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Physiological Considerations in Systemic Family Therapy

The Role of Internal Systems in Relational Contexts

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It was an introductory family science course and one book—*The Family Crucible* (Napier & Whitaker, 1978)—that awakened me (A.B.) professionally. Intending to study psychology, I had mistakenly registered for a family science class to fill a general education requirement. As I read about Carl Whitaker's approach, it was as though all the pieces of a universe I hadn't known was fragmented fell into place. "This is it!" I thought. "It's not about the individual; it's about the system!" From that point forward, I was an adamant disciple of systems theory.

More than 20 years later, I am struck by my own myopic approach to systemic thinking and work. While I was busying myself studying and treating family systems, I almost completely ignored a literally vital system of human functioning—that of the body. Just as we must view so-called individual functioning in the context of relationships, so too must we view individual and relational functioning in the context of human physiology.

The mind–body connection, or the link between human physiology and cognition, emotion, and behavior, makes it highly relevant to our field. Human physiology refers to the processes and functions of the body and its parts. It encompasses the interrelation of the body's nerves, organs, genes, chemicals, and hormones—internal systems that affect individuals' interactions with their external systems. To some extent, the relationship between our internal and external systems is common knowledge. Most are familiar with the fact that getting insufficient sleep is associated with physiological processes that result in irritability, which may result in relationship conflict. Thus, poor sleep has behavioral and physiological consequences (Banks & Dinges, 2007; Rossa, Smith, Allan, & Sullivan, 2014). Another example is the use of psychotropic drugs to alter specific elements of human physiology (e.g., SSRIs impact serotonin levels in the brain), which in turn can have significant impact on behaviors that are expressed within the families and systems of which the user is a part. For systems

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therapists, an understanding of internal systems as well as external systems is key to intervening appropriately with clients.

Although many physiological processes are preconscious and therefore beyond our control, increasing our awareness of their role in family systems gives systemic family therapists another level from which to understand clients' experiences and intervene. Because entire volumes have been dedicated to psychophysiology or the role of physiology in human cognition, emotion, and behavior (Andreassi, 2007; Cacioppo, Tassinary, & Berntson, 2017), we will not attempt to provide a comprehensive description or analysis of how physiological processes are related to systemic therapy. Instead, our objective in this chapter is to review the field's historical understanding of physiology, provide a basic overview of the physiological processes most relevant to systemic family therapy (SFT), highlight the unique role of systemic therapists and therapy in accessing and utilizing principles of psychophysiology to promote healing, and provide some initial guidance about physiologically informed interventions for practitioners.

Physiology in Our History

Although physiology's role in relationships has received increased and substantial attention only recently, it has resided—sometimes silently—at the core of much SFT theory and thought. John Bowlby used primate research to help him conceptualize and theorize that humans require attachment for survival and that our physiology mediates the process of avoiding or creating safe attachment relationships. (See Seedall and Sandberg (2020), vol. 1, for further discussion of attachment theory.) Bowlby described physiological regulation as necessary to a person's ability to form the security he called attachment. That attachment then helps the individual maintain a regulated physiology (Bowlby, 1973). As a central feature of attachment, physiology was then theorized and examined as core to the self-regulatory processes that facilitate human connection.

As systems theory began to take hold among psychoanalysts and SFT as a field grew, emphasis was placed on communication patterns and interactional cycles. Individual physiology became somewhat sidelined, with interpersonal physiological processes almost completely ignored. Eventually psychotherapists began revisiting the role of the body and self-regulation (e.g., Greenberg & Pascual-Leone, 2006; Levenson & Gottman, 1983), with particular emphasis on the notion that dysregulation and arousal are problematic in the formation and maintenance of healthy relationships. Since that time, some interest has grown among clinicians and scholars, who have largely worked to compile and summarize what we know about the brain and body and their relevance to the field (e.g., Badenoch, 2008; Fishbane, 2013; Hanna, 2013). Still, although increased emphasis has been placed on the need to more fully integrate physiologic concepts into our work (e.g., Atkinson, 2005), most structured and published interventions are limited to suggesting therapists understand physiological processes and then work to intervene in behavioral (rather than biobehavioral) ways. Expanding our ability to integrate multiple levels of systems (as in a biopsychosocial approach) will entail sufficiently considering and addressing individual physiology and interpersonal physiological processes, including couple and family processes, therapist–client processes, and physiologically based interventions.

Psychophysiological Processes

Because self-regulation is core to attachment and the skills necessary for developing and maintaining healthy relationships (e.g., effective conflict management), the physiological processes associated with emotional regulation are among the most relevant to SFT. These are evidenced in such experiences as outbursts of anger or cowering away from an argument (i.e., "fight or flight"), feeling emotionally connected or "in sync" with family members, and having a prolonged stress response after negative interactions. Such experiences are largely mediated by the balancing of the sympathetic and parasympathetic branches of the autonomic nervous system (ANS) and the functioning of the endocrine system. Additionally, there are instances in which indicators of these physiological systems come into concordance or synchrony between family members, suggesting that family members impact each other in unconscious and automatic ways. For instance, securely attached infants and their mothers have concordant heart rates when reunified after a brief period of separation (Donovan & Leavitt, 1985), which allows them to reestablish their bonded relationship and facilitates further adaptive functioning. Thus, we review here how the ANS and endocrine system work and their relevance to SFT.

