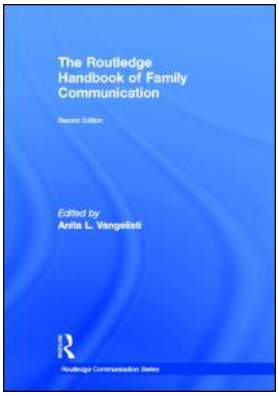

The Routledge Handbook of Family Communication

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Psychophysiological Methods in Family Communication Research

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Psychophysiological Methods in Family Communication Research

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We have been witness in the past decade to some extraordinary theoretic and methodological advances in the study of family communication, as many other chapters in this volume articulate. Among those with the greatest promise for transforming our understanding of family behavior is the collection of methods offered by psychophysiology. In 2004, Floyd articulated the potential of psychophysiological methods for illuminating family communication, as part of a special issue of *Journal of Family Communication* focused on innovative methodology. Today, psychophysiological research provides an unprecedented look at the connections between familial behavior, physiological response, and health, offering communication researchers multiple new avenues for effecting improvements in physical well-being via improvements in social well-being.

Our goal in this chapter is to introduce the theoretic principles of psychophysiology and to describe various research programs that are exploiting their advantages to improve our understanding of family communication processes. We conclude with recommendations for researchers interested in incorporating psychophysiological methods into their own research.

Psychophysiology as a Method for Understanding Family Communication

A principal assumption of psychophysiology is that cognitive, emotional, behavioral, and social events are all reflected in the body's physiological processes. Take, for example, the experience of fear, which is associated with a host of hormonal reactions, nervous system activities, and muscular responses that distinguish it from other emotional experiences, such as sadness or surprise. Falling in love likewise initiates neural and hormonal activities that differ systematically from those associated with falling out of love. Psychophysiological researchers focus attention on the multiple ways that social events—including communicative behaviors—interface with the body's physiological systems and influence health, disease, and wellness (Loving, Heffner, & Kiecolt-Glaser, 2006).

To appreciate the relevance of psychophysiological methods in the study of communication, it is necessary to recognize the somewhat counterintuitive assumption that *all communication acts are biological acts.* No social behavior, whether verbal or nonverbal, is possible without the direct intervention and interaction of multiple anatomical and

physiological systems. Production of a spoken word, for example, requires intricate coordination between the cerebral cortex, the spinal cord, the respiratory system, the laryngeal complex, and the muscles of the soft palate, tongue, and lips. Decoding of the same word depends on equally intricate collaboration between the tympanic membrane, the ossicles and cochlea, the spinal cord, and the cerebral cortex.

Communicative behaviors not only make use of anatomical and physiological systems; they, in turn, act upon those systems. If the spoken word is one of anger, its decoding will likely induce muscular tension, temporary immunosuppression, and the elevation of stress hormones such as cortisol in the hearer. If the word instead conveys appreciation, it may cause the release of neurotransmitters such as dopamine or peptide hormones such as oxytocin, imparting sensations of reward to the receiver. Recognizing the link between communication and physiology does not deny that many interpersonal acts are also historical, cultural, religious, political, economic, and aesthetic. Those are pervasive influences on communicative behavior, and we would not argue otherwise. Our argument implies, however, that insight into family communication is greatly advanced by exploring and understanding its physiological components. To prime our discussion, we next review the major physiological systems adjudicated in biophysiological behavioral research.

Principal Physiological Systems

To appreciate the use of psychophysiological methods, it is useful to understand various physical systems and what they do. In this section, we briefly address those issues for the brain and nervous system, and the cardiovascular, endocrine, and immune systems, which are the focus of much psychophysiological research.

Brain and Nervous System

The brain is a mass of tissue and nerves that consumes approximately 20 percent of the body's energy and brain controls every bodily activity and function with the exception of certain reflex actions. Structurally, the brain comprises four major regions: the *cerebrum*, *diencephalon*, *brain stem*, and *cerebellum*. The cerebrum, composed of the frontal, parietal, occipital, and temporal lobes, governs memory and learning, language and communication, olfaction, sensory processing, and movement. The diencephalon contains the thalamus, the epithalamus, and hypothalamus, the latter of which is an important component of the *limbic system*, which manages emotional experiences. The brain stem consists of the midbrain, the pons, and the medulla oblongata and plays important roles in alertness, consciousness, pain sensitivity, and cardiovascular and respiratory control. The cerebellum coordinates muscle movement, regulates muscle tone, and maintains equilibrium.

