic simulation during CBIs.

Other Barriers. Episodic simulation might be a means of addressing several barriers to cultivating compassion that have been discussed in the literature on CBIs. A general advantage of episodic simulation is that it removes the time pressure to act that may be anxiety-inducing in the real world. Thus, episodic simulation facilitates exploring how to navigate a situation to cultivate compassion, providing time and space to develop "habits of mind" that prepare one to engage out in the world.

One proposed barrier is avoidance due to perceived ability and effort. Evidence suggests that people may avoid compassion because they lack confidence in their abilities to mitigate another's distress and/or perceive it as requiring too much effort (Cameron et al., 2019; Scheffer et al., 2021). Episodic simulation in which taking action successfully alleviates another's suffering may build confidence while simultaneously instantiating action repertoires that can be implemented in the world. Moreover, episodic simulation is also a technique for cultivating the motivation to act compassionately – to make the effort. In Tibetan compassion practices, imagining that a close other is suffering is thought to initiate a spontaneous experience of this willingness to help. Recent scientific evidence is consistent with this account, indicating that people are less likely to avoid compassion when a close other is involved (Scheffer et al., 2021). Because episodic simulation involving a close other evokes compassionate motivation, it can serve as an experiential foundation that can then be drawn upon to cultivate compassion for diverse others. As one practices engaging compassionately with those who are not close others, through episodic simulation, it may instantiate a familiarity that increases confidence and decreases perceived effort.

Episodic simulation may also be a useful practice for those experiencing fatigue and hopelessness upon repeatedly being exposed to others' distress and trauma (e.g., in service

professions such as nursing; (Cavanagh et al., 2020; Cocker & Joss, 2016)). It is exhausting to

continually experience empathic distress without recourse (Klimecki & Singer, 2012) and use of

maladaptive strategies to cope increases risk of psychopathology (Aldao et al., 2010). Episodic

simulation is a means of approaching a familiar situation differently, during which a practitioner

is empowered to navigate the situation such that a more positive outcome is experienced. This

approach is similar in some respects to the imagery-based "rescripting" that has been developed

as a clinical therapy for intrusive memories (Holmes & Mathews, 2010; Ji et al., 2016; J. Pearson

et al., 2015)). More specifically, episodic simulation of the situations contributing to fatigue may

provide experiential practice cultivating other-oriented compassion that prevents one from

becoming absorbed in self-focused distress. Even when tangible actions that can be taken to

reduce another's distress are limited, one can cultivate a compassionate stance that does not

avoid the other person's suffering nor inhabit it to one's own detriment.

Finally, an individual's ability to extend compassion and care to others may be

diminished when they do not feel cared for and supported themselves (Condon & Makransky,

2020b; Gilbert et al., 2011). Tibetan practices such as the 7CEP assume that one has the capacity

to simulate compassion for a close other, and insecure attachment or other obstacles may prevent

an individual from doing that simulation effectively (Condon & Makransky, 2020b). Thus, in

what has been referred to as a "receptive mode" of compassion practice, a practitioner immerses

in a simple moment of caring connection from any time in their life with the intention to re-

experience feeling seen and loved, in ways that build on traditional features of Tibetan practices

(Condon & Makransky, 2020a). Episodic simulation likely supports cultivating these feelings by

elaborating a remembered episode such that it is vividly experienced in that moment. Here, an

emphasis on the relational aspects of care and compassion also generates productive questions

regarding how episodic simulation is practiced in secular contexts. For example, episodic simulation may also be a useful tool for nurturing relationships by embodying how to solicit, receive, and extend care.

As others have noted, it may be the case that those who stand to benefit the most from compassion training may be the least likely to resonate with it (Mascaro et al., 2015; Rockliff et al., 2008). Moving forward, it will be important to consider how guided practice of episodic simulation is delivered in CBIs for different populations, and to examine whether contextual and/or individual difference variables predict engagement. It is an open question whether more tailored approaches to CBIs can overcome specific barriers to cultivating compassion.

Impact of Episodic Simulation

In this final subsection, we consider the impact of engaging in episodic simulation during CBIs. In addition to discussing the hypothesized impacts of training to skillfully cultivate compassion through episodic simulation, we also consider how integration of episodic simulation with other types of contemplative practices may enhance prosocial impact.