Autonomic nervous system

Perhaps the most common physiological processes under consideration and investigation in relational research and practice are those involving the heart and brain. Although physiological researchers since Darwin have known that the ANS is core to bidirectional heart–brain interaction, we can largely credit Stephen Porges for focusing the field's attention on the relationship between the ANS and social behavior. After writing several papers illuminating the fact that the heart and brain work to facilitate social engagement and attachment, Porges synthesized his work in his influential polyvagal theory (Porges, 2011).

Polyvagal theory posits that one of the primary functions of the heart–brain connection is to facilitate connection with others. This is done by unconsciously assessing for and responding to the relative safety (or, in its absence, danger/threat) of a situation. If a situation is threatening, the body's response is to engage protective mechanisms that remove it from the threat. This sympathetic nervous system (SNS) response includes increased heart rate, diverting blood and energy from smaller to larger muscle groups, and hypervigilance. It is often referred to as the *fight-or-flight* response because it allows an individual to either resist a threatening situation or escape it. In circumstances devoid of threat, the heart–brain connection regulates self-soothing via the parasympathetic nervous system (PNS). As part of the PNS, a vagal brake serves to inhibit SNS activation by sending signals along the vagus nerve to the heart, lungs, and digestive track enabling a rest, digest, and connect state. Because the vagus nerve innervates the face, throat, and ears as well as the heart, PNS regulation results in increased eye contact, calm vocal timbre, auditory receptivity, and more open body posture, all of which facilitate social connection. Thus, active engagement of the PNS is necessary for life-sustaining, healthy relationships.

Because social connection is a vital need for humans (Holt-Lunstad, Smith, & Layton, 2010), assessment of the safety or danger of a situation includes its relational components. Consider what occurs when one perceives that another dislikes or is angry at him. The SNS responds as to any other threat, and he may experience an increased heart rate, difficulty making eye contact, or sweating. This physiological experience accompanies the desire to fight back or escape (i.e., fight or flight), which moves the individual to engage in behaviors that are designed to protect him from the relationship (e.g., escalating conflict or withdrawing from further interaction). In contrast, relational safety cues from a partner (expressed as a result of their PNS functioning, such as in the form of an open posture, eye contact, or a calm vocal tone) help one feel at ease and active his PNS, facilitating connection between the two. This is evidence for the assertion made in the polyvagal theory that the role of the PNS in facilitating connection is not unidirectional. A basic illustration of this process is shown in Figure 9.1, which demonstrates that behaviors and experiences in relationships serve to inform the heart–brain connection and shape individuals' responses to future interactions via conscious and unconscious processes.

Consider a child who grows up in a home with an alcoholic mother who gets angry and physically violent each night after drinking. With repeated experiences over time

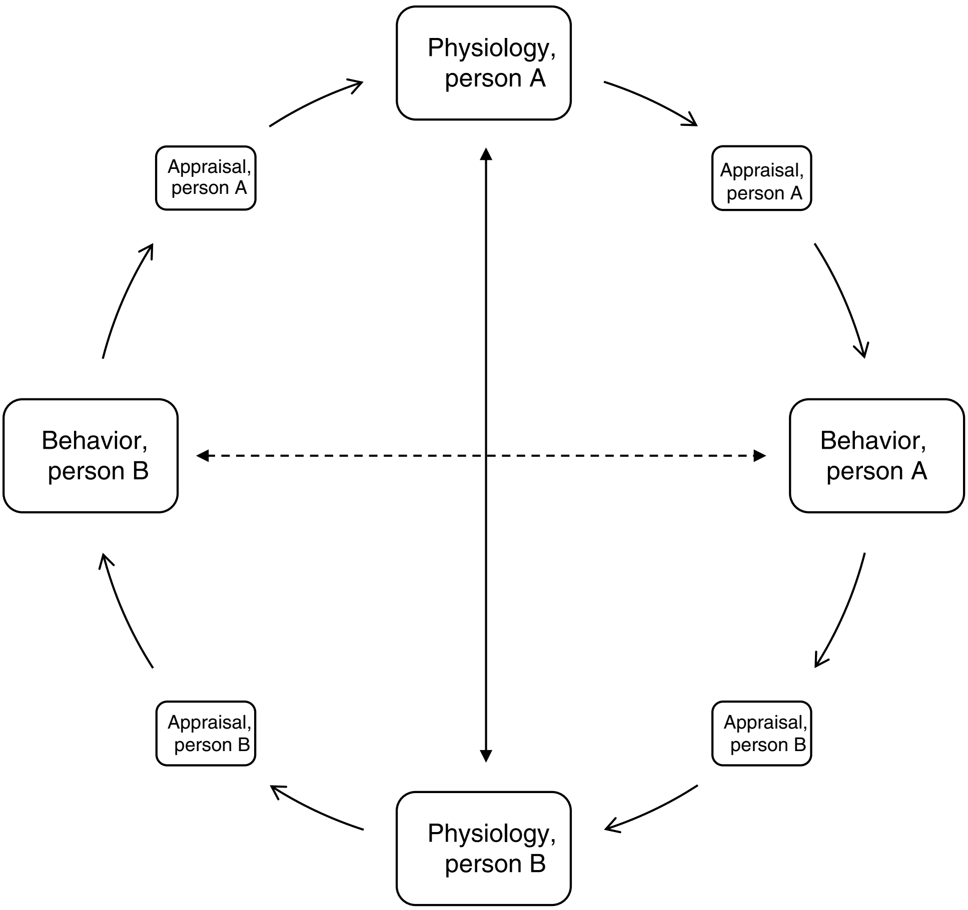

Figure 9.1 Cycle of physiologic processes and behavior. The dotted line between each person's behavior does not represent an automatic or unconscious process, but rather a conscious process that acts as a potential intervention point.