The brain and spinal cord comprise the central nervous system, whose function is to coordinate all bodily activity. The spinal cord serves three primary functions. First, it relays information and instructions from the brain through spinal nerves to coordinate motor activity. Second, it relays sensory information from sensory organs (eyes, ears, tongue, nose, and skin) to the brain for processing. Finally, it coordinates various reflex actions (Maton et al., 1993).

Cardiovascular System

The cardiovascular system comprises the heart and the arteries, arterioles, capillaries, veins, and venules through which blood is circulated. The heart contracts continuously to

pump oxygenated blood to the body. Deoxygenated blood returns from the body to the heart, where it is pushed through the pulmonary artery to the lungs for reoxigination. Newly oxygenated blood returns from the lungs to the heart's left atrium, where it is passed to the left ventricle for circulation via the aorta, the body's largest artery.

Endocrine System

The endocrine system comprises a network of ductless glands that produce and secrete *hormones*. Hormones are chemicals that bind to cells that contain receptor sites. Once bound, hormones alter the metabolic processes of their receptor cells.

Social science research has tended to focus primarily on the activities of particular glands, including the pituitary and adrenal glands and the gonads. The pituitary gland, located at the base of the brain, secretes eight hormones, four of which have been of interest to social scientists. *Oxytocin* stimulates uterine contractions and the let-down reflex in expectant mothers, and also plays a role in emotional bonding and attachment (Young & Wang, 2004). *Vasopressin* regulates water absorption by the kidneys and also facilitates pair bonding (Hammock & Young, 2006). *Prolactin* stimulates milk production in lactating women and is responsive to changes in emotion in both women (Turner et al., 2002) and men (Fleming, Corter, Stallings, & Steiner, 2002). Finally, *adrenocorticotropic hormone (ACTH)* initiates the one of the body's major stress responses (Aguilera, 1994).

The adrenal glands, located atop the kidneys, produce *cortisol*, a steroid hormone elevated in response to stress (Burke, Davis, Otte, & Mohr, 2005). The adrenal glands also produce small quantities of *androgens*, the male sex hormones, and *estrogens*, the female sex hormones (Rainey, Carr, Sasano, Suzuki, & Mason, 2002). Levels of androgens in females and estrogens in males are regulated by the adrenal glands. Most sex hormones, however, are secreted by the gonads. Female gonads, called ovaries, produce estrogens and *progesterone*, which govern secondary sex characteristics and regulate menstruation, and also appear to contribute to the onset and maintenance of maternal behavior (Rosenblatt, 2008). Male gonads, called testes, produce androgens (including *testosterone*), which produce secondary sex characteristics and regulate sperm production, and are also associated with aggression in both men (Dabbs, Frady, Carr, & Besch, 1987) and women (Dabbs, Ruback, Frady, Hopper, & Sgoutas, 1988).

Immune System

The body's immune system consists of a coordination of structures and processes that protects against disease by identifying and destroying tumor cells and pathogens, whether bacterial, viral, fungal, parasitic, or prionic (Klosterman, 2009). The immune system includes two separate but interrelated components: the *innate* immune response and the *adaptive* immune response. Innate immunity is a nonspecific response that humans share not only with other mammals but also with lower-order organisms such as sponges. The innate immune response includes three processes: (a) inflammation, produced by granulocytes and cytokines; (b) antibody response, produced by complement proteins; and (c) cellular response, facilitated by leukocytes and natural killer cells. The adaptive immune response is a pathogen-specific response that incorporates B and T lymphocytes (small white blood cells that identify foreign bodies for the immune system to attack) and immunoglobulins. Unlike the innate immune response, the adaptive immune response confers immunity, protecting the organism against future threats by the same pathogen.

Having now reviewed the fundamental principles of psychophysiology and the major physical systems it adjudicates, we turn our attention next to the broad and growing research literature on the physiological bases of family communication.

