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Targeting couple and parent-child coercion to improve health behaviors

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ABSTRACT

This phase of the NIH Science of Behavior Change program emphasizes an "experimental medicine approach to behavior change," that seeks to identify targets related to stress reactivity, self-regulation, and social processes for maximal effects on multiple health outcomes. Within this framework, our project focuses on interpersonal processes associated with health: coercive couple and parent-child conflict. Diabetes and poor oral health portend pain, distress, expense, loss of productivity, and even mortality. They share overlapping medical regimens, are driven by overlapping proximal health behaviors, and affect a wide developmental span, from early childhood to late adulthood. Coercive couple and parent-child conflict constitute potent and destructive influences on a wide range of adult and child health outcomes. Such interaction patterns give rise to disturbed environmental stress reactivity (e.g., disrupted sympathetic nervous and parasympathetic nervous systems) and a wide range of adverse health outcomes in children and adults, including dental caries, obesity, and diabetes-related metabolic markers. In this work, we seek to identify/develop/validate assays assessing coercion, identify/develop and test brief interventions to reduce coercion, and test whether changes in coercion trigger changes in health behaviors.

This phase of the National Institutes of Health (NIH) Science of Behavior Change (SoBC) program encourages an experimental medicine approach to behavior change and improving health outcomes, with a focus on cross-cutting phenomena that have broad implications for changing behaviors associated with stress reactivity, self-regulation, and social processes. Behavior accounts for about 40 percent of risk associated with preventable premature deaths and problematic health conditions in the United States (NIH, 2017). Risky behaviors include substance use, physical inactivity, poor diet, poor sleep, and failing to follow through on medical advice to reduce morbidity (e.g., maintain healthy weight, take medications as prescribed, engage in good oral hygiene practices) among those at elevated risk. It is important to note that most of these behaviors occur in social contexts. Arguably, family provides the most potent socialization context for behaviors that can support or impede healthy behavior change. In fact, considerable research implicates family interaction in directly affecting proximal health outcomes, including, but not limited to, cardiovascular reactivity (Cartozian & Ybarra, 2005; Ewart, Taylor, Kraemer, & Agras, 1991), immunologic function (Kiecolt-Glaser et al., 1993), sleep quality (Troxel, Braithwaite, Sandberg, & Holt-Lunstad, 2016), metabolic responses to high fat meals (Kiecolt-Glaser et al., 2015), peripheral neuroendocrine activity (Malarkey, Kiecolt-Glaser, Pearl, & Glaser, 1994), the activity of brain regions implicated in stress (Graham, Fisher, & Pfeifer, 2013), and wound healing (Kiecolt-Glaser et al., 2005). Furthermore, family processes can encourage or impede health behaviors by providing contexts in which diet, activity, engagement with primary health care, and other behaviors occur (Repetti, Taylor, & Seeman, 2002). Given such findings, it is encouraging that family processes can be considered as potential malleable targets to treat many medical disorders (e.g., DiMatteo, 2004) and prevent new ones (Brotman et al., 2012).

1. Experimental medicine approach

An experimental medicine approach involves (1) identifying an intervention target, (2) developing assays, or measures, to allow one to verify that one has engaged said target, (3) experimentally engaging said target, and (4) testing the degree to which the target engagement produces a desired behavior change. In the present paper, we will discuss plans for an experimental medicine approach to a destructive interpersonal process—coercion—that has ramifications for key health behaviors related to Type II Diabetes and oral health.

2. Coercive process

We have chosen to focus on coercive conflict in couples and

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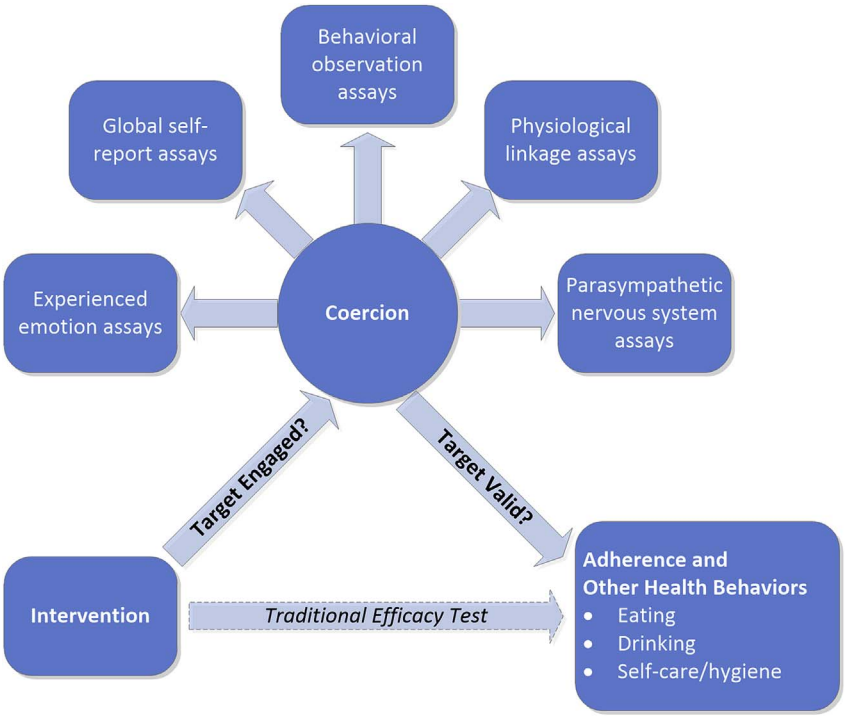