signaling to the child (and his body) that he is not safe, his body begins to have a physiological reaction to triggers, or reminders, of the violent circumstances (e.g., the smell of a certain alcoholic beverage, angry shouting). In such instances, the vagal brake is released, suppressing the PNS and allowing the SNS to become the more dominant system working to keep the child safe. As a child, he may physically hide himself in his room or elsewhere. As an adult, without a cognitive appraisal (such as positive sentiment override) to interrupt his physio-behavioral response, he may become fearful when his wife becomes angry and will similarly hide or withdraw. This withdrawal or avoidance serves to protect; however, it also inhibits the ability to connect and maintain a meaningful relationship.

Conversely, there are those whose PNS effectively inhibits premature acceleration of the SNS. A child with a secure attachment to her parents, who consistently experiences relational safety and appropriate repairs after relational ruptures, may, in adulthood, tolerate a higher level of threat before the vagal brake is released because her vagus nerve is more adept at maintaining a self-regulatory state (quantified by higher vagal tone). Research has demonstrated that those with higher vagal tone (and therefore a greater propensity to be self-regulated; see Beauchaine, 2001; Beauchaine, Gatzke-Kopp, & Mead, 2007) have higher marital quality or relationship satisfaction (Helm, Sbarra, & Ferrer, 2014; Smith et al., 2011) and use more positive social engagement skills (Geisler, Kubiak, Siewert, & Weber, 2013).

Polyvagal theory provides an important lens for understanding how ANS responses to the relational environment shape human interactions. It also helps us understand how relational patterns become programmed into the brain and continue to shape behavior. In clarifying the role of the vagus nerve and its affiliated organs in social connection and how vagal tone mediates interactions between internal systems and external systems, polyvagal theory explains how the heart–brain connection influences areas of the body that enable us to make appraisals about others' emotional states, thereby facilitating relationship-maintaining behaviors. The role of the ANS in assessing for relational safety or threat highlights that human beings are organized in such a way that connection is a central feature of lived experience. This further underscores the importance of clinicians recognizing what is happening within themselves and clients in order to intervene appropriately.

Common clinical measures of ANS functioning are heart rate, pulse oximetry (measuring oxygen levels), and electrodermal activity (EDA). These, together with others such as respiratory sinus arrhythmia (RSA) and cardiac impedance, are also used in couple and family research. Sympathetic activation can be identified by an increased heart rate, irregular breathing (i.e., drop in oxygen saturation in blood), a drop in RSA, an increase in EDA, and a drop in cardiac impedance. Parasympathetic activation is usually accompanied by an increase in RSA, with stable levels (reflecting baseline) of blood oxygenation, EDA, and heart rate.

Hormones and neurochemicals of the endocrine system

The ANS and affiliated organs are only one part of the psychophysiological system affecting relational processes, however. Hormones of the endocrine system also mediate social interactions. The nervous and endocrine systems are linked in the brain by the hypothalamus via the pituitary gland. The hypothalamus maintains homeostasis in the body by producing and directing the release of certain hormones such as oxytocin and vasopressin. These hormones are stored in and released by the pituitary gland, which also produces hormones including cortisol. Among their other functions, oxytocin, vasopressin, and cortisol facilitate affect and behaviors that either promote or inhibit social connection. As systemic therapists seek to understand the internal systems and the processes by which those systems influence social interactions, it is beneficial to be aware of these hormones and their roles.

Oxytocin is positively correlated with increased trust, trustworthiness, ability to decode positive facial cues, empathy, increased eye gaze, more positive communication between couples, and bonding to parents (see Bachner-Melman & Ebstein, 2014). It is robustly implicated in the process of falling in love, bonding, and maintaining bonds through gaze, touch, and affect (see Algoe, Kurtz, & Grewen, 2017; Feldman, 2012; Szymanska, Schneider, Chateau-Smith, Nezelof, & Vulliez-Coady, 2017). Oxytocin plays a vital role in parent–infant and couple bonding. Higher oxytocin facilitates mothers' ability to respond positively to their infants; it is associated with greater reward-system activity (i.e. dopamine response) during interactions and longer episodes of shared social gaze (see Feldman, 2012). Higher oxytocin in fathers is associated with greater stimulatory play (e.g., encouraging object exploration and positive arousal such as moving the child's limbs), more frequent touch, and higher vagal tone, indicating greater physiological readiness to engage with their children (see Feldman, 2012). In couples, oxytocin appears to promote positive perceptions of the other partner, bonding behaviors, and social receptivity (Algoe, Kurtz, & Grewen, 2017; Feldman, 2012). Thus, oxytocin provides an important biological foundation for the relationship couples develop with each other and with their young children.

In contrast, emerging evidence suggests vasopressin may be positively associated with behaviors that impede connection in romantic relationships. There is some indication that higher levels of vasopressin are associated with aggression, increased stress in social contexts, and decreased cognitive empathy among men (see Bachner-Melman & Ebstein, 2014). Additionally, higher vasopressin levels are associated with negatively biased perceptions of neutral or friendly faces among men, and studies imply that these associations influence marital satisfaction (see Heinrichs, von Dawans, & Domes, 2009). However, the research paints more than simply a bleak picture of vasopressin. There is some evidence that higher vasopressin is associated with more stimulatory play with infants among mothers and fathers (Apter-Levi, Zagoory-Sharon, & Feldman, 2014). Thus, it appears that vasopressin plays a role in somewhat excitatory or aroused interactions, which may be developmentally necessary in parent–child interactions, though less beneficial in romantic relationships.

