Mindfulness and the Skillful Navigation of Couple Relationships[1]

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Conscious efforts to improve relationships may fall short because the skillful navigation of relationships depends as much upon automatic internal processes that occur outside of awareness as it does upon conscious, intentional effort. A growing body of research suggests that a particular form of mental training, mindfulness meditation, may improve the way the brain automatically processes and organizes relationship-relevant cognition and behavior. Mindfulness training appears to promote structural and functional changes in neural circuits that mediate attention, regulate physiology and emotion, and enhance or inhibit the capacity for empathy. After reviewing behavioral benefits and neural changes associated with mindfulness training, a method for integrating mindfulness training into a therapy for couples is then reviewed.

Thanks to a series of longitudinal studies over the past thirty years, the interpersonal habits that characterize partners who have satisfying long-term couple relationships are well documented (Gottman, 2011). By measuring the relative presence/absence of these habits, researchers have been able to predict the fates of specific relationships -- in some studies with up to 94% accuracy. Compared to partners who were headed toward relationship dissolution, successful partners were more able to avoid criticism, defensiveness, contempt, and stonewalling during conflict; "turn toward" and tune in to their partners in response to "bids" for connection (versus ignoring or avoiding); avoid responding to their partner's negative affect with their own negative affect (negative affect reciprocity); avoid the tendency to read negativity into neutral or positive statements or actions made by their partners; engage in at least five positive interactions for every negative interaction with their partners; repair damage done during arguments; avoid distress-maintaining thoughts about their partners after arguments; recover quickly from physiological arousal during and after disagreements; help their partners recover from diffuse physiological arousal during and after disagreements; accept influence from their partners (versus being defensive and unwilling to compromise); bring up complaints without blame or criticism (soft startup); shift attention from frustrations to possibilities; and express fondness and admiration toward their partners on a regular basis (for a review, see Gottman, 2011).

Information from the studies predicting relationship success is valuable for those who are motivated to put effort into improving their relationships. However, the skillful navigation of relationships depends as much upon automatic internal processes that occur outside of awareness as it does upon conscious, intentional effort (Adolphs, 2009). For example, people vary in their ability to accurately interpret the intentions and motivations of others. Some people effortlessly and skillfully pick up on meaningful cues, while others are oblivious to the

[1] Portions of this paper are adapted from Atkinson (2013).

same sort of cues (Davidson, 2012). Automatic internal processes such as those involved in social intuition are thought to be part of what makes up a person's social aptitude or social intelligence. The brain does much of the work involved in social intelligence without conscious awareness. Each person's brain uniquely biases perception, generates emotion, releases stress-related hormones, mirrors the emotional states of others, and generates varying degrees of need to connect with others. The specific ways that automatic processes such as these operate in any individual appear to be partly genetically determined and partly shaped by experience. In either case, reflexive internal processes are central to a person's social aptitude. Intentional efforts to improve one's relationship can only take a person so far. Relationship improvement may at least partly hinge on changing the way the brain automatically selects what to pay attention to and what to ignore, regulates mood and processes relationship-relevant experience and information (Goleman, 2006).

With new technologies for studying the brain, the neural mechanisms involved in social processing (both conscious and automatic) are increasingly apparent (Adolphs, 2009). Crucial brain areas include the prefrontal cortex, anterior and posterior cingulate cortex, insula, amygdala, hippocampus, and temporo-parietal junction, among others. Many studies over the past few decades have established that the structure, health, and functionality of the brain can change in response to certain kinds of activity, a process known as *neuroplasticity*. The discovery of the brain's neuroplasticity has spurred a search for experiences and activities that can promote beneficial changes in the structure and functioning of the brain. It is believed that, just as physical exercise promotes muscular growth and strength, there may be forms of mental exercise that can promote growth and strengthening of the brain. Mental practices for strengthening brain circuits that process and regulate affect, social cognition, and social behavior could be especially significant for people who are in search of more satisfying couple relationships (Atkinson, in press, 2013, 2005).