Applications to Family Communication

Thus far we have reviewed some of the major concepts, biological systems, and theoretic approaches used in biophysiological social science. Even though the importance of biology was emphasized years ago by interpersonal communication scholars such as Beatty and McCroskey (Beatty, McCroskey, & Heisel, 1998; McCroskey, 1997), Cappella (e.g., 1991, 1996), and others (e.g., Andersen, Garrison, & Andersen, 1979; Horvath, 1995), communication science lags behind many other social science disciplines (including psychology, sociology, family studies, bio-behavioral health) in terms of recognizing and implementing a biological approach. Several communication scholars have argued for quite some time that a focus on biology is the "wave of the future." In fact, Knapp, Miller, and Fudge (1994) argued in the *Handbook of Interpersonal Communication* that providing greater attention to biological correlates and influences was an important direction in interpersonal communication research. Much contemporary research in family and interpersonal communication suggests that their vision is finally being realized. Why has it taken so long for interpersonal communication scholars to begin to recognize the importance of biology? We can identify at least eight reasons why interpersonal communication scholars have only recently incorporated biology into their empirical studies:

1 the relative newness and smallness of the communication discipline;
2 a lack of knowledge about how to conduct biosocial research;
3 the belief that researchers must be biologists or neuroscientists to do physiological research;
4 a lack of understanding about the importance of biology for human behavior;
5 the logical barriers of cost, technology, and time;
6 a fear that validating the role of biology in human behavior somehow diminishes the study of behavior;
7 a concern on the part of institutional review boards and funding agencies that the communication discipline is unequipped to do such research;
8 a backlash to a misperceived deterministic approach in biosocial research.

Regardless of just how much of our communication is genuinely genetically directed, researchers have come a long way from using deterministic approaches to study biosocial processes. As Booth, Carver, and Granger (2000) noted, until relatively recently there were significant gaps in the understanding of the connections between physiological processes and human behavior. As those authors suggested, "the nature of many physiological processes was largely unknown, and the technology necessary to operationalize physiological variables was in its infancy" (p. 1018). Many researchers who conducted physiological research turned to rather simplistic, reductionistic explanations to understand the influence of biology on behavior (Booth et al., 2000). However, the introduction of noninvasive and relatively inexpensive measures of biological markers and the breaking of interdisciplinary boundaries has dramatically increased our knowledge of physiology in human behavior (Booth et al., 2000; Hellhammer, Wust, & Kudielka, 2009). Dynamic models that recognize the fluid interplay among contextual, behavior, and

biological processes have replaced deterministic ones. Gottlieb (1991) contends that biology lays the foundation for individuals' ability to adapt to environmental challenges. However, environmental challenges simultaneously induce behavioral change that, in turn, affects biological responses such as hormone secretion and gene manifestation (Booth et al., 2000). Biological processes that predict a particular behavioral response, and behaviors that predict changes in biological processes, may be stimulated or attenuated by environmental challenges. Consequently, interpersonal communication and the environment that surrounds those communicative behaviors, play a considerable role in influencing, and being influenced by, physiological processes.

In this section, we highlight some of the physiological research in interpersonal communication while simultaneously drawing from research in other disciplines to inform our research. More specifically, we will examine biosocial research on speech anxiety and "trait-based" communication skills, attraction, affection, touch and social support, aggression and violence, emotions, and intrapersonal communication processes such as planning and imagined interactions.

Communicating Attraction: Pathways to Long-Term Pair Bonding

Several theorists in the fields of communication and psychology have argued that the formation of significant relational ties with others is an essential part of the human experience. Baumeister and Leary (1995) proposed that humans have a fundamental "need to belong," that is, an innate need to form long-term relationships with other individuals in the context of communities. Taylor et al. (2000) likewise argued that the need for long-term relationships is necessary for survival, particularly for the female members of a given species. Similarly, Floyd (2006) argued that the affection and support received from long-term relationships augments the overall health and well-being of individuals in these relationships.

Although each of these theorists offer a slightly different perspective on the significance of close relationships, all are unanimous in their assertion that the formation of long-term pair bonds confers certain strategic advantages on the members of these partnerships. For example, the belongingness hypothesis specifically notes that membership in a community provides individuals with greater access to important resources like food, shelter, water, protection, and potential mating partners (Baumeister & Leary, 1995). Tend-and-befriend theory (TBT; Taylor et al., 2000) posits that the protection provided within communities is an especially important factor in the formation of long-term relationships among female members of a species. Because female members of most mammalian species are physically smaller than their male counterparts and typically bear the primary responsibility of care for offspring, the typical fight-or-flight responses associated with the experience of stress are maladaptive insofar as they potentially place offspring at greater risk. As a result, parallel behavioral mechanisms that promote affiliation in the face of stress have evolved: tending and befriending. According to the theory (Taylor, 2006; Taylor et al., 2000), tending involves caring for, protecting, and soothing offspring during moments of stress whereas befriending involves the active solicitation of assistance from peers. In addition to many of the social benefits delineated in the aforementioned theories, Floyd's (2006) affection exchange theory (AET) argues that the communication of affection, a behavior that aids in the development and maintenance of close relationships, is physiologically rewarding for individuals. As such, individuals are encouraged to develop and foster significant relationships (especially affectionate