Fig. 1. Experimental medicine approach to behavior change model of coercion and health.

between parents and children. Coercion Theory (Patterson, 1982; Reid, Patterson, & Snyder, 2002) is one of the most highly developed and influential interpersonal models of dyadic family conflict. It explains how, despite their unpleasant and destructive qualities, hostile escalation in conflict is functional and reinforced for both parties. To the extent that dyads' conflicts are characterized by mutually reinforced, mutually escalating behavior and affect, they are coercive. Patterson posited that people learn coercive behavior through ways in which conflicts are resolved. Over time, if Person A responds to Person B's escalating aversive behavior by giving in, thus ceasing his/her own aversive behavior, B learns to escalate to get his/her way. Importantly, both persons' behaviors are maintained through reinforcement. B is negatively reinforced for escalating (via A withdrawing) and may be positively reinforced as well (via A doing what B was asking for in the argument). A is negatively reinforced for giving in (via the termination of B's aversive behavior).

Take, for example, a child who resists having her teeth brushed by her mother. The child might start to whine and pull away. In response, the mother might scold and yell at the child and more forcefully try to get her teeth brushed. At this point, the child screams and throws her toothbrush. Her mother, frustrated, leaves the bathroom and the screaming child. The child ceases her tantrum, but her teeth go unbrushed. In this scenario, the final behaviors of both the child and parent are negatively reinforced by conflict termination (i.e., escape conditioning). The child is negatively reinforced for screaming and throwing the toothbrush. The mother is negatively reinforced for acquiescing to the child's resistance.

Over time, these conflicts serve as learning trials. Of course, B does not always win. Sometimes, B backs down in response to A's aversive escalation. Thus, once a coercive process takes hold, both members of the dyad are faced with an unfortunate choice: (a) give in and lose the battle, or (b) win via out-escalating the other. This process leads to ever darker, bitter battles. In Patterson's (1976, p. 1) exquisite phrasing, each person is both “victim and architect of a coercive system.” This very specific dyadic process is the operationalization of coercion we use as the target in our proposed research. We will return to the measurement challenges faced by this specific construct below.

In its original instantiation, Coercion Theory was defined primarily in functional-analytic, operant reinforcement terms (as outlined immediately above), and provided the first truly transactional account of adverse family relations. These relations could now be understood as long term outcomes of dynamic, reciprocal aversive exchanges that occurred thousands of times across development in at risk families. Coercion Theory identified reinforcement contingencies that maintained anger and aggression within families, predicted longitudinal increases in such outcomes, and recognized that *both* parents and children negatively reinforce one another's aversive behaviors (Patterson, DeBaryshe, & Ramsey, 1989; Snyder & Stoolmiller, 2002). These observations enjoy overwhelming empirical support (e.g., Lansford et al., 2011).

More recent instantiations of Coercion Theory elaborate on this behavioral perspective by specifying *internal* mechanisms of reinforcement that maintain aversive family relations (see Beauchaine & Zalewski, 2016). In particular, Snyder and colleagues (e.g., Snyder, Edwards, McGraw, Kilgore, & Holton, 1994; Snyder, Schrepferman, & St. Peter, 1997; Snyder & Patterson, 1995), as well as our own group (Slep, Heyman, & Lorber, 2016), demonstrated that conflict escalation is accompanied by emotion dysregulation, that affected family members are more likely to escalate conflict when in dysregulated, irritable states, and that intense displays of negative emotion are more likely to terminate conflict in coercive families than in less aggressive families. Thus, not only does negative reinforcement occur through escape from aversive behaviors of others, but also through escape from one's own negative affective states. Escape from one's own negative affective state is a potent motivator for conflict behaviors that undergird coercive process (Lorber, Del Vecchio, Feder, & Slep, 2017).

As this discussion reveals, contemporary Coercion Theory explains active ingredients in both couple and parent-child coercion, which are marked by interrelated sets of affective, behavioral, and physiological signatures. Aversive behaviors, physiological reactivity/arousal, affective lability, and emotion dysregulation are all reinforced and maintained by coercive relationship dynamics (e.g., Beauchaine & Zalewski, 2016; Beauchaine, 2015). Coercion Theory provides specific targets for intervention. Indeed, all of these processes are implicated directly in the progression of type 2 diabetes and dental caries, as reviewed below.