Mindfulness

In the past decade, dozens of studies have emerged suggesting the effectiveness of a particular type of mental practice for promoting changes in the brain's social circuitry. Variations of this method share the goal of cultivating a state (and an enduring trait) of *mindfulness*. Mindfulness involves a state of mind that is purposeful, non-reactive, non-judgmental, and attuned to the present moment (Kabat-Zinn, 1990). Contemporary mindfulness practices draw inspiration to varying degrees from the historical Buddhist meditation methods, but they are practiced with a secular mindset and their effectiveness is evaluated with scientific tools (including brain imaging technologies such as functional magnetic resonance imaging [fMRI] and positron-emission tomography [PET]). The three types of meditation most often used in mindfulness training are: focused attention meditation, open monitoring meditation, and compassion or loving-kindness meditation (Vago & Silbersweig, 2012). *Focused attention* meditation involves adopting the intention to keep one's focus of attention on a particular object such as the breath, a visualized image, or sensations in the body. When the mind wanders, the practitioner avoids self-judgment and simply brings attention back to the chosen object of focus. *Open monitoring* meditation involves monitoring the content of one's experience from moment-to-moment, attending fully to whatever is

present (sensations, thoughts, feelings, etc.) in an accepting, non-judgmental way. The third type of meditation involves focusing one's attention in a way that cultivates empathy and compassion for self and others. Known as *compassion* or *loving-kindness meditation*, this practice has been brought to secular society largely through the writings of the Dalai Lama (2001). It focuses on challenging one's unexamined thoughts and emotions toward other people, and developing feelings of empathy and love for people, beginning with oneself and extending, eventually, to those with whom one has conflicts and/or dislikes.

The Neurobiology of Mindfulness

Evidence from controlled studies suggests that mindfulness training promotes growth and development in specific areas of the brain that are known to be involved in processing and organizing social/emotional experience and behavior. Across over 20 different studies, meditators have been found to have increased volume, density and/or gyrification in socially-relevant areas of the brain when compared to non-meditating controls (Atkinson, 2013). Dozens of additional studies document functional and connective changes within and between brain regions in response to mindfulness meditation (Vago & Silbergerg, 2012). The most widely cited brain areas of gross morphological change during and in response to both focused awareness and open monitoring meditation training are the dorsolateral prefrontal cortex, the anterior cingulate cortex and the insula (Vago & Silbersweig, 2012). As data accumulates, researchers are finding that they can easily recognize the characteristic changes often found in meditators' brains. In one study using multivariate pattern recognition (a prominent tool for analyzing neuroimaging data) along with automated morphometric analysis to examine brain structure, researchers were able to distinguish regular meditators from non-meditators with 94.87% accuracy (Sato et al., 2012).

The structures and processes of the brain that appear to be strengthened most by mindfulness meditation are considered part of the social brain circuitry -- areas of the brain that mediate 1) open awareness and attention regulation, 2) the regulation of physiological arousal and emotion, and 3) empathy. In this section, the significance of these processes for relationships will be discussed, and studies suggesting that mindfulness strengthens each process will be reviewed.

Open Awareness and Attention Regulation

Aptitudes related to natural awareness and attention regulation are considered to be core features of both social and emotional intelligence (Goleman, 2006). People vary considerably in the degree to which they naturally pay attention to the details of their moment-to-moment surroundings. Some people notice small changes while others are only vaguely aware of things that surround them -- often being occupied instead with the execution of specific tasks, or with thoughts about the past or future. The degree of attentiveness that partners give to the details of their lives together has been found to predict relationship satisfaction and stability (Gottman, 2011). Researchers have found that people who are satisfied with their relationships notice and acknowledge each other's positive actions and qualities at higher rates than those who are dissatisfied with their relationships. In contrast,

people who are in relationships headed for failure overlook positive actions and qualities in their mates. In one study, researchers found that distressed partners underestimate the frequency of positive comments or gestures made by their partners by 50% compared to objective raters (Gottman, 1999). Satisfied partners are considerably more attentive to the details of each other's internal psychological worlds. Their responses are more accurate when asked for details regarding their partners' preferences, they know more about their partners' worries and stresses on a daily basis, they are better at noticing things that make their partners feel good, and they are more aware of moments when their partners are making bids for attention (Gottman, 2011).