Cortisol has also received significant empirical attention, elucidating its role in relationship processes. Cortisol is produced as part of the hypothalamic–pituitary–adrenal (HPA) axis, the body's central stress response system. Essentially, when an individual is under stress, the HPA axis releases cortisol. Because the HPA axis is sensitive to the individual's social experiences, cortisol studies have been able to identify the effects of relationship distress on the individual. Research has shown that when partners experience conflict or marital relationships are distressed, the HPA axis is activated and cortisol release increases (Burke, Davis, Otte, & Mohr, 2005; Ditzen et al., 2007; Kiecolt-Glaser et al., 1997; Saxbe, Repetti, & Nishina, 2008). Low support from a romantic partner is also associated with a heightened cortisol response (Seeman, McEwen, Singer, Albert, & Rowe, 1997; Uchino, Cacioppo, & Kiecolt-Glaser, 1996). Because high or dysregulated cortisol levels are related to serious health issues including cardiovascular disease and poor immune system functioning, it is important for SFTs to be aware of how relational distress may manifest in physical ways. Also, as relationship distress is usually experienced by both partners, it is not surprising that Saxbe and Repetti (2010) found that spouses' cortisol patterns are linked over several days. This association is moderated by marital satisfaction, indicating that co-regulation of some physiological systems may depend on relational dynamics.

Synchrony/co-regulation

In understanding the psychophysiological systems that affect social interaction, an awareness of both the components and the processes is important. Not only are the ANS and endocrine systems linked, as previously noted, but individuals' internal systems affect each other. The synchronization of family members' physiological markers is an important phenomenon when considering SFT processes. Most research has focused on mother–infant co-regulation and has established that heart rhythms and oxytocin levels synchronize during interactions (Feldman, 2012; Feldman, Magori-Cohen, Galili, Singer, & Louzoun, 2011), upregulating in moments of stimulatory or object-focused play and downregulating in times of soothing, gazing, and nurturing interaction. These co-regulatory processes are considered foundational to the child's ability to form and maintain relationships into childhood and throughout life (Feldman, 2007a).

A comprehensive review on physiological linkage between couples (Timmons, Margolin, & Saxbe, 2015) adeptly highlights when such synchrony may be helpful versus problematic in romantic relationships. Evidence indicates that co-activation of the HPA axis (i.e., stress response) is generally problematic because it is related to poorer relationship functioning. This is also often true for co-activation of the SNS, which can indicate a pattern of negative affect reciprocity or conflict escalation (Gottman, Coan, Carrere, & Swanson, 1998; Levenson & Gottman, 1983). However, synchrony in the SNS is a nuanced phenomenon because there is some indication that co-regulation is also associated with increased empathy (see Timmons et al., 2015). Indeed, Sbarra and Hazan (2008) suggest that co-regulation is an important feature of adult romantic attachment, and research has found some evidence to suggest that greater SNS co-regulation is associated with greater marital satisfaction (Helm, Sbarra, & Ferrer, 2014). Thus, the relationship between synchrony in SNS and relationship outcomes is likely linked to the emotional contexts and processes wherein the SNS is activated.

Therapist–Client Physiologic Synchrony

One phenomenon that has been receiving growing attention in adult individual psychotherapy over the last decade, but has yet to be adequately addressed in SFT literature, is the process through which therapists' and clients' physiology often become interlocked and synchronized, thus creating a shared system that involves feedback loops among the interactants' physiology. Therapy is at its heart an interpersonal encounter in which therapists and their clients become cognitively and emotionally involved with each other. Thus, fundamental phenomena that dominate interpersonal processes in general, such as synchrony, are of high relevance to the therapeutic context (Koole & Tschacher, 2016). Indeed, when involved in an interpersonal interaction, people tend to involuntarily synchronize their perceptual, affective, physiological, and behavioral responses with each other (Wheatley, Kang, Parkinson, & Looser, 2012).

Moreover, it has been argued that such multimodal synchrony facilitates effective and coordinated social interactions, as it allows people to obtain partial access to the internal states of those they interact with and through this process to get "on the same page" (Semin & Cacioppo, 2008). Consistent with this idea, synchrony was found to be associated with trust (Bernieri, 1988), relationship satisfaction (Julien, Brault, Chartrand, & Bégin, 2000), cooperation (Wiltermuth & Heath, 2009), and altruistic pro-social behaviors (Valdesolo & DeSteno, 2011).

Drawing upon such findings, Koole and Tschacher (2016) have recently introduced the interpersonal synchrony model of psychotherapy, which postulates that the therapeutic alliance is grounded on the synchronization of client's and therapist's behavior and physiology. Specifically, the model suggests that such client–therapist synchrony allows the dyad to construct mutual understanding and shared emotional experience, which consequently deepen the client–therapist bond. Support for this idea can be found, for example, in a study that monitored in-session clients' and therapists' EDA, an index of the SNS (Marci et al., 2007); in this study, clients from dyads who exhibited higher EDA synchrony during the session reported that their therapists were more empathically understanding. Moreover, in moments of high synchrony, both clients and therapists demonstrated more positive behaviors toward each other (e.g., showed positive regard).