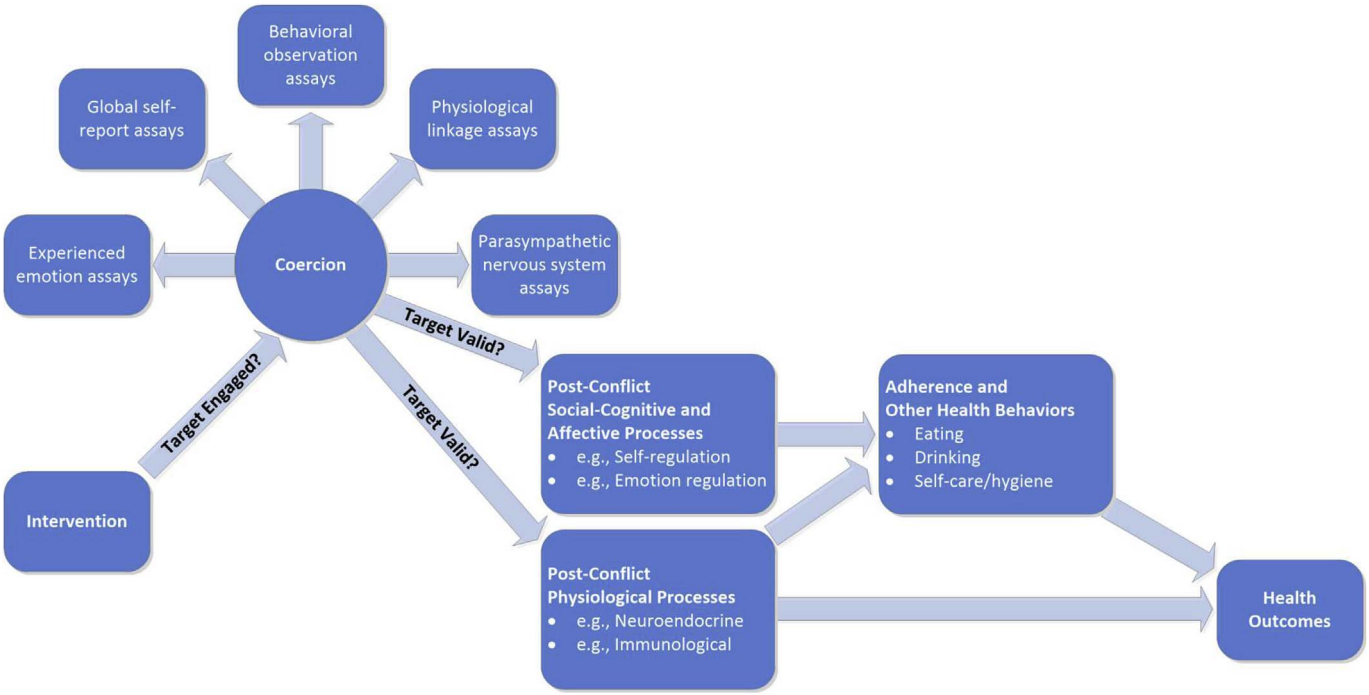

Fig. 2. Full heuristic model: Experimental Medicine Approach to Behavior Change Model of Coercion and Health, including proximal and distal health-related outcomes.

Accordingly, all are putative indicators in Fig. 1—which outlines our experimental medicine approach to couple and parent-child coercion, behavior change, and health—and will be refined further as part of our project.

Fig. 2 presents an expanded heuristic model, which adds additional potential mediators. As noted in extensive reviews by Robles, Slatcher, Trombello, and McGinn (2014) in a meta-analysis of 126 published empirical articles investigating relationship quality and physical health, and Repetti et al. (2002) in an extensive review of effects of negative family environments on children, sizable literature link hostile couple and parent-child relationships to (a) problems with social-cognitive and affective processes, such as self-regulation of emotion and behavior; (b) physiological stress reactivity, such as cardiac and electrodermal reactivity; and (c) poor health outcomes.

Following from this literature, we hypothesize that changing coercive processes will have direct effects on adherence and health behaviors (eating/drinking/self-care/child-care) by increasing cooperation and honestly-brokered concessions, and reducing hostility and resentfully-extracted false promises of compliance. These proximal outcomes—combined with improved behavior and emotion regulation and reduced assaults on immune and neuroendrocrine function—should lead to improved distal health outcomes.

Developing and validating improved measures of multiple facets of coercive conflict, and identification of fast-acting, highly-specific interventions that can reduce (or engage) coercion could have far-reaching effects on health behaviors and healthcare. In addition, these measures and intervention efforts could extend more basic research on behavior and behavior change by allowing us to better understand complex interrelations among interpersonal processes and diverse health outcomes.

Given the range of health indicators and behaviors associated with coercive conflict, it was necessary in the investigations described herein to focus our research on specific outcomes. We chose two distal health outcomes: diabetes and oral health. These disease states were selected given established relations with coercive conflict in families and their core public health implications.

3. Type-2 diabetes and oral health: two major public health problems

Type 2 diabetes is escalating in prevalence, and is a growing cause of premature morbidity and mortality, ranking as the seventh leading cause of death in the U.S. It is a significant contributor to coronary heart disease and stroke, blindness and other eye problems, kidney failure, periodontal disease, hearing loss, peripheral neuropathy, and eventual lower-limb amputation (Centers for Disease Control and Prevention [CDC], 2014). Rates of type 2 diabetes and prediabetes among youth (ages 12–19 years) have risen dramatically over the past decade; at present, 23% have prediabetes (May, Kuklina, & Yoon, 2012). Financial burden on the nation is extensive—$245 billion in 2012 (CDC, 2014). Even though treatment of type 2 diabetes decreases morbidity and mortality (Diabetes Control and Complications Trial Research Group, 1993), glycemic control remains unsatisfactory (Pladevall et al., 2004). Poor insulin resistance, an early sign of vulnerability, may never progress to diabetes and its adverse sequelae in protective environments characterized by healthy diet, controlled weight, low stress, and exercise (for extended discussion, see Beauchaine & Cicchetti, 2016). A primary objective of our project is to alter aspects of family environment when children are very young, thereby reducing risk for type 2 diabetes.

Oral health is an important component of overall health (e.g., Tabak, 2008; U.S. Department of Health and Human Services [USDHHS], 2000). It is one of 42 foci of the U.S. Government's *Healthy People 2020* public health strategy (USDHHS, 2010), and is related centrally to 10 other focus areas (e.g., diabetes, oral cancers, and early childhood health). Oral diseases are the most common human chronic diseases (Sheiham, 2005) and links between oral health and overall physical health are clearly established (Vargas & Ronzio, 2006). Dental problems cause significant discomfort and pain, functional limitations, global health effects, quality of life decrements, and self-esteem diminution (e.g., Locker, 1988; Reisine, 1988; USDHHS, 2000). Per capita dental costs exceeded $353 in 2012 (Wall, Nasseh, & Vujicic, 2014), although many go without needed dental care—especially more expensive dental care—because they cannot afford it.