While the advantages of natural attentiveness in relationships seem clear, the ability to consciously regulate and focus attention may be just as important. During disagreements, most partners have a natural tendency to focus on the flaws in their mates' logic. Studies suggest that successful partners are more able to overcome this attentional bias, noticing positive behaviors of their partners during arguments and acknowledging understandable aspects of their partners' reasoning – even though they may not agree with their partners' conclusions (Gottman, 1999). Successful partners are also more able to avoid ruminating over negative events in their relationships than unsuccessful partners, who tend to get caught in distress-maintaining thoughts (Gottman, 2011).

Studies using established measures of attention suggest that mindfulness meditation may improve abilities related to both *open awareness* (the automatic inclination and ability to notice details of moment-to-moment experience) and *attention regulation* (the ability to consciously direct one's attention in specific ways) (Atkinson, 2013). One of the areas of the brain most directly involved in attention regulation, the anterior cingulate cortex (ACC), appears to be consistently strengthened through mindfulness meditation. Numerous studies have documented changes in ACC activity levels in response to mindfulness mediation. Other studies have found increased ACC volume and density. One study found greater cortical thickness in the dorsal ACC in experienced meditators when compared to control subjects (Grant et al, 2010). In two additional randomized clinical trials, an increase in white matter integrity involving the ACC was found in short-term meditators while no comparable increase was found in the control subjects (Tang et al., 2010, 2012). During meditation, the repetitive process of 1) focusing attention, 2) noticing that attention has been pulled in another direction, then 3) bringing attention back to the original focus is thought to be the central mechanism that promotes ACC growth. Neuroscientist Richard Davidson has suggested that the repetitious processes of "noticing and bringing back" may be the mental equivalent to the physical weightlifting "reps" to strengthen the body.

In addition to strengthening brain processes involved in attention regulation, mindfulness meditation may change neural processes that facilitate open awareness. Studies show that meditators are better than controls at avoiding getting so preoccupied with some tasks or details that they are inattentive to others. Open awareness meditation appears to promote phase-locking of brain waves in a way that makes the meditator more receptive to outside information. While attention abilities tend to decline with age, one study found that older subjects who were experienced meditators showed rates of attentiveness that were comparable to younger subjects who had no meditation experience (van Leeuwen, Muller, & Melloni, 2009).

It's not difficult to see how the focused attention process in mindfulness meditation could strengthen the ability to be attentive to one's partner. Partners in ailing relationships can often be heard saying things like, "You never listen to me!" Partners who have trouble being attentive when their mates are talking may be well-intended, but simply unable to prevent their minds from wandering or being sidetracked by reactions they have to what their partners are saying. Exercising the ability to notice when the mind has wandered or become sidetracked, then bringing attention back to the original focus is practiced through focused attention meditation, over and over again.

The potential benefits of open awareness meditation for relationships are also clear. The simple act of noticing that your partner is wearing new clothes, or that he changed the cat litter, can have a cumulative positive effect on a relationship.[2] People who are inattentive to their partners' moods, routines or physical appearance often are not deliberately trying to ignore their partners. Their brains may simply be unaccustomed to paying attention to the details of their surroundings. In the open monitoring process, the meditator exercises the ability to tune into the details of her surroundings, paying attention to even small changes as they happen while avoiding getting so occupied with any particular aspect of experience that other important aspects are missed.