Koole and Tschacher's (2016) model goes one step further to suggest that client–therapist synchrony has a central role in improving clients' regulatory capacities and, thus, in reducing clients' psychological distress. Specifically, the model argues that clients' experience of having a therapist who is synchronized with their affective and physiological arousal, but at the same time is capable of regulating both parties' arousal, keeping it within an optimal arousal zone, provides clients the valuable opportunity to process their emotional hardship in a safe environment. Over the course of treatment, such recurrent interpersonal experiences of co-regulation (Butler, 2011) are internalized, thus ultimately facilitating the development of clients' own regulatory capacities.

No study to date has explicitly examined the suggested association between client–therapist synchrony and improvement in clients' emotional regulation capacities; however, indirect evidence can be drawn from the mother–infant primary attachment bond in which the beneficial effects of synchrony on infants' development are widely documented (e.g., Davis, Bilms, & Suveg, 2017; Granat, Gadassi, Gilboa-Schechtman, & Feldman, 2017; Moore & Calkins, 2004). Specifically, it was found that mother–infant behavioral and physiological synchrony helps to regulate children's emotional distress; furthermore, mother–infant synchrony was found to predict children's capacity for emotional regulation even in the absence of their mothers (for review see Feldman, 2007b).

Importantly, in all effective SFTs, emotional regulatory processes are key. For example, therapists often find themselves working with family members on de-escalating maladaptive emotional cycles, reestablishing emotional bonds, and facilitating positive emotional experiences (Gottman, 2002; Harway, 2005; Johnson & Greenberg, 1985). Such therapeutic tasks are most frequently emotionally and physiologically engaging for therapists as well. It is assumed that skillful therapists are equipped with the ability to notice both their own and the family members' physiological and emotional reactions and to use this information to navigate the therapeutic interaction into a more regulated and constructive one (e.g., helping family members be in touch with their own as well as with each other's emotions).

In light of these theoretical assumptions, it is quite surprising that the role of therapists' emotions and physiology in the therapeutic endeavor is hardly examined. In fact, to our knowledge, only one research group has directly examined the therapists' physiology effects in couple therapy (Seikkula, Karvonen, Kykyri, Kaartinen, & Penttonen, 2015). Their work elucidates how complex and multifaceted the interpersonal physiological dynamics that occur in the context of SFT are, as these dynamics involve at least two clients and sometimes more than one therapist. For example, in one study (Karvonen, Kykyri, Kaartinen, Penttonen, & Seikkula, 2016), the EDA synchrony between 10 couples and their therapists at the beginning of therapy was examined; in this study two therapists worked together with each couple, and, thus, the existence and effects of the six unique dyads' synchrony could be examined. Interestingly, their results indicated that 85% of all dyads showed a significant EDA synchrony; however, among all three possible sets of dyads (therapist–therapist, therapist–client, and client–client), therapist–therapist dyads displayed the strongest synchrony, whereas client–client dyads displayed the weakest one.

These results trigger intriguing questions, such as the following: (a) Do family members who become more synchronous over the course of treatment also become more attuned to each other and thus benefit more from treatment? (b) Should moments of therapist–client synchrony be equally distributed among the family members to facilitate alliance and engagement of all parties? (c) What is the role of therapist–therapist synchrony? Does it model collaborative interactions and dyadic attunement? These questions, and others, still await an empirical examination; in our view, answering them can provide valuable insights for SFT therapists into the best ways to attend, understand, and make constructive use of their own and their clients' embodied physiological reactions.

One direct implication of the interpersonal synchrony model of psychotherapy is that SFT therapists should continuously attend to and if needed try to improve the physiological synchrony with their clients. Notably, there is consistent variability in therapists' effectiveness (Baldwin & Imel, 2013), some of which is attributed to therapists' interpersonal skills (e.g., Anderson, Ogles, Patterson, Lambert, & Vermeersch, 2009). Based on the documented beneficial effects of therapist–client synchrony, it is quite possible that finding ways to improve such synchrony may improve the ultimate outcome of therapy. For example, with current technological advancement, it becomes more and more feasible to use noninvasive monitoring devices. Such monitoring can be useful in providing therapists with feedback regarding the changing levels of synchrony with their clients throughout the session, as well as in identifying moments of heightened (dis)connection. Integrated with video recording, this feedback can help sensitize therapists to the shared embodied experience with their clients and thus facilitate beneficial verbal and nonverbal communication patterns.

Intervention

Considering the inseparable link between physiology and relationship functioning, together with the evidence that therapist–client physiological processes are an important consideration, it becomes important to identify ways therapists can integrate a physiological perspective into their work. Here, we address three approaches therapists can take: (a) use assessment to learn their clients' key/relevant physiological markers so they can create more physiologically informed treatment plans and intervene where necessary; (b) promote awareness and educate clients about physiological processes; and (c) work to change client physiology using in- and out-of-session interventions to promote psychosocial change.

Assessment

Because there are physiologic indicators of poor relationship functioning (e.g., low vagal tone, heightened cortisol functioning), therapists can benefit from gaining a clearer picture of their clients' physiologic profiles and functioning. This is especially important because there is great variability between people in their physiologic profiles (i.e., baseline levels of physiologic functioning), which should be accounted for in all assessment and intervention. Establishing healthy collaborative care networks will be beneficial for therapists routinely seeking this kind of information because primary care physicians can help provide necessary data. When a medical record is only sparsely notated or little history exists, therapists can recommend or request clients complete a physical examination that will provide relevant information. For instance, a therapist working with a high-conflict couple may be interested in knowing more about the biological bases for their escalation. Referring the couple to a physician who can provide RSA (i.e., an indicator of vagal tone) levels, basic arousal patterns (e.g., how long before heart rate increases significantly under stress), and diurnal cortisol patterns for each spouse would provide the therapist practical information to use when planning interventions to interrupt the physiologic arousal that accompanies behavioral escalation. Most of these tests can be conducted in physician's offices (e.g., the heart's stress response) or ordered from qualified labs (e.g., that perform cortisol assays).