romantic relationships) by biochemical reactions that occur within their own bodies (a review of studies investigating this claim follows). Given that these relationships are both psychologically and physiologically rewarding, people often invest considerable resources into the maintenance of these relationships. The theory further argues that, over the lifespan of the relationship, individuals tend to be highly selective when picking potential relational partners and utilize affection gestures to remain attuned to their partners' level of commitment to the relationship after it is established.

One of the claims of AET is that people are selective when choosing a potential long-term romantic partner, but what features are desirable when individuals try to identify suitable partners? One typology (McCroskey & McCain, 1972) identified three characteristics that individuals find particularly attractive in relational partners (including long-term pair-bond partners): physical attractiveness, social attributes, and task abilities. Physical attractiveness includes numerous aspects of physical appearance such as clothing and sexual attractiveness. Social attributes refer primarily to the friendship prospect that others pose; as such, items associated with this dimension of attractiveness refer to others' pleasantness and whether or not they are similar to/compatible with existing friends. Finally, task abilities refer to whether or not others are reliable, adept at solving problems, and focused on relevant tasks. In subsequent paragraphs, we will review research relevant to the first two of these characteristics.

Physical Attractiveness

Researchers from fields like evolutionary psychology and cultural anthropology have invested considerable effort into identifying physical traits that contribute to an individual's level of attractiveness. Although these studies have identified several traits that contribute to both men and women's levels of attractiveness (for review, see Gallup & Frederick, 2010), for the purpose of this review, we will focus on studies that have examined the role of facial attractiveness, body proportion and symmetry, and scent in assessments of attractiveness.

Although many people recite the adage "beauty is in the eye of the beholder," several studies have revealed that there are in fact several facial features that are universally attractive (e.g., facial symmetry, facial neotany). In a recent study, Gangestad, Thornhill, and Garver-Apgar (2010) examined whether or not men's facial masculinity, facial attractiveness, or intelligence moderated the relationship between the point of maximum fertility in their female partner's menstrual cycle and extra-dyadic attraction. Overall, results indicated a strong and consistent effect for facial masculinity such that low levels of facial masculinity were associated with relatively high levels of female partners' extra-dyadic attraction during ovulation. By comparison, men's facial attractiveness yielded a similar albeit weaker effect (partial ^{2} for masculinity = .25 and for attractiveness = .14) and men's levels of intelligence did not affect the relationship between fertility and extra-dyadic attraction.

Studies examining the role of body symmetry and scent have revealed that these characteristics tend to overlap quite significantly. The now-famous "T-shirt studies" (Gangestad & Thornhill, 1998; Thornhill & Gangestad, 1999) were among the first to evaluate the relationship between physical attractiveness and scent. In each of these studies, experimenters asked individuals to sleep in T-shirts for two nights then asked opposite-sex raters to evaluate the scent of the T-shirts on three criteria: pleasantness, sexiness, and intensity. Although men did not demonstrate a strong preference for particular

female scents, women (particularly those who were ovulating during the assessment) consistently preferred the scent of men whose level of fluctuating asymmetry (FA) was low. These authors argue that one possible explanation for the relationship between scent and symmetry is that both are indicators of genetic fitness. Indeed, recent studies investigating the link between attractive scents and genetic fitness have identified the major histocompatibility complex (MHC) as a likely link between these two factors (Thornhill et al., 2003). The MHC is a highly polymorphic collection of genes that enables the immune system to differentiate between the body's own tissue and pathogens (Penn & Potts, 1999) meaning that animals (including humans) with heterogynous MHC genes are advantaged over their counterparts with relatively homogenous MHC genes. As a result, results from experimental studies indicate that individuals preferentially seek out mates whose MHC genes would benefit potential offspring. At least one experimental study has explored the relationship between scent, MHC variability, and body symmetry; Thornhill et al. (2003) determined that ovulating women's assessments of men's scent attractiveness were negatively associated with men's degree of FA ($r = -.29$) whereas men's MHC heterozygosity was positively associated with scent attractiveness ($r = .33$) despite the fact that FA and MHC heterozygosity were not directly related.