Regulation of Physiological Arousal and Emotion

The ability to regulate negative emotion during and after conflict has been consistently associated with relationship stability and satisfaction (Gottman, 2011). Especially important is the ability to avoid "negative affect reciprocity" -- the tendency to respond to one's partners' expression of negative affect with one's own negative affect. Negative affect reciprocity is the strongest and most consistent correlate of relationship dissatisfaction that has been identified across research laboratories world-wide. Partners in ailing relationships demonstrate higher levels of "flooding" – a "state of feeling overwhelmed by one's partner's negative emotions and one's own emotions as the partner brings up issues" (Gottman, 2011, p. 131). Flooding often involves diffuse physiological arousal (DPA) – the activation of the body's alarm response, which includes an increased heart rate, an increase in how hard the heart contracts, an increase in constriction of the arteries, increased blood volume, reduced oxygen concentration in the blood, decreased blood supply to the gut and kidneys, secretion of adrenaline and cortisol, increased amygdala activation, decreased frontal lobe activation, and immunosuppression (Gottman, 2011). DPA begins when a heart rate climbs above 100 beats per minute. Researchers have found clear associations between DPA and relationship satisfaction. Gottman (2011) summarizes: "The faster partners' hearts were beating, the faster their blood was flowing, the more their hands were sweating, and the more they jiggled around in their uncomfortable chairs, the more their marital happiness declined in the next 3 years. The calmer they were, the more their marital happiness increased" (p. 127). One study found that in marriages headed for eventual divorce, husbands had heart rates that were an average of 17 beats per minute higher than those who were in stable marriages. Emotional flooding and DPA

[2] Gender pronouns are alternated throughout this manuscript in order to avoid the cumbersome alternative of repeatedly using "him/her," "hers or his," etc.

have been found to inhibit the use of humor, creativity, creative problem-solving, empathy, and non-defensive listening (Gottman, 2011).

The positive effects of mindfulness meditation on physical and emotional regulation are well-documented (Holzel et al., 2011). People trained in mindfulness meditation show less reflexive emotional interference and physiological reactivity when completing tasks, decreased negative mood states, faster decrease in skin conductance response after aversive stimuli, less startle response in reaction to aversive stimuli, and less distractive and ruminative thoughts and behaviors. Mindfulness practices have been shown to increase parasympathetic tone and decrease sympathetic activity, resulting in decreased heart rates, blood pressure, cortisol levels, breathing rates, muscle tension, and lowered oxygen and carbon dioxide consumption (Holzel et al., 2011).

During emotion regulation, prefrontal control systems modulate arousal of the amygdala, which detects emotionally arousing stimuli. During mindfulness meditation, practitioners bring attention and acceptance to physical sensations associated with emotions while deliberately suspending evaluative processes. The process of calming negative affect by turning toward and accepting the unpleasant physical sensations that accompany it appears to draw upon neural mechanisms known to be involved in *exposure* and *extinction*. Mindfulness practitioners turn toward (expose themselves to) physical sensations involved in unpleasant emotions while disengaging from the habitual interpretative and evaluative responses that often re-stimulate further negative affect. As practitioners learn to 1) uncouple negative emotions from the cognitive associations that re-stimulate them while 2) engaging in processes that promote physiological soothing, they discover that emotions are transitory and need not be feared. The neural mechanisms mediating exposure and extinction are well-known, involving the ventromedial prefrontal cortex and hippocampus. Both of these brain areas have shown structural changes (increased gray matter) following mindfulness meditation training (Hölzel et al., 2011).

Given the clear relationship between emotional regulation and relationship satisfaction, studies documenting the effectiveness of mindfulness training in increasing emotional regulation abilities should be of interest to all who are concerned about relationship health. The ability to calm oneself in spite of real or perceived provocation from one's partner could help lessen negative affect reciprocity. The emphasis in mindfulness training on uncoupling negative emotions from the cognitive associations that re-stimulate them could reduce the tendency of partners to engage in distress-maintaining thoughts in the aftermath of conflicts.

Empathy

Empathy has been found to consistently correlate with and predict the quality and stability of couple relationships (Atkinson, 2013). Empathic accuracy enables partners to provide instrumental and emotional support to one another. Empathic attunement during conflict appears to be especially important, and has been shown to moderate marital tension and conflict escalation. Partners who are more trusting of their mates' empathic motivations have been found to behave less cautiously and challenge their partners less during conflict. Gottman (2011) found that the degree of empathy evidenced by partners in their interactions predicted whether a couple would stay together or eventually break up.