Some therapists may choose to invest in equipment that provides this kind of basic information for in-session assessment and use. In fact, many individual and some SFT therapists are already using this approach successfully. Although those biofeedback devices and software that provide moment-to-moment readings and the possibility of user-controlled settings represent more of a significant financial investment (e.g., NeXus biofeedback system; www.mindmedia.com) than those devices usually oriented toward clinical work (e.g., HeartMath system; www.heartmath.com), they allow clinicians to efficiently assess baseline physiologic functioning, providing pertinent information for treatment planning. For example, if a client's baseline skin conductance level (signifying SNS activation and behavioral inhibition) is elevated, this indicates that the client "at rest" is more aroused or "on edge," which suggests he/she may avoid emotional stimuli. The therapist can then incorporate that insight into his/her approach.

When collaborative care or acquiring a biofeedback device is not feasible, therapists may also use in-session techniques to have clients describe their own physiology. Facilitating interoception—or awareness of the body and its sensations—serves the dual purpose of identifying what is happening physiologically and beginning physio-related intervention. This can be as simple as the therapist asking clients to sit quietly and identify physical sensations. Gottman recommends having clients find their own pulse and count beats per minute at baseline as well as after a conflict discussion, which provides a picture of their physiologic functioning and tendency toward arousal (Gottman, 1999). For some (such as in the case of play with children), having clients describe physical experiences through art can be helpful. This is because art expression is a sensory activity, which taps into the limbic system and right hemisphere, both of which are areas of the brain associated with intense emotional processing and the physiology of emotions (Malchiodi, 2012).

Promoting awareness

Promoting client's awareness of their own physiology is a basic first step in integrating physiological principles in an SFT context. Often, clients are so unaware of what is happening internally that they may adamantly deny feeling or being influenced by internal processes. One example is the husband who denies being angry while he is red in the face and scowling. Another example may be a wife who denies being upset while refusing to make eye contact, maintaining a closed posture, and repeatedly professing "It doesn't matter" in response to strong emotions her husband has expressed. Helping clients own their internal state and the implications it has in their relationships puts physiology on the table as meaningful in therapy.

In SFT, helping members of a family system become aware of each other's physiology is another valuable precursor to change. Parents can learn to recognize, for instance, that criticism suppresses children's parasympathetic activity (Skowron et al., 2011) and can send a child into a defensive "fight-or-flight" mode and inhibit logic. Spouses can recognize receptive vs. closed states in each other and use this information to inform their decision about when to bring up a difficult subject. As awareness increases, family members can also tune into how their own physiology affects their family members. A wife might learn to recognize that her anger and "fight" physiology is perceived as unsafe and activates her husband's "flight" mode, which undermines her ability to engage with him. Increasing awareness of client physiology sets the stage for other physiologically informed interventions.

Psychoeducation Once clients and therapist have an awareness of what is happening physiologically for themselves and others in their systems, interpreting their experience using psychoeducation is helpful. The psychoeducation offered by therapists can normalize client experiences and help them externalize problematic relational patterns. Touching on the basics that were explained earlier in this chapter is a good place to start. Recognizing that the body has physiological processes to ensure survival and that relational danger is interpreted as a threat the same way a tiger would be is core to understanding how the internal and external systems interact. Giving further explanations of what various physiological states (e.g., "fight or flight," "rest, digest, connect") mean in terms of brain functioning can further elucidate common interactions. Most people recognize the experience of becoming irrational when highly angry or stressed and of "shutting down" in the face of what feels like an insurmountable obstacle. Tying in endocrine system functioning and the emotionally positive experiences of connection or the emotional disconnect that comes with stress can also be helpful and further set the stage for effective intervention.

Psychoeducation is most effective when a system is not in immediate crisis. When emotions are high, as noted, the brain is not capable of processing information the way it is when the environment feels safe. Once psychoeducation has happened, however, it can be used in crisis moments to diffuse conflict. Pointing out what is happening physiologically for a client, and why, validates their experience and promotes a feeling of safety. For example, when a couple starts yelling at each other in session, the therapist can step in, slow the process, point out their current "fight-or-flight" physiology, and note the relational pattern that is in process. In a parent–child interaction, helping the child recognize his physiology and how it is manifesting in his behavior can be calming and informative to both parent and child. Therapists can also provide psychoeducation about how clients' biological and experiential differences inform their physiologic profiles and consequently their psychosocial functioning. For instance, when a family has one child who is typically calm and another child who is often reactive, it can be useful to teach parents the potential effects different parenting behaviors (e.g., shouting, intensity of physical play/contact, gaze) have on each child (Slagt, Dubas, Deković, & van Aken, 2016). This can serve to destigmatize some "problematic" child behaviors that occur due to automatic, nonconscious biological factors. It can also help the parents tailor their approaches to better complement each child's temperament.