Social Attractiveness

Physical features like facial attractiveness, scent, and body symmetry often affect assessments of attractiveness at an unconscious level. In contrast, scholars in communication studies have identified several aspects of interaction that affect attraction at a conscious level. Burleson and colleagues (Burleson & Denton, 1992; Burleson & Samter, 1996) have examined the role that cognitive and communicative skills play in the process of attraction and the maintenance of ongoing relationships. Overall, the results of these studies reveal that one of the most important social aspects of both attraction and relationship maintenance is similarity in social skill levels. Whether seeking a friend or a spouse, individuals are attracted to others whose cognitive and social abilities match their own, and, once the relationship has been established, similarly matched pairs tend to foster satisfying interaction. Evidence for the matching effect is evident among dyads with differing levels of skills—Burleson and Denton (1992) reported that married couples consisting of two low-skilled communicators did not differ in reported levels of satisfaction from couples consisting of two highly skilled communicators.

Communicating Affection in the Family

For many couples that successfully navigate the attraction and courtship process, the next step in the progression of their relationship is marriage, a public pronouncement of their mutual affection as well as a legal relationship in which spouses agree to share their resources with one another. Indeed, empirical studies have confirmed that, compared to unmarried individuals and those in dissatisfying relationships, happily married individuals report higher levels of happiness and satisfaction, report lower levels of depression, experience decreased mortality risks, and exhibit reduced risk for cardiovascular diseases (for a full review, see Robles & Kiecolt-Glaser, 2003). Of the explanations that have been offered for the benefits of marriage, several scholars have argued that the provision of social support that occurs within these relationships provides satisfied spouses with the

resources they need to maintain their health and well-being (Robles & Kiecolt-Glaser, 2003).

While it appears that spousal relationships can indeed be healthy, scholars are still developing theoretical explanations as to *why* supportive spousal relationships lead to positive health indicators. One possible explanation highlighted by our research group at Arizona State University lies in the ability of an individual to communicate and receive affection, defined as feelings of deep warmth and regard towards another (Floyd, 2006). In this section we will discuss the theoretical foundation of this premise, moving into the research on the benefits of both spousal and parental affection.

Affection Exchange Theory

Affection exchange theory (AET), initially developed a decade ago and subsequently elaborated (Floyd, 2006), is a neo-Darwinian perspective based on the theoretical premise that humans are driven towards the superordinate evolutionary goals of survival and reproduction. AET states that all humans are born with the innate capacity to give and receive affection, regardless of time, race, and culture. Since the inception of AET in the literature, a growing number of articles have supported the basic tenets of the theory. Floyd (2002) found a positive association between affection and a host of relational and psychological variables, including relational satisfaction, a secure attachment style, and the number of close relationships. These findings were replicated in a later study that additionally showed that the benefits existed for given affection *even after controlling for received affection* (Floyd et al., 2005). Research has also found that affection is associated with healthier levels of blood pressure, glycosylated hemoglobin, and total cholesterol (Floyd, Hesse, & Haynes, 2007; Floyd, Mikkelson, Hesse, & Pauley, 2007). We subsequently will discuss a multitude of studies showing the same health benefits in a family context.

Spousal Affection and the Stress Response. Studies examining the benefits of spousal communication of affection have examined the question from two basic avenues: whether levels of affection that are typical within ongoing partnerships or manipulated levels of spousal affection relate to health. Floyd and Riforgiate (2008) examined whether expressed affection in a spousal relationship was related to individual diurnal cortisol variation. A healthy diurnal variation contains a high peak in the morning and a large drop throughout the day, reaching the low point during near midnight (Kirschbaum & Hellhammer, 1989). As hypothesized, they found a strong linear relationship between levels of expressed affection by the spouse and participant diurnal cortisol variation, as well as waking cortisol levels and the ratio between cortisol and dehydroepiandrosterone-sulfate (DHEA-S) (Floyd & Riforgiate, 2008). Another study utilizing a sample of premenopausal women found an inverse relationship between self-reported levels of partner hugs and blood pressure. They also discovered a positive relationship between partner hugs and baseline levels of oxytocin, a hormone commonly linked to bonding and attachment (Light, Grewen, & Amico, 2005).