3.1. Medical regimen adherence in diabetes and oral health

Patient non-adherence is among the greatest challenges for success in treatment of both diabetes (World Health Organization [WHO], 2003) and oral health (USDHHS, 2000). This challenge was therefore a required focus of the present research, and one that has been linked with a variety of indicators of coercive family conflict. In the first year of diagnosis, a substantial proportion of type 2 diabetes patients (20–75% of new patients) discontinue their prescribed regimen (e.g., Osterberg & Blaschke, 2005), and of the remainder, only 50% take their medications at the time and dose prescribed (e.g., Booth & Nowson, 2010). There is evidence that treatment adherence is linked to family variables. Importantly, higher couple relationship satisfaction is related to better self-reported diabetes self-care behaviors (Trief, Ploutz-Snyder, Britton, & Weinstock, 2004). Impairment in patients' adherence to medical regimens, including those for diabetes, is linked to the partner actively attempting to control one's health behaviors (Lewis & Butterfield, 2007), as well as sabotaging (i.e., questioning the need for a partner's medication; Carter-Edwards, Skelly, Cagle, & Appel, 2004; Henry, Rook, Stephens, & Franks, 2013; Mayberry & Osborn, 2014), and hostilely engaging with the regimen (i.e., coercing a partner; Hagedoorn et al., 2006; Mayberry & Osborn, 2012, 2014). For patients with type 2 diabetes, higher levels of conflict are associated with less motivation and self-efficacy toward adherence (Rosland, Heisler, Choi, Silveira, & Piette, 2010), less diet regimen adherence (Glasgow & Toobert, 1988; Wen, Parchman, & Shepherd, 2004) and lower medication adherence (Mayberry & Osborn, 2012; Tang, Brown, Funnell, & Anderson, 2008). This could suggest coercive conflict as an underlying mechanism of adherence in such families.

We are unaware of studies linking such negative family behaviors to oral health regimen adherence. In what may be the only relevant study, Lorber, Maisson, Slep, Heyman, and Wolff (2017) failed to find an association of child oral hygiene maintenance (e.g., tooth brushing) and interparental hostility. Clearly, in comparison to the better-developed literature on diabetes self-care behaviors, much less is known about the connections between family behaviors and oral health regimen adherence. Yet we suspect that the stresses of negative family behaviors such as coercion have substantial, albeit uncharted, potential to disrupt oral care routines.

3.2. Proximal health behaviors in diabetes and oral health

In addition to medical regimen adherence, such proximal health behaviors as sugar-rich food and beverage consumption, preventative self-care behaviors, and parental enforcement and monitoring of young children's preventative practices (i.e., child-care) are also very likely impacted by coercion. Sugar consumption in particular is implicated in both dental caries and type 2 diabetes (Hooley, Skouteris, Boganin, Satur, & Kilpatrick, 2012; Institute of Medicine [IOM], 2011; Malik et al., 2010; Mekary, Giovannucci, Willett, van Dam, & Hu, 2012).

Consuming sugar-rich foods and drinks increases risk for dental caries (IOM, 2011), wherein bacteria that are abiogenic and aciduric (primarily *S. mutans*) predominate and the biofilm becomes cariogenic (Marsh, 2006). Increased consumption of carbonated beverages is associated with increased dental erosion via high acid levels (e.g., Ehlen, Marshall, Qian, Wefel, & Warren, 2008). Similarly, regular consumption of sugar-sweetened beverages, such as soft drinks and fruit drinks, is associated with 26% increased risk of type 2 diabetes (Malik et al., 2010), and increased weight (Greenwood et al., 2014). Between-meal snacking—including sweet foods and beverages, non-fresh fruit products, popcorn, and sipping milk or juice across the day—is related to worse oral health, especially among young children (Hooley et al., 2012). Evidence also suggests an association between increased type 2 diabetes and between-meal snacking among overweight and obese adults (Mekary et al., 2012).

The need to explore the relevance of family process as a causal mechanism contributing to proximal health behaviors for some families is clear. In our work, we have shown that interparental emotional aggression is associated with child consumption of sugar-rich beverages (Lorber, Del Vecchio et al., 2017, Lorber, Maisson et al., 2017; Lorber, White-Ajmani, Dixon, Slep, & Heyman, 2017) and that parent-child hostility is associated with obesogenic snacking in boys (Lorber, White-Ajmani et al., 2017). Furthermore, parenting interventions designed to reduce coercion, with no focus on eating or activity, reduce childhood obesity (Brotman et al., 2012).

That said, the technology for easily and validly assessing coercive conflict as well as the interventions designed to modify it are not yet well suited for porting into experimental medicine applications. In experimental, patient-centered medicine, careful assessment of the patient guides the provider to isolate mechanisms conferring risk for that particular patient. These mechanisms can then be targeted. For such an application, it is critical that measures be psychometrically sound and precise, but also highly usable by people with a variety of training backgrounds. At the moment, the gold standard for assessing coercive process involves collecting video-recorded observations of conflict and then coding the interaction in very precise ways with coding systems that take months to master, and finally analyzing the data to isolate conflict bouts and then classify those bouts into coercive and non-coercive conflicts. Clearly, that gold standard cannot be used in real time in real world settings.