Hundreds of studies have examined the neural mechanisms underlying human empathy (Zaki & Ochsner, 2012). Relying mainly on fMRI, the majority of studies suggest that empathy is dependent upon *experience sharing* – the vicarious experiencing of another person's emotion through activation of the same emotion in oneself (Bernhardt & Singer, 2012). For example, in one study Avenanti, Bueti, Galati, and Aglioti (2005) demonstrated that watching a video of a needle pricking a specific hand muscle reduces motor excitability of the equivalent muscle in the observer, similar to the freezing response that would occur if pain was directly administered. Brain structures known to mediate experience sharing include the inferior parietal lobule, insula, superior temporal sulcus, anterior cingulate cortex, and the premotor cortex (Zaki & Ochsner, 2012). In addition to experience sharing, the ability to infer the beliefs and desires of another person (*mentalizing*) is thought to contribute to empathy. Brain structures involved in mentalizing include the temporoparietal junction, temporal pole, Precuneus, posterior cingulate cortex, and medial prefrontal cortex (Zaki & Ochsner, 2012).

Numerous studies suggest that mindfulness training boosts empathy and leads to functional and structural changes in these empathy-related brain areas. Studies examining vicarious responses to emotional states such as social exclusion, disgust, and anxiety suggest that the anterior cingulate cortex and insula are central to the vicarious experiencing process (Bernhardt & Singer, 2012). More than 20 studies show changes in one or both of these areas in response to mindfulness training (Atkinson, 2013). The insula and anterior cingulate cortex are thought to be crucial parts of the brain's resonance circuit – interconnected neural regions that enable a person to tune into or align their internal states with those of another person. Both the insula and anterior cingulate cortex are prominently involved in the process of interoception – awareness of the interior of the body. Whereas empathy is often equated with the ability to tune into another person, neuroscience discoveries suggest that the ability to tune into oneself may be just as important. Awareness of the subtleties of one's own emotional fluctuations from moment-to-moment in response to the emotions of others may be necessary in order to know experientially what others are feeling (Siegel, 2012). Mindfulness training may help people become better attuned to others by helping them become better attuned to their own emotions.

Mindfulness and Couples Therapy

To the extent that mindfulness training increases natural attentiveness, boosts the ability to regulate mood and increases the capacity for empathy, one might assume that it is widely used in conjunction with therapies for improving couple relationships. Surprisingly, there is currently only one professional book on the subject of mindfulness in couples therapy (Gehart, 2012). In this book, the author extolls the value of mindfulness meditation for improving relationships, but observes that most couples therapy clients are not sufficiently motivated to meditate. She encourages therapists to refrain from attempting to routinely engage couples in mindfulness training, suggesting that a more realistic approach is to employ mindfulness-informed practices, rather than structured mindfulness training. The author provides an array of suggestions for weaving principles of mindfulness into case conceptualization, treatment planning, and designing/implementing interventions in couples therapy. Like Gehart, others have incorporated selective mindfulness concepts or processes

into their couples therapy approaches. Beckerman and Sarraccoe (2011) have integrated mindfulness into *Emotionally Focused Therapy for Couples*, while others (Harris, 2009; Peterson, Eifert, Feingold, & Davidson, 2009) have integrated select aspects of mindfulness training in applying *Action and Commitment Therapy* to couples. Currently, just one couples therapy approach formally incorporates mindfulness training as a regular part of the treatment process – *Pragmatic-Experiential Therapy for Couples* (Atkinson, 2005).