Several studies have examined the question of whether manipulated levels of spousal affection can impact physiological health. One research team has conducted work on the physiological benefits of warm contact (a ten-minute period of sitting in close proximity while holding hands and viewing a romantic film clip) in a spousal relationship (e.g., Grewen, Girdler, Amico, & Light, 2005). A recent study out of this line of research took married couples through a four-week intervention designed to teach couples how

to support each other better through touch and massage. Oxytocin levels rose for the experimental group throughout the procedure, while the experimental group also experienced a significant drop in alpha amylase relative to controls (Holt-Lunstad, Birmingham, & Light, 2008). Another study found a relationship between oxytocin levels and nonverbal displays of romantic love such as Duchenne smiles and head nods (Gonzaga, Turner, Keltner, Campos, & Altemus, 2006). Our research team examined the benefits of kissing in a spousal relationship, instructing the experimental group to increase romantic kissing in their relationship over a six-week period, while a control group experienced no relational change. After the trial, the experimental group had a significant drop in total cholesterol, while the control group had no change (Floyd et al., 2009).

Parental Affection and the Stress Response. The amount of affection that parents show to their children can also have important attachment and biopsychosocial outcomes. Tend and befriend theory (TBT: Taylor et al., 2000) argues that one of the main behaviors exhibited by women in periods of high stress is tending to offspring while blending into the environment. The displays of affection thus mute the stress response from the child, giving the child maximum capacity to survive until adulthood. Taylor and colleagues review a plethora of research that supports the premise that affectionate communication from the mother leads to a healthier stress response from the child (Taylor et al., 2000). Other research has revealed that mothers' abilities to communicate affection to their children can be affected by their attachment style. One study of first-time mothers found a relationship between a secure attachment style and greater brain activation of several regions associated with reward while the mothers viewed images of their own infants. Mothers with a secure attachment style also experienced greater levels of oxytocin activation upon touching their infant than did those with an insecure attachment style (Strathearn, Fonagy, Amico, & Montague, 2009). Oxytocin has also been linked to the communication between fathers and infants, with a positive relationship between levels of synchronous effect between fathers and infants during a social interaction and levels of oxytocin (Gordon, Zagoory-Sharon, Leckman, & Feldman, 2010).

Parental affection can lead to several biopsychosocial outcomes for the children as well. Schrodt, Ledbetter, and Ohrt (2007) found that affection mediated the relationship between family communication patterns and young adult children's mental well-being (both perceived stress and mental health). Another study surveyed children over the span of several decades as they grew into adults, discovering an inverse relationship between levels of maternal affection that participants received at the age of eight months and levels of general distress for the same participants as adults (Maselko, Kubzansky, Lipsitt, & Buka, 2011). Children who received lower levels of parental affection were less able to regulate the stress response, with higher baseline cortisol levels and more sustained cortisol levels following a stressor (Wismer Fries, Shirtcliff, & Pollak, 2008).

The overarching conclusion from this body of research is that affection in the family is adaptive, helping spouses to connect, helping parents nurture offspring, and helping children respond to stress throughout their lifetime. Altough affection can lead to substantial health benefits, the communication of conflict can prove detrimental to several psychological and physiological markers, which we will now discuss.

Conflict in the Family

As previously outlined, a large body of research supports the conclusion that satisfying marital relationships lead to higher indices of psychological and physiological well-being

for individuals compared to people who are single or even dating; however, a multitude of studies demonstrate that, as healthy as marriages can be, unhealthy marriages lead to very unhealthy consequences for those same individuals, including poor indices of cardiovascular health and immune functioning. (e.g., Denton, Burleson, Hobbs, Von Stein, & Rodriguez, 2001; Robles & Kiecolt-Glaser, 2003). In this section we will summarize studies that have examined marital conflict in couples, the links between physiology and divorce, and the impact of conflict and divorce on children.

Physiology and Marital Conflict

Research on the physiology of marital conflict has focused on both newlywed and long-term married couples. Several studies by the Kiecolt-Glaser research team from Ohio State have analyzed the physiological effects of marital conflict behaviors in newlywed couples. In one of their earlier studies, newlywed couples were instructed to undertake a 30-minute conflict discussion on a divisive topic. The researchers found that the individuals (especially women) who exhibited more negative behaviors during the conversation had significantly higher levels of adrenocorticotropic hormone (ACTH), epinephrine, and norepinephrine (Malarkey, Kiecolt-Glaser, Pearl, & Glaser, 1994). In a second study, wives' cortisol levels (indeed, all hormonal levels that were studied, including epinephrine and norepinephrine) rose in response to the conflict setting, and this was especially true when the wife would enact a negative behavior that prompted her husband to withdraw from the interaction (Kiecolt-Glaser et al., 1996). The husband's cortisol level, on the other hand, did not significantly change during the conflict setting. This was partially explained by the notion that women are generally more sensitive to negativity in the relationship than are men (Kiecolt-Glaser et. al., 1996).