Furthermore, interventions need to target coercion precisely and be able to be implemented by a wide range of healthcare providers. Right now, the interventions that have the strongest support for reducing coercive conflict are intervention packages that are most often delivered by credentialed mental health professionals in scheduled individual or group sessions and that last for several weeks. Although they impact coercion, they also target many other aspects of parent child and couple functioning. More specific and precise interventions that can be delivered in less time and by providers with less training are critical to be able to include the targeting of coercion in a range of health care settings. These are current gaps in the literature that our study is intended to help fill.

4. Building the tools to allow coercion to be targeted in experimental medicine

4.1. Overview of our model

As part of our focus on interpersonal processes and health, we use an experimental medicine approach to behavior change to test two related models of coercive couple conflict and parent-child coercion (see Fig. 1). The research is designed to identify and validate optimal assays or measures of coercion as operationalized earlier in this paper and optimal brief interventions to reduce these processes. We then focus on testing relations with adherence and health behaviors. The approach to behavior change for both types of coercion is displayed in Fig. 1.

4.2. Coercive Family Process Theory

As outlined above, among the most highly developed and influential behavioral models of dyadic family conflict is Patterson's (1982) Coercive Family Process Theory, which explains how, via negative reinforcement, aversive escalation sequences are reinforced for both persons, despite their unpleasant and destructive qualities. Patterson's theory explains the active ingredient in both couple and parent-child coercion. Indicators, possible measures, and their relations with a variety of health outcomes, including processes implicated in oral health and diabetes, are detailed below.

4.3. Assays of coercive conflict

Direct observation of coercive behavior. Behavioral observation assays of both couple and parent-child conflict are exceptionally well developed (e.g., Heyman, 2001; Kerig & Baucom, 2004; Locke & Prinz, 2002) and include the gold standard measure of coercion described above. Coercion has been successfully operationalized and observed in studies of couples (Slep et al., 2016) and families (e.g., Snyder et al., 1994). The majority of this research has involved parent-child dyads, the results of which has provided considerable support for Patterson's (1982) theory relating parent-child coercion to child antisocial outcomes (Reid et al., 2002). Although coercion has only recently begun to be formally studied in the couples literature, it has long been suspected to be at play (Weiss & Heyman, 1990). In Heyman's (2001) review of over 200 observational studies of couple conflict, one of the keystone "stubborn facts"—found across coding systems, countries, studies, and researchers—is that those in distressed relationships are more likely to reciprocate/escalate their partners' hostility. Reciprocity and escalation are not direct measures of coercive process. Yet they are very much the expected products of coercive process. Thus, the results reviewed by Heyman strongly, if indirectly, suggest the role of coercion in couple relationship dysfunction. As part of our research, we will evaluate the potential of using observational protocols but using simpler, less intensive forms of coding to validly isolate coercive conflict in an attempt to develop assays that will be more easily adapted to health care settings. Rigorous, fine-grained coding of the sort detailed above will serve as the gold standard measure against which the others will be validated.

Self-report questionnaires of coercive behavior. Self-reports are the most common form of validated assessment for a variety of indicators of couple and parent-child coercion (Corcoran & Fischer, 2013), but have not been developed and tested as assays of coercion narrowly defined as we have here. Because these reports cover a wide range of contexts and time-spans, they can supplement coverage provided by other forms of assessment in laboratory contexts (Snyder, Heyman, & Haynes, 2004). For example, Averill (1982, 1983) demonstrated the frequent, chronic nature of anger generated by couple conflict.

Perhaps the two most frequently measured indicators of coercion assessed with self-report are physical and emotional/psychological intimate partner violence (IPV) and parent-child aggression. These constructs are related to coercion, but are not measures of coercion per se. Self-report measures of these constructs have been repeatedly validated (e.g., Archer, 1999; Lorber & Slep, 2017). Importantly for the present research, self-report measures of these constructs have an established track record of concurrent and predictive validity in relation to physical health outcomes in both adults and children. For example, in adults, IPV is associated with increased risk for physical injury and seeking of medical attention (Bonomi, Anderson, Rivara, & Thompson, 2009), dental caries (Lorber et al., 2014) and development of chronic disease (Coker, Davis, & Arias, 2002). Moreover, parent-child aggression assessed via questionnaire confers risk of compromised health into adulthood (e.g., Afifi, Mota, MacMillan, & Sareen, 2013; Goodwin, Hoven, Murison, & Hotopf, 2003). More generally, exhaustive reviews document damaging effects to biological systems of growing up in angry and aggressive environments (Beauchaine, Neuhaus, Zalewski, Crowell, & Potapova, 2011; Repetti et al., 2002, 2011), with extensive and long lasting health effects (Norman et al., 2012), largely through disruptions in stress regulation systems and health behaviors.

Self-reports for coercion-related indicators, such as IPV and parent-child aggression, abound (e.g., Corcoran & Fischer, 2013). Yet, because there are no self-report measures, or assays, *specifically for coercion,* we will develop and validate such measures.