Pragmatic-Experiential Therapy for Couples

Pragmatic-Experiential Therapy for Couples (PET-C) helps relationship partners develop nervous system capacities needed to implement empirically-validated skills that have been found to be highly predictive of successful relationships success. While early formulations of PET-C included selective mindfulness-informed practices (Atkinson, 1998, 2005), as the body of evidence documenting the effectiveness of mindfulness has grown, mindfulness training has become formally integrated (Atkinson, 2014, in press).[3] PET-C assumes that the skills that predict relationship success are often difficult for distressed partners to develop because they require a high level of self-regulatory and empathic ability. Just as a person who has never engaged in weight training cannot bench press 400 pounds at will, a distressed partner who has never engaged in mental training may be unable to implement interpersonal skills that require a high level of self-regulation and empathy. Using analogies such as this, PET-C practitioners seek to motivate clients to tune up their nervous systems by engaging in mindfulness training. Cultivating motivation for mindfulness training occurs in phases:

Phase 1: The need for empirically-verified skills. The first phase involves helping partners understand that it's unlikely that they will get the kind of responsiveness from their mates that they would like to have unless they develop more skill in navigating conflicts. Through a careful assessment process, the therapist identifies specific skill deficits evidenced by each partner, and then presents the following logic:

> *"All partners in long term relationships feel upset with each other at various times. Evidence suggests that some people know how to handle such moments in ways that cultivate respectfulness and receptivity in their partners. Others react in ways that make it almost impossible for their partners to genuinely care. Studies suggest that the ability to react effectively when feeling upset is not optional -- it's a must for anyone who hopes to have a satisfying intimate relationship. If you want to be treated well by your partner, you need to learn to think and act like people who almost always get treated well, and you certainly don't want to think and act like people who almost never get treated well."*

The therapist paints a clear picture for each partner of the kind of changes needed in his or her typical habits in order to react more effectively during conflict.

[3] Information about PET-C training opportunities in Europe can be found at www.paarinstitut.ch.

Phase 2: The need for a well-tuned nervous system. As the therapist describes needed changes, clients usually recognize the difficulty of the task that lies ahead of them. The therapist clarifies that for most people, good intentions and conscious effort alone aren't enough to be able to implement the skills in emotionally-charged situations. The therapist explains: "Even with the best of intentions, you can't win a race unless you're driving a well-tuned vehicle. We need to be sure that the vehicle you're driving -- your nervous system -- is tuned up and well-functioning. Right now, you seem a little bit agitated and edgy. You've been through a lot, and you're pretty stressed. Unless we do something to lower your stress level, you may be unable to do the kind of things that are going to be needed in the weeks ahead."

Phase 3: Mindfulness training as a vehicle to improved nervous system functioning. The therapist goes on to explain that there is a scientifically-documented method for reducing stress and tuning up the nervous system – mindfulness training. The therapist details studies documenting the effectiveness of mindfulness training, and sends emails to clients containing web links to articles from the *New York Times* and other outlets attesting to the widely-recognized effectiveness of mindfulness training. The therapist explains the bottom line: Most people who are in stressed relationships cannot make significant progress without developing more flexible nervous systems. The therapist proposes a 2-pronged approach: 1) Learning the needed interpersonal skills, and 2) Developing the mental strength and agility needed to implement the skills when they are needed through mindfulness training. The therapist takes the following position: "I'll work with you whether you engage in mindfulness training or not, but I want you to understand that your odds of success will be much higher if do."

Motivation for mindfulness training is enhanced by asking each partner to complete a questionnaire which asks clients to react to a series of statements regarding abilities that mindfulness training has been shown to strengthen. Sample statements include: "I ruminate too much after disagreements with my partner," "I give in in order to keep the peace too often". "I need to be better at making sure that my preferences and opinions count as much as my partner's," "I need to find a way to react less intensely when my partner does things that I don't like or agree with." "My mind wanders too much while my partner is talking to me." Meeting with each partner separately, the therapist reviews self-identified areas of needed improvement, discussing specifically how mindfulness training will help the client improve. Once partners are motivated to undertake mindfulness training, they begin a mindfulness course by either attending in person, or engaging in a self-guided program such as the 8-week course developed by Williams and Penman (2011). With the guidance they receive in mindfulness training courses, clients practice mindfulness 10-30 minutes per day while simultaneously engaging in couples therapy sessions.