Both studies also proposed an interaction between measures of immune functioning and the amount of negative communication strategies participants enacted during the conflict. Overall, the findings showed a strong interaction, as more negative participants had significantly greater variation in their immune system health when compared to positive participants. For example, compared to positive participants, negative participants were found to have lower levels of antibodies, evidence of a weaker immune system (Kiecolt-Glaser et al., 1993). Negative participants also had a higher amount of antibody titers produced for the Epstein-Barr virus (EBV), a latent herpes virus that is present in virtually everyone, suggesting that the cellular immune response of the negative group was less competent in controlling the latent virus (Kiecolt-Glaser et al., 1993). Overall, the negative participants showed a greater amount of immune down-regulation. As with the hormonal results, the effects of the conflict on the immune system were stronger for women than for men. Those findings support the claim that newlywed couples are physiologically impacted by marital conflict and strife.

To ensure that the high levels of happiness and relationship satisfaction typical of newlywed couples did not confound the results of the studies previously discussed, Kiecolt-Glaser and colleagues replicated the study using older married adults (Kiecolt-Glaser et al., 1997). The researchers gathered couples that had been married, on average, for 42 years (mean age of 61). As with the newlywed couples, negative behaviors and negative escalation (especially for wives) accounted for a significant proportion of the variance for cortisol production, as well as several immunological assays (e.g., EBV and lymphocyte production), supporting the claim that the relationship between physiology and marital conflict lasts throughout the life of the marriage.

Physiology and Divorce

Several studies claim that the longevity of a marriage can be predicted through individual physiological reactivity to marital conflict. Levenson and Gottman (1985) discovered a general relationship between physiological arousal during conflict and relational satisfaction over a three-year period. Three years after the couples engaged in conflict, all previous measures of physiological arousal were highly correlated with the husband's later marital satisfaction, even controlling for the initial levels. Levenson and Gottman continued this promising line of research by undertaking three more long-term studies of married couples (see review in Gottman, 1994). Overall, the husband's heart rate was found to be a predictor of marital satisfaction and relational dissolution in two of the three studies, while the wife's heart rate was a predictor in the middle study. Based on these findings, Gottman referred to this cardiovascular arousal as flooding in his later papers, arguing that the arousal leads to a cascading effect for a couple towards isolation, loneliness, and divorce (Gottman, 1994).

In 2003, Kiecolt-Glaser's research team decided to bring back their 1993 newlywed sample for a ten-year follow-up, seeking to understand whether conflict behavior and hormonal levels could predict future dissolution of the marriage (17 of the 90 couples had divorced in the interim). Basal levels of epinephrine and ACTH at Time 1 were markedly higher for the divorced group versus the married group (Kiecolt-Glaser et al., 2003). Norepinephrine spikes were significantly higher for those couples still married who classified themselves as dissatisfied as opposed to satisfied couples (Kiecolt-Glaser et al., 2003).

The toll that divorce takes on the physiological makers of health in distressed and recently divorced individuals has been well documented, but until recently, the physiological effects of divorce on the children of divorced and divorcing couples had received comparatively little attention. Indeed, research has confirmed that inter-parental conflict often spills over into parent–child interactions in the form of negative comments and inappropriate disclosures that reduce children's well-being (Afifi, McManus, Hutchinson, & Baker, 2007). Experimental studies examining the effect of marital distress on conversations between children and parents have confirmed that the discussion of inter-parental conflict is both psychologically and physiologically distressing to the children. Afifi, Afifi, Morse, and Hamrick (2008) found that the experience of divorce significantly contributed to children's feelings of being "caught" between their parents and that this feeling predicted both emotional and physiological distress during a discussion of the parents' relationship. Additional evidence suggests that young adult children of divorced parents experience hormonal changes that contribute to feelings of stress when engaged in a discussion of family conflict issues with a parent. When divorced parents make inappropriate disclosures to their young adult children, their children's α-amylase levels (a salivary enzyme linked to cardiovascular responses to stress; see Granger et al., 2006, for review) exhibit a marked reduction immediately following the conversation followed by a significant increase 20 minutes post-interaction (Afifi, Granger, Denes, Joseph, & Aldeis, 2011). The authors note that this pattern of delayed reaction is significant insofar as it provides speculative evidence for the burden that adult children from divorced families often experience. Whereas divorced and divorcing parents are often hesitant to disclose many details about their relationship to younger children, adult children frequently serve as a confidant for one or more of their parents. As such, the authors posit that they exhibit a somewhat blunted stress response during inappropriate parental

disclosures but that their discomfort with the situation eventually provokes a "flight" response.