Experienced emotion. As we have described above, (a) coercion refers to a very specific behavioral sequence that is driven by the negative reinforcement of aversive behavior via conflict termination, but (b) recent elaborations of the model have incorporated affective and biological factors as *internal* mechanisms of negative reinforcement in coercion. Accordingly, measures of experienced emotion and autonomic physiology are essential to our empirical approach. Self-report measures have a long history as valid indicators (e.g., Watson, Clark, & Tellegen 1998) of experienced emotion, one of several channels of emotion (Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005). The link between self-reported negative emotion and compromised physical health is exceptionally well-established (see reviews by DeSteno, Gross, & Kubzansky, 2013; Salovey, Rothman, Detweiler, & Steward, 2000). Much research has also demonstrated the relevance of measures of negative experienced emotion in relation to indicators of coercion, such as physical and psychological aggression, in couple (Norlander & Eckhardt, 2005) and parent-child (e.g., Rueger, Katz, Risser, & Lovejoy, 2011) dyads.

One approach that shows promise for measuring coercion related processes is the continuous rating of experienced emotion via a dial while viewing a video recording of one's prior interaction with a partner or child. This approach was introduced and validated by Gottman and Levenson (1985) in couples research and later validated for use in parent-child interactions by Lorber (2007). In these studies, video recall measures of emotion were associated with the observed behavior of the self, partner, and child over the course of laboratory interactions. Compellingly, both studies showed evidence of "physiological reliving" in which physiological responses during video-recall were similar to those recorded during laboratory interactions. Slep et al. (2016) used a video-recall assay to study couples' experienced anger in conflicts and found that—consistent with an expanded focus of Coercion Theory to include *internal* mechanisms of reinforcement that maintain aversive family relations—anger escalations and de-escalations were negatively reinforced by decreases in a person's own experience of anger in addition to negative reinforcement via partner's acquiescence. As reported by Lorber (2007), parental experienced emotion measured via video-recall is also associated with harsh discipline in parent-child dyads, further suggesting the role of aversive experience in coercive process. We will explore the extent to which this measurement approach can validly and specifically assess coercive processes.

Psychophysiology. Indices of peripheral physiology—particularly autonomic nervous system measures—are useful for characterizing physiological aspects of emotion and emotion regulation in individuals and dyads (Beauchaine, 2015; Levenson, 2014). During family interactions, coercive patterns of emotional experience and expression among participants are reflected in attendant patterns of physiological responses, and can be quantified using measures of reactivity (i.e., change from baseline; e.g., Gottman et al., 2003; Lorber & O'Leary, 2005), as well as the time-linked similarity of physiological responding across individuals (Levenson & Gottman, 1983; McAssey, Helm, Hsieh, Sbarra, & Ferrer, 2013) using techniques such as time series/multilevel time series analysis (Beebe et al., 2007; Gottman, 1981; Lorber, 2007) and non-linear dynamical modeling (Crowell et al., 2014).

Of particular interest to the present research, psychophysiological linkage refers to synchronization of dyad's physiological responses during emotion-laden interactions. Levenson and Gottman (1983) reasoned that linkage likely reflects physiological embedding of coercive exchanges in discordant couples perhaps due to emotional contagion or attempts to influence the partner that occur during conflict (Hatfield, Cacioppo, & Rapson, 1994; Reed, Randall, Post, & Butler, 2013). Levenson and Gottman (1983) found that a significant portion of variance in marital satisfaction is accounted for by linkage in peripheral autonomic measures observed when married couples discussed disagreements. Saxbe and Repetti (2010) extended this finding to cortisol measured over three days in naturalistic settings. Parent-child physiological linkage has also been found to be amplified in stressful conditions (Waters, West, & Mendes, 2014). Importantly, recent research from our group indicates that among certain vulnerable populations, psychophysiological linkage is driven more by parents than by children (Crowell et al., 2014). This provides a basis for focused intervention.

Historically, the most common measures of the autonomic nervous system are heart rate, electrodermal activity, and blood pressure. We focus here, however, on respiratory sinus arrhythmia (RSA), a key marker of emotion and emotion regulation which we believe provides a most promising avenue for understanding coercion. RSA reflects the ebbing and flowing of heart rate (HR) across successive respiratory cycles, due to increases in inhibitory parasympathetic efference during exhalation and decreases in inhibitory parasympathetic efference during inhalation (Beauchaine, 2001; Porges, 1995). It is assessed via spectral analysis of the electrocardiographic R-wave time series. In a recent study, we demonstrated that members of coercive mother-daughter dyads who were engaged in a conflict discussion displayed concordant actor (within-person) effects, becoming simultaneously physiologically and behaviorally dysregulated. In contrast, control group dyads evidenced concordant partner (between-person) effects, and showed increased physiological regulation during minutes when their partner was aversive (Crowell et al., 2014). Further suggesting a role for RSA in coercion, we also recently found that withdrawal of maternal RSA, suggesting poor emotion regulation, during discipline encounters amplifies the impact of mothers' sense of flooding (e.g., becoming overwhelmed by the child's behavior) on harsh discipline practices (Lorber, Mitnick, & Slep, 2016).

Coercion can affect family members' health and well-being by (a) creating a chronically stressful environment thereby altering patterns of physiological responding and increasing allostatic load (e.g., Beauchaine, 2015; Beauchaine et al., 2011), and/or (b) impairing interactions (e.g., increasing hostility and negative affect; decreasing affection, acceptance, and monitoring; and compromising communication and discipline; Capaldi, Kim, & Shortt, 2007; Hetherington, 1989; Krishnakumar & Buehler, 2000; Orina, Wood, & Simpson, 2002; Snyder et al., 1997). As a result, autonomic nervous system disruption becomes automated, and an emotional environment is created that undermines organized routines such as attention to one's own preventive self-care and the regular socialization of children's health behaviors (see Beauchaine & Zalewski, 2016). For example, following intense conflict, a parent may be more preoccupied with his/her own physiological arousal/emotional state than with enforcing limits on sweets or on a bedtime brushing routine, and the child is likely to experience elevated stress reactions. That same parent may also engage in emotional eating in an attempt to down-regulate her/his own negative affect (Macht & Simons, 2000).