Relevant Situations

In CBIs, episodic simulation is used to imagine vivid and detailed experiences of being motivated to reduce another's suffering and successfully taking action to do so. We hypothesize that such experiences of compassion during episodic simulation resemble experiencing compassion in the real world. Thus, we suggest that neural patterns instantiated during this contemplative practice can implicitly prime an individual to act compassionately in the real world. This hypothesized mechanism suggests that the greatest prosocial impact in the real world may be observed in situations that are most similar to those imagined during CBI practices. There may also be aspects of episodic simulation practices that generalize across situations.

Some action repertoires may be useful across a number of situations, such as asking questions to understand how to best support another person (instead of relying solely on one's inferences). Moreover, practicing episodic simulation repeatedly to cultivate compassion across different situations may instantiate a "mental habit" of orienting towards others with affiliative intent – in terms of noticing others' suffering and engaging with it, mentalizing to avoid reductive assumptions of others, and cultivating compassionate feelings that motivate figuring out actions to take in the situation instead of succumbing to the uncertainty of what to do.

Measurement Approaches

The simulation hypothesis described above suggests that the impact of episodic simulations should be assessed in the context of situations experienced in the world. To date, CBI research has primarily focused on self-reports from the practitioner on how they generally feel or behave (Kirby et al., 2017), but such self-reports can deviate from how an individual feels and behaves in everyday life (Conner & Barrett, 2012).

To examine the impact of episodic simulation, we propose investigating how a person behaves out in the world, either through staging situations as part of the study or observing their behavior during relevant situations in daily life. For example, Condon et al. measured whether participants were willing to give up their seat to an injured individual, even when the individual sitting next to them did not offer their seat (i.e., an unresponsive bystander) (Condon et al., 2013). Participants were not aware that this situation was staged and part of the study until afterwards. Staging a situation offers a high degree of experimental control because all participants experience the same situation, but this specificity can also be limiting. A consideration is the similarity of the situations being assessed to those that were imagined during episodic simulation. An advantage of tailoring CBIs to particular groups of individuals (e.g.,

healthcare professionals, educators) is that assessment can also be tailored to the particular

situations that these individuals encounter and may find challenging (e.g., bedside care,

classroom management). Naturalistic observation of situations that a participant engages in as

part of daily life is another valuable measurement technique, using tools like the Electronically

Activated Recorder (EAR) (Mehl, 2017) or, for example, coding interactions captured on video

(Mascaro et al., 2020). Measurement via mobile technology (e.g., phones, wearables) is also an

exciting frontier in this regard. Recent research indicates that it is possible to measure features of

face-to-face encounters in the world via smartphone sensing methods, including content of

conversations, turn-taking in conversations, and speaker's voice pitch (Harari et al., 2017).

Second, we suggest it is important to understand the experiences of the practitioner, the

individual(s) presumed to be impacted by the practitioner's actions in a situation, and the

concordance between the two. Decades of research show that social connectedness is critical for

mental and physical health, a key ingredient of flourishing (S. Cacioppo et al., 2015; Dahl et al.,

2020; Holt-Lunstad, 2018). This research emphasizes an individual's subjective experience of

feeling connected with others (J. T. Cacioppo & Hawkley, 2009). Ecological momentary

assessment (or experience sampling) is a method for assessing such feelings in the context of

social interaction in everyday life (e.g., Li & Hui, 2019; Ringwald & Wright, 2021; Shackman et

al., 2018). Although CBI research to date has tended to focus on the experiences and feelings of

the practitioner (Quaglia et al., 2020), more complex, dyadic approaches are beginning to take

shape (Mascaro et al., 2020). For CBIs to have maximal impact in the way intended, a sense of

connection would be experienced both by the practitioner and the individual(s) presumed to

benefit from the practitioner's prosocial actions. In a healthcare context, for example, measures

have been developed to assessed the experiences of patients (Mascaro et al., 2020).

Integration with other types of meditation practice

Because the compassion practices that we focus on here are one variety of meditation practice (Dahl et al., 2015; Singer & Engert, 2019), we consider how the impact of episodic simulation may be bolstered by other meditation techniques. First, integration with foundational mindfulness-based practices may bolster individuals' ability to simply engage and sustain episodic simulation by stabilizing attention, especially attention to internal states. Mindfulness-based practices may also serve as a foundation for compassion practices by improving individuals' ability to engage with distress through nonjudgmental awareness.