Although this review is far from exhaustive, it has identified multiple interpersonal communication topics toward which the principles of biophysiology have been applied. To conclude our chapter, we offer the following comments on the future uses of the evolutionary and biophysiological approach and some brief words of advice for researchers interested in pursuing that approach in their own work.

Incorporating Psychophysiological Methods in Family Communication Research

To conclude this chapter, we have elected to address some practical issues relevant for family communication researchers interested in incorporating physiological measures into their work. Those issues concern training requirements and requirements for facilities and instrumentation.

Training Requirements

We have surmised elsewhere (Floyd & Afifi, 2012; Floyd & Haynes, 2005) that psychophysiological methods could be more useful in many sub-fields of the communication discipline if only adequate training were available to graduate students and researchers. Indeed, a small handful of graduate programs in communication now offer such training, which incorporates the theoretic, physiological, and procedural aspects of psychophysiological research.

Theoretic Training

Applying physiological methods to the study of family communication requires fluency in the theoretic bases of psychophysiology, biological psychology, and the processes of natural selection. Those theories give researchers a basis for deriving testable hypotheses—such as, for instance, the hypothesis that marital conflict is physically stressful. Those theories are not overly complex, but they are infrequently incorporated into communication training at the undergraduate or graduate level, which instead relies heavily on learning theory models.

Physiological Training

Besides understanding the theories from which one might derive predictions regarding the physiological nature of communication acts, researchers must also understand the physiological systems and outcomes they are examining. To document the physical stress of marital conflict, for instance, one should be familiar with the structure of the endocrine system and the nature of stress hormones, in order to know which hormones to measure and when.

Procedural Training

Finally, as with any method, researchers must learn the procedures of psychophysiological research. Knowing which stress hormones should be elevated by marital stress—and

why—are important first steps, but they are of limited use until one knows *how* to measure those hormones. Unlike attitudes, beliefs, or intentions, most physiological outcomes cannot be measured via self-report or unobtrusive observation; rather, they require a different skill set, which can be obtained via education and experience.

Facilities and Instrumentation

A second practical issue for communication researchers interesting in using psychophysiology is the need for adequate facilities and instruments. Here, we will address the importance of data collection facilities, data analysis facilities, and instrumentation separately.

Data Collection Facilities

Facility requirements for data collection vary substantially according to the type of physiological outcomes being measured. Simple cardiovascular measurements, such as blood pressure or pulse rate, can be made in most any facility where proper instrumentation is available. Taking immune and hormonal measurements, in contrast, often requires collecting blood samples, which must be done by trained personnel in a laboratory with an appropriate biohazard rating. Although most communication departments do not have such laboratories, communication researchers can often gain access to appropriate facilities by collaborating with scholars in other disciplines, such as nursing, clinical psychology, or exercise science.

Data Analysis Facilities

Many laboratories that are equipped to collect physiological samples—such as blood or saliva—are not equipped to analyze them. Communication researchers should investigate in advance their options for data analysis. Options include professional service laboratories that will analyze the samples on a fee basis and "wet labs" at the researchers' own school, which may be willing to conduct the analyses at cost.

Instrumentation

Finally, psychophysiological measures require appropriate instrumentation. Some instruments—such as a stethoscope and sphygmomanometer for blood pressure assessment—are relatively inexpensive and uncomplicated to operate. Other instrumentation—such as an electrocardiogram for heart rate assessment or an electroencephalogram for neurological assessment—are more expensive to buy and maintain, and come with greater training requirements. Again, communication researchers just beginning to use physiological methods often find it best to collaborate with colleagues who are trained to operate such instrumentation.

Communication researchers are fortunate to have a wide variety of theories and methods to bring to bear on understanding the family. In this chapter, we have articulated how the use of psychophysiology can illuminate aspects of family communication—and its implications for health and well-being—that are not well adjudicated by other methods.

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