To date, none of the physiological indices have been evaluated for their abilities to specifically and validly indicate coercive conflict. As part of this research, we will evaluate each of these indices' potential as coercion assays.

4.4. Testing the malleability of indicators through brief, targeted intervention

As with most behavior change interventions, almost all existing, validated strategies for coercive target engagement and reduction are part of multi-component treatments (e.g., Forgatch & Kjøbli, 2016; Roddy, Nowlan, Doss, & Christensen, 2016). One of the charges of the experimental medicine approach is to isolate "active ingredients" in these treatments so that more efficient approaches can be isolated, tested, and disseminated. In selecting target engagement (i.e., intervention) strategies for our research, we applied several criteria. First, we sought interventions that can be delivered quickly (in less than 15 min) by experimenters or interventionists with minimal specialized training. This maximizes portability of interventions to a wide variety of settings. Second, we identified interventions that had some empirical support for engaging coercion among both parents-children and couples. Third, we sought interventions that operate through precisely delineated mechanisms. Finally, we strove to find interventions that are sufficiently powerful to produce reliable changes in coercion within the confines of a single brief laboratory assessment.

For both couple and parent-child coercion, published studies document brief interventions that engage targets or indicators successfully, thereby reducing behaviors related to coercion. In couples research, Gottman, Ryan, C. Swanson, & K. Swanson (2005) used the term "proximal change experiments" to describe the target engagement approach articulated in the experimental medicine approach to behavior change. Using distressed couples, they created several targeted interventions to change behaviors that are indirect markers of coercion. Both the "improve friendship" intervention (increasing fondness and admiration between partners, using each other for daily support and bonding) and "manage conflict" intervention (coping better with intractable problems and improved navigation of solvable problems) likely decreased probability of coercive exchanges. Importantly, *each took one day*.

Also drawing on the proximal change experiments concept, Babcock, Graham, Canady, and Ross (2011) attempted two narrowly targeted interventions with couples who reported IPV. Each intervention, which lasted less than 10-min, involved male partners learning to replace automatic hostile reciprocations with more measured behaviors. The "Accepting Influence" intervention involved the male partner's finding and identifying with the "kernel of truth" within his partner's argument and reattributing any perceived hostility as her underscoring the importance of the topic (rather than as indicative of anger toward him). In the "Editing-out the Negative" intervention, the man was asked to resist the temptation to become defensive and say something negative in response to a complaint or negative statement by his partner. Compared with couples in an active control condition (learning time out), men in the two proximal change conditions showed significantly greater declines in coercion indicators during a subsequent observed conflict (expressed and experience aggressive emotion). Furthermore, female partners in the experimental conditions also experienced less aggressive emotion even though they did not directly receive the intervention, underscoring the systemic nature of the phenomenon.

Among parents and children, Slep and O'Leary (1998) manipulated mothers' attributions for child misbehavior and then observed mother-child behaviors in misbehavior- and coercion-evoking situations. Mothers who were told that their children were not to blame for misbehaving acted less coercively and felt less angry than mothers who were told that their children misbehave voluntarily/with negative intent. Similar to the Babcock et al. (2011) finding, children exhibited less negative affect even though it was mothers who received the manipulation. Finally, a meta-analysis of components within various coercion reduction interventions (Wyatt Kaminski, Valle, Filene, & Boyle, 2008) indicates that elements with the strongest effect sizes involve boosting positive parent–child exchanges, using timeout to shape noncoercive child behavior, and teaching parents to respond consistently. All of these focused techniques might be employed in experimental interventions to engage coercive process.

5. Approach

Based on the SoBC experimental medicine approach and our review of the literature, we selected two target engagement strategies in the context of parent-child and couples relationships to determine if they cause reductions in coercive conflict, and if so, which assays (i.e., measures) will provide evidence of target engagement. The first strategy is a cognitive manipulation. Parents or members of a couple perform an exercise designed to increase benign attributions for child or partner behavior, and then interact with their child or partner. Dyads complete structured, analogue interaction tasks designed to set the stage for conflict/coercion, modeled on prior protocols (e.g., Heyman et al., 2002; Lorber & Slep, 2005). In controlled experiments, attributional reframing impacts harsh parenting and negative behavior in couples (e.g., Fincham & Bradbury, 1988; Slep & O'Leary, 1998), is a component of empirically-supported, more extensive, dyad-focused interventions (e.g., Epstein & Baucom, 2002; Sanders, Kirby,

Tellegen, & Day, 2014), and is successful as an experimental manipulation in affecting emotion regulation (e.g., Gross & Levenson, 1997).

The second condition is a behavioral intervention. The purpose of this intervention is to override automatic reactions that serve as to barriers to goals by indicating how, where, and when specific responses will be put into action to help achieve goals. Overriding automaticity is a key element of combatting coercive exchanges that occur thousands of times in distressed parent-child and couple dyads (e.g., Gottman, 2015; Reid et al., 2002) by leveraging "implementation intentions" (Gollwitzer, 1999). Individuals consciously learn to implement intentions by selecting a cue that interferes with the goal (e.g., "If cue X arises, then I will do Y"). When the cue is experienced, the goal-directed response is automatic, enacted immediately, and without conscious intent. Parents and couples will do an exercise designed to develop "if-then" plans for dealing with conflict and negativity, using strategies to downregulate their own negative emotions and decrease coercive behaviors.