Integrating Mindfulness Training and Therapy Sessions

As clients engage in daily mindfulness exercises, they participate in a combination of conjoint and individual sessions in which they are helped to tailor their mindfulness skills to the task of improving their relationships. Special emphasis is given to helping partners relate mindfully to difficult feelings that arise in response to relationship conflicts. Partners often fuel distress by ruminating unproductively over distressing interactions, obsessing on the details of

their partners' perceived wrongdoings. Mindfulness training helps partners avoid blindly accepting the validity of gut-level interpretations that are automatically generated by their brains. In addition, PET-C combines the interruption of rumination with breathing and sensory exercises that sooth physiological arousal. The therapist helps clients learn to postpone deliberating about upsetting situations until they have calmed upset feelings through the process of mindful self-soothing. The process of approaching uncomfortable feelings in an accepting manner activates the left prefrontal cortex, an area of the brain associated with positive feelings (Davidson, 2012). Partners discover that rapid calming of difficult feelings can result when they avoid patterns of thinking that re-stimulate the feelings and instead engage in physiological soothing processes.

Some clients are unable to give mindful attention to strong negative emotions without getting lost in distress-maintaining thoughts. As a stepping stone, PET-C therapists help such clients engage in processes that stimulate milder versions of uncomfortable feelings than the ones that typically arise in the moments when upsetting things happen. Deliberate stimulation of uncomfortable feelings can happen in a variety of ways, but among the most frequently used is a method in which clients listen to audio-recorded criticisms that the therapist has asked their partners to record when feeling upset. Most clients feel provoked when listening to their partners' pre-recorded criticisms, but not as strongly as when criticisms are delivered "live" and in person. By preparing and then voluntarily listening to recorded criticisms, clients can stimulate uncomfortable feelings at will, practice mindful self-soothing, interrupt counterproductive thinking, and practice effective ways of reacting each time they listen (Atkinson, 2014).

Additional methods for stimulating and working mindfully with upset feelings involve visualization and mental rehearsal. Scientists have known for decades that when a person practices a physical skill over and over, the brain areas involved in producing the skill get stronger, literally increasing in size. But only recently discovered is the fact that *mental rehearsal* also changes the brain – and the changes achieved through mental rehearsal can be almost as sizeable as those accomplished through physical rehearsal. Like other mindfulness methods, mental rehearsal methods involve sustaining attention in particular ways for prolonged periods of time. In a well-known Harvard study (Pascual-Leone et al., 1995), subjects who had never played the piano before were given instructions and asked to practice a piece two hours per day for five days – a total of 10 hours. Before and after these practice stints, their brains were scanned. As anticipated, subjects showed brain changes in the areas of the motor cortex that corresponded to the physical movements that they had practiced. Another group of subjects, randomly assigned to a second practice condition, did the same thing as the first group with one crucial exception: they never pressed the keys of the piano. Instead, they visualized *mentally* each of the practice movements. These mental-rehearsal-only subjects evidenced almost the same changes in their brains as the subjects who'd actually practiced using their hands. Specifically, mental practice produced nearly identical changes in the motor cortex even though subjects hadn't moved their fingers---they just visualized moving their fingers. Mental rehearsal also improved performance. The first time the people in the mental-rehearsal-only group pressed the keys, they could already play the rehearsed piano piece almost as well as the physical rehearsal group. After just one day of physical practice, they could play as well as the group who had practiced physically for five days.

The Harvard piano studies aren't the only ones that show brain and performance-level changes in response to mental rehearsal. A study at the Cleveland Clinic found that subjects could increase their finger strength 53 percent through physical exercises over a 12-week period. A second group showed a 35 percent strength increase through mental visualization only (Ranganathan et. al, 2004). In a 2007 study conducted at Bishop's University in Quebec, college athletes who engaged in hip flexor exercises increased their muscle strength 28 percent, while a mental-rehearsal-only group strengthened their hip flexor muscles by 24 percent (Shackell & Standing, 2007). Numerous studies over the past decade have shown that surgeons who engage in mental and physical practice together are more skillful than those who engage in physical practice only (Arora et. al., 2011), stroke victims who engage in mental visualization in addition to physical therapy recover functioning faster (Braun et. al., 2013), and athletes and musicians who combine mental and physical practice perform better (Schuster et.al, 2011).