Intervention to change physiology

Just as using interoceptive techniques provides the clinician with information about physiological factors that influence relationship functioning, it can be key to clients' change process. Specifically, therapists can use mindfulness techniques to promote client self-awareness of physiologic processes (Siegel, 2011). That awareness can act as the impetus for behavioral changes to help the client engage in more constructive relationship processes (e.g., sharing baseline physiological state information with family members, who are then more informed and enabled to be other-aware or empathic).

Considering that some physiologic states are associated with better social connection and relationship functioning than others (Feldman, 2012; Porges, 2011), it behooves SFT therapists to promote physiology that is conducive to healthy interactions and relationships. These are interventions that access multiple parts of the brain, rather than being localized to one, enabling the ANS and endocrine systems to function more holistically. Such interventions utilize the frontal cortex (associated with rational decision making) as well as the limbic system (associated with emotional reactivity). There are options for both in-session and out-of-session, therapist-directed interventions.

In-session therapeutic interventions As touched upon in the assessment section, therapists can use psychoeducation about physiology to help clients shift their own physiological states (Siegel, 2011). Simply teaching clients how their bodies work, how they respond to threat or safety, and what their bodies are doing in moments of emotional intensity or calm can help normalize processes, facilitate cognitive or behavioral attempts to calm/self-soothe, and encourage healthier habits that will result in more regulated physiology.

In addition to psychoeducation, therapists can use in-session techniques to help clients self-regulate. Techniques range from expensive technological options like biofeedback to simpler but less researched options like body scans and progressive muscle relaxation. Biofeedback may be particularly appropriate for clients who favor objectivity or who struggle with self-awareness. Biofeedback devices can be used to improve client awareness of and ability to change muscle tension, respiration patterns, cardiac reactivity, and other physiological factors that influence social behaviors. The Association for Applied Psychophysiology and Biofeedback, Inc. (aapb.org), is a good resource and network for those interested in incorporating biofeedback into their practices. Alternatively, therapists can incorporate body scans, guided imagery, or progressive muscle relaxation, all of which serve the purpose of regulating physiology (Sheehan, 2012), so that clients are in a better state to engage with each other. These techniques can be practiced out of session as well and are easy to learn.

Relational interventions to help clients regulate physiology are particularly appropriate for SFT. Therapists may encourage partners to make physical contact during session (e.g., holding hands) as there is evidence that touch changes physiology and promotes physiological synchrony between couples (Chatel-Goldman, Congedo, Jutten, & Schwartz, 2014). Touch has also been shown to stimulate the release of oxytocin and endorphins, which are associated with anxiety reduction and increased calm and trust, making it a potentially powerful intervention when used in therapy (Marcher, Jarlnaes, Münster, & van Dijke, 2007). Therapist discretion is essential, however, because touch can be perceived as intrusive when a relationship feels particularly unsafe and may, therefore, further activate the SNS.

There are additional relationally oriented physiological regulatory interventions therapists can use in session. These include gratitude expression, which can increase parasympathetic activity (McCraty, Atkinson, Tiller, Rein, & Watkins, 1995); use of music, which has been shown to increase autonomic activity associated with immunity (McCraty, Atkins, Rein, & Watkins, 1996) or (when singing together) synchronize cardiac patterns (Müller & Lindenberger, 2011); and helping family members forgive. Research has shown that simply visualizing granting forgiveness is associated with a lower physiological stress response than harboring a grudge (vanOyen Witvliet, Ludwig, & Vander Laan, 2001). In appropriate instances, therapists can encourage conciliatory behavior (such as offering comfort), as this has been associated with lower blood pressure in both spouses—the person extending forgiveness and the person receiving it (Hannon, Finkel, Kumashiro, & Rusbult, 2012).

Lastly, considering the emerging literature on therapist–client physiological processes, therapists can consider their own effect in therapy. At the most basic level, therapists can cultivate their own "therapeutic presence" by working on their own regulation and incorporating a person-centered approach, which then sends the message that clients are safe and allows them to become more regulated and primed for connection (Geller & Porges, 2014). Additionally, there is a strong tradition of encouraging mimesis in SFT (e.g., Minuchin, 1974), which has received empirical support in recent years. Namely, the more therapists and clients engage in synchronized movements, the better the client's assessment of the relationship and the better the therapeutic outcomes (Ramseyer & Tschacher, 2011). Because behavioral mimicry is associated with greater self-regulation (see Chartrand & Lakin, 2013), therapists can both engage in mimesis and coordinate activities between clients that would facilitate such synchrony for them (e.g., an experiential sculpting activity) (see behavioral correlation in Figure 9.1).

Out-of-session interventions SFTs can also use the field's strong tradition of assigning homework to facilitate physiological changes. In fact, out-of-session work is likely necessary given the complex interplay of myriad factors influencing how our bodies function. One of the most influential activities therapists can assign clients is regular aerobic exercise. Aerobic exercise is consistently associated with decreased self-reported anxiety and physiological correlates thereof (Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991) and decreased depression, stress, and negative affect (see Penedo & Dahn, 2005). Because of the robust relationship between exercise and improved mental health, it has been recommended that clinicians integrate exercise interventions into their work with clients (Stathopoulou, Powers, Berry, Smits, & Otto, 2006).