A recent proposal is that integration of compassion and a particular element of mindfulness may be particularly important to flourish in everyday life (Condon et al., 2019). More specifically, this framework focuses on the "dereification" dimension of mindfulness, which amounts to experiencing one's thoughts just as thoughts, and not as real representations of the world (Lutz et al., 2015). In contrast to *de*reification, the compassion practices discussed here are an intentional act of reifying one's mental states. One immerses in an imagined experience to simulate the experience, as if it were real. As described earlier, episodic simulation is thought to be beneficial because it prepares an individual to engage in prosocial perception and action out in the world. In other words, intentional reification could be considered a skillful means of cultivating compassion for diverse others. However, as we describe next, we assume that such compassion practices need to be balanced with mindfulness, especially dereification skills.

Mindfulness and meditation practices that deconstruct the notion of self build awareness and skill in *de*reification; that is, the insight that one's mind is constructing experience and that such constructions are an interpretation or "story" about the world (Lutz et al., 2015). Because this skillset is thought to cultivate psychological flexibility and willingness to consider other

views, it may be important for learning and adjusting in the social world (Condon et al., 2019).

Dereification may enhance episodic simulation through increased flexibility to imagine a

familiar situation such it is experienced differently (e.g., as compassion versus empathic

distress). Furthermore, while episodic simulation may prepare one to engage in compassion,

situations out in the world are, at times, novel or unexpected. In such situations, a compassionate

intention may not result in reducing the suffering of another. When it is recognized that an

interpretation of a situation is just that – an interpretation – it opens the door to considering how

one's understanding of a situation may be incomplete and/or incorrect from another person's

perspective. Thus, in theory, dereification skills may help individuals adjust in such situations

and be receptive to (vs. threatened by) feedback from others.

We propose that another important direction for future research is to understand the

distinct and possibly interactive contributions of different contemplative practices in fostering

compassion, prosocial behavior, and social connection. Dismantling designs that experimentally

manipulate the types of contemplative practice participants engage in would be a useful approach

for examining the relative impact of different contemplative practices (Lindsay et al., 2019).

Concluding Remarks

In conclusion, we posit that "deep integration" between psychological science and

scholarship in Buddhist traditions is fruitful for stimulating future research (Wilson-Mendenhall,

Dunne, et al., 2019). Mental imagery is receiving increasing empirical attention as a therapeutic

technique for addressing psychopathology (Ji et al., 2016; J. Pearson et al., 2015). We suggest

that mental imagery, and more specifically episodic simulation, is also a promising avenue for

cultivating psychological and social well-being. Building on basic science research, we propose

evaluating the hypothesis that episodic simulation is a pathway through which compassion-based

interventions benefit practitioners and those around them, especially during daily living.

Conflict of Interest Statement

C.W-M. has served as a consultant to Healthy Minds Innovations, Inc., a nonprofit company associated with the Center for Healthy Minds. R.J.D. is the founder, president, and serves on the board of directors for the nonprofit organization Healthy Minds Innovations, Inc.

Author Contributions

CW-M: outlined manuscript, drafted and revised specific sections of the manuscript; reviewed and commented on the section JDD wrote. JDD: drafted and revised a specific section of the manuscript; reviewed, edited, and commented on other sections of the manuscript. RJD: reviewed, edited, and commented on the entire manuscript.

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Table 1

How episodic simulation may function such that it translates into prosocial behavior.

	Function of Episodic Simulation	How Facilitates Prosocial Behavior
Motivational Feeling	Induce compassionate feelings, which are characterized by warmth, care, and concern for another that fuel the motivation to alleviate their suffering.	Supplies motivation to engage in prosocial behavior (i.e., initiate goal-oriented action). Prevents absorption in self-focused empathic distress.
Calibrated Mentalizing	Consider what another person may believe, feel, want, and need in order to act in ways that alleviate their suffering. Practice seeking out the other person's perspective to calibrate one's inferences about their experience.	Identifies actions that may benefit the other person based on understanding of what they are experiencing. Decreases likelihood of avoidance or ineffective action due to reductive assumptions and misperceptions.
Precise Action	Embody engaging with another person such that it alleviates their suffering. Ground compassion in situated actions that foster experiences of positive social connection.	Instantiates sensorimotor patterns that can prime prosocial behavior out in the world. Elicits affective outcomes that reinforce such behaviors (e.g., "warm glow of giving").