PET-C operates under the assumption that, in the same way musical and athletic skills can be improved through mental rehearsal, disagreement-related skills can be improved through mental rehearsal as well. On a daily basis, clients are encouraged to stimulate upset feelings by picturing recent disagreements they had with their partners over specific subjects. Clients then prepare for upcoming conversations about these topics by listening to a series of audio recordings that help them practice mindful self-soothing while visualizing themselves engaging in specific skillful behaviors in the upcoming conversations. After rehearsing in this way for several days, clients initiate actual conversations. PET-C practitioners report that clients who engage in this process on a daily basis for 4-8 weeks experience significant changes in their automatic disagreement-related habits, enabling more skillful interaction with their partners.

PET-C therapists also encourage partners to engage in mindfulness exercises designed to increase feelings of love and connection. Dozens of studies in the past decade suggest that, in the same way that the subjects in the Harvard piano study strengthened motor areas of their brains by simply thinking about moving their fingers, it may be possible to strengthen areas of the brain that generate feelings simply by thinking about having feelings. In these studies, subjects engage in exercises that produce sustained activation of the parts of the brain that are responsible for generating them. The strongest evidence comes from numerous studies documenting that, compared to control subjects, subjects who engaged regularly in a technique (often called *Loving-Kindness Meditation*) in which they sustained attention on feelings of love and compassion evidenced greater increases in feelings of empathy and compassion, more growth in empathy-related brain areas, and more altruistic behavior (Galante et. al., 2014). Inspired by these studies, PET-C engages clients in structured mental exercises that are designed to prime brain areas that mediate intimacy-related feelings. These exercises involve activities such as +1) thinking of, dwelling on and savoring times when they have experienced such feelings in the past, 2) imagining themselves experiencing such feelings in the future, and spending desiring (wishing for) the emergence of the feelings. Clients are given the following guidance:

> *Each time you engage an exercise that focuses on a particular feeling, earnestly invite and yearn for the feeling to develop inside of you. The more time you spend inviting and wanting feelings to emerge within you, the more naturally these feelings will emerge throughout you daily life – even at moments you aren't consciously trying to feel them.*

> *Don't worry if you can't physically sense positive feelings as you invite and cultivate desire for them to come. The most important thing is that you spend time in a receptive, inviting state while you engage in the mental activities. It's enough for you to simply hold the door open and invite the feelings. Over time, they will accept your invitation. As you begin this process, mild versions of good feelings will become active beneath the threshold of your conscious awareness. With continued practice they will become more detectable and distinct. Amazingly, across many studies, those who regularly engage in positive mental practices develop not only more feelings of love and empathy -- but they experience more of a wide range of positive feelings including joy, gratitude, serenity, interest, hope, pride, amusement, inspiration, and awe* (Atkinson, 2014, pp. 127-128).

Atkinson (2014) emphasizes that that not just any kind of attention will produce changes in the brain. Regular, sustained attention is essential. The subjects in the Harvard piano study didn't just have occasional wishes for increased piano skills; they spent hours per day specifically imagining the piano moves necessary to develop the skills. Similarly, those involved in the loving-kindness meditation studies didn't just entertain fleeting thoughts about wanting to feel more love and compassion; they spent time each day dwelling on the desire to have more feelings of love and connection---in some studies up to 40 minutes per day over the course of eight weeks.

Conclusion

When considering information relevant to the health of intimate partnerships, the most significant neuroscientific development that has occurred in the past decade involves the mounting evidence documenting the impact of mindfulness training on brain systems and structures that mediate social and emotional intelligence. The efforts to integrate formal mindfulness practices into the counseling process described in this paper are the first of their kind in the field of couples therapy. Given the rapidly accumulating evidence regarding the benefits of mindfulness for couple relationships, it is likely that we will see a significant increase in similar efforts in the near future.

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