One of the hypothesized mechanisms by which exercise helps improve psychological health is through its regulatory effect on the sleep cycle. With more consistent, healthier sleep patterns, individuals tend to function better. For instance, research has found that men who report better sleep efficiency also have less negative interactions in their marriage the following day. The same study found that greater discrepancy in bed- and wake-time between husbands and wives was associated with wife reports of more negative interactions and fewer positive interactions the next day (Hasler & Troxel, 2010). It is hypothesized that the association between sleep and marital quality is in part due to a secure relationship's ability to help individuals be more regulated and improve HPA functioning (see Troxel, 2010; Troxel, Robles, Hall, & Buysse, 2007). Thus, educating clients about good sleep hygiene and assigning healthy sleep routines is another way to help clients' physiology adjust and increase self-regulation, thereby facilitating improved relationship functioning.

A growing and popular approach to improving physiological regulation is through mindfulness practices. Mindfulness, like meditation, is thought to promote psychophysiological regulation, reducing arousal and reactive responses. This is accomplished through awareness of the present experience and nonjudgment, reducing reactivity. Growing evidence links mindfulness with self-regulation (Siegel, 2011), greater relationship satisfaction (Barnes, Brown, Krusemark, Campbell, & Rogge, 2007), and enhancement of non-distressed relationships (Carson, Carson, Gil, & Baucom, 2004) and has been suggested as a healthy parenting model (Duncan, Coatsworth, & Greenberg, 2009). SFTs can teach mindfulness skills and encourage continued use of such techniques outside of session. Indeed, couples who continue to use mindfulness-based techniques over time show better relationship functioning in the long term than those who do not (Carson, Carson, Gil, & Baucom, 2004).

Other Considerations and Future Directions

The study of psychophysiology in SFT processes is an exciting and intriguing area of the field. Because the mind–body connection is so clearly relevant to our understanding and work with relationships, it can appear to be a crystal ball that holds a multitude of answers, drawing us as scholars and practitioners in. Although there certainly are answers to be found in considering how physiology relates to SFT processes, we encourage some caution in this area.

It is important that we take care not to submit to reductionist explanations of complex internal systems. For instance, research has implicated a specific area of the brain—the insular cortex, especially the anterior insula—as responsible for visceral processes associated with emotional experiences (see Critchley & Harrison, 2013). It may be tempting, therefore, for researchers to hone in on this region of the brain when trying to understand why a child reacts the way she does to perceived disapproval from her parents. Perhaps, however, the child's emotional response is influenced by a synchronous process with her protective older sibling, in which it would be prudent to additionally examine the sibling's physiological/neural response and other systems known for synchronous responding. Emotional experiencing, like so many processes, is multifaceted and nuanced and only becomes more so in the context of dyads, triads, and more complex family systems. Although an in-depth examination of singular processes can be informative, they should exist in the context of systemic theory and investigation.

The psychophysiology literature dealing with family systems is usually based on sound theory, most often polyvagal theory (Porges, 2011), although other established human science theories are also integrated or otherwise foundational for such studies (e.g., attachment theory; Seedall & Wampler, 2012). The use of these theories notwithstanding, much of the literature still only gives a snapshot of singular physiological processes in the context of small subsystems (e.g., examining RSA in the context of couple interactions; Smith et al., 2011). Because the internal human system comprises many processes, the interrelation of which affect and are affected by external processes and behaviors, such limited examinations and their implications are akin to describing a complex, dynamic rain forest based on examining a single tree. What is needed is a more comprehensive investigation of psychophysiological processes and their association with myriad relational systems. For example, research has found that EDA, which indicates SNS activation, is higher among anxiously attached spouses during a conflict discussion when their spouse is more avoidantly attached (Taylor, Seedall, Robinson, & Bradford, 2018); however, perhaps this SNS response is contingent on the individual's propensity for a heightened stress response, which would be evident in his HPA axis functioning. Or, perhaps the SNS response during that conflict is different based on whether the couple has a crying infant in the room, which has been shown to lower the mother's heart rate (see Hane & Fox, 2016). Further, whether (or how) these system responses vary in or out of therapy sessions is unknown. Multifaceted studies are needed to truly understand the interplay of intra- and inter-individual systems.

One reason such studies do not exist in the SFT literature is that they require a lot of resources, in terms of both financial cost and time. Additionally, this kind of work is intrusive and demands a lot from research participants. This then raises the ethical question of whether we are asking too much of research participants who are also therapy clients. Even with good compensation, asking this much of clients may amount to compulsion. As a result, the psychophysiology literature related to SFT is still in its infancy. This is further evident in the fact that the vast majority of studies are correlational and cross-sectional in nature. A manageable first step would be to distribute the burden asked of research participants and use a planned missingness design, wherein each research participant is randomly assigned to provide a subset of the overall items used in the study (Little & Rhemtulla, 2013).

This would allow for multiple measures of internal and interpersonal functioning without taxing any one person. Of course, the sample size needed for this would be higher; for this, we recommend establishing collaborations with like-minded researchers and practitioners so data may be aggregated across sites, thereby facilitating larger and more diverse datasets.

Conclusion

Just as I (A.B.) was surprised to realize how constricted my view of systemic thinking and work has been, SFT as a field is awakening to the broader reality that internal systems shape the external systems we have been studying and vice versa. Our bodies, how they function, and how they subconsciously interact are integral to relational processes. As our understanding of these phenomena deepens, we are presented with more holistic intervention opportunities, including in- and out-of-session techniques. Even our physiological roles as therapists are an important consideration, suggesting that physiologically informed systemic thinking will influence our being as much as our practice. We encourage researchers and practitioners to attend to physiology as a pathway toward more effective therapy and greater integration and collaboration with those in other helping professions.

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