We are testing these interventions in separate parent-child and couple studies with medically at-risk populations. The parent-child study includes dyads in which the child, a 1.5- to 3-year-old toddler, is at elevated risk for early childhood caries. The couple study includes dyads in which at least one adult has, or is at risk for, type 2 diabetes. Each uses a 2 × 2 mixed factorial design: Intervention Group (cognitive vs. behavioral; between subjects) × Condition (intervention vs. control; within subjects). Dyads are randomly assigned with a 1:1 allocation to intervention group. Condition is counterbalanced within each intervention group—50% of dyads are observed interacting with their children/partners after first receiving an intervention and 50% are first observed after a period of no intervention. To allow us to determine both the success of the target engagement strategies with engaging coercion indicators, as well as the reliability and validity of each coercion assay or measure (e.g., observational and psychophysiological; see above), all measurement approaches will be used with all participants.

To test the effects of target engagement strategies not only on coercion, but also on downstream health-related behaviors, participants take snack breaks following the aforementioned dyadic interaction tasks in both studies. The available snacks are a standardized set of foods and drinks that include healthy, low sugar options (e.g., carrots; water) as well as unhealthy, high sugar options (e.g., cookies; soda). We chose to focus on sugar consumption given its key role in the etiology and maintenance of dental caries and type 2 diabetes (Hooley et al., 2012; IOM, 2011; Malik et al., 2010; Mekary et al., 2012). As an additional health-related behavior in the parent-child study, we also observe parents brushing their child's teeth, which will be coded for the quality of tooth brushing (e.g., time toothbrush is in contact with teeth). These objective observations of health behavior will allow us to determine whether our brief cognitive and behavioral interventions impact sugar consumption and tooth brushing quality via their intermediate impact on coercion. Ultimately, through this research, we will develop and validate assays, isolate and test strategies for target engagement, and determine their effectiveness in not only producing behavior change for coercive conflict, but also health behaviors. We will thus "connect the dots" between intervention, coercion, and health behaviors to experimentally evaluate the change model proposed in Fig. 1.

We will test these interventions and putative assays with samples of 100 parent-child and 100 couples in a within-between randomized design, where dyads are randomized to one of two interventions, and serve as their own control, with the order of intervention and control interactions also being randomized. All dyads will be screened as at elevated risk for coercive conflict (to optimize the potential ability of lab interventions to reduce coercive conflict) and at elevated risk for either Type 2 diabetes (couples) or early childhood caries (toddler-aged children). Families will come to the lab for two sessions, one in which they complete the control condition and one in which they complete the intervention condition. Both interventions will be delivered by Bachelor's-level subject runners in the laboratory setting. In each, they will (1) interact in standardized observational protocols designed to elicit coercive processes in dyads that experience these (Heyman, 2001), (2) complete baseline physiological assessments, and will be tracked physiologically through and after the observed interaction, (3) complete self-report measures of coercion (at baseline and after both interactions). Following interactions in each session, participants will be offered healthy and unhealthy snacks; the nature and amount of snacking will be observed and quantified to provide an assessment of the link between coercion and health behavior. In parent-child dyads, following each snack break, parents and toddlers will be video recorded brushing the toddlers' teeth in a standard bathroom setup. We will examine all putative assays and interventions in both parent-child and couple dyads and test for invariance across the two samples and treat samples as clustered and within a hierarchical design as warranted. For more information, see https://osf.io/f82b2/

It is worth noting that intimate partner violence and child abuse occur at alarmingly high rates in the population generally and will, of course, characterize some of the dyads that ultimately end up in our samples. As such, it is important to have protocols in place when conducting this type of research to ensure safety and to offer resources when they are wanted. More information on our protocols can be obtained from the authors. Also noteworthy is that families characterized by aggression do typically find participating in research similar to this study as neutral or even helpful (Owen, Heyman, & Slep, 2006).

6. Summary, limitations, and future research

Coercion involves the negative reinforcement of behavioral and emotional escalation through hostile efforts to compel another person into complying with one's desires. Even when the "winning" party succeeds, s/he has only won a battle in an ongoing war. Indeed, the losing party only sullenly concedes, and rarely adheres to extracted concessions, setting the stage for the next round of hostile engagement. Thus, when conflict is around adherence to health-related behaviors (e.g., a parent coercing a child into tooth brushing), the long-term effect is likely not what the victor seeks, even when the short-term effect is favorable. Forcing the other into adhering or into adopting healthier eating, drinking, or self-care tends to be a pyrrhic victory.

Furthermore, coercion exacts physiological costs (e.g., degraded neuroendrocrine and immune functioning; see Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002; Repetti, Robles, & Reynolds, 2011) and erosion of the self-regulation of behavior (Fitzsimons & Finkel, 2011) and emotion (English, John, & Gross, 2013). These processes likely interfere with such highly plastic, self-regulation-dependent behaviors as tooth brushing adherence and avoiding sweet, fermentable carbohydrates and sweet beverages (Heyman, Slep, & Wolff, 2013; Lorber et al., 2014).

We speculate that changing coercive processes has direct effects on adherence and health behaviors (eating/drinking/self-care/child-care) through increased cooperation and honestly-brokered concessions, and reduced hostility and resentfully-extracted false promises of compliance. It is likely that these proximal outcomes—combined with improved behavior and emotion regulation, and reduced assaults on physiological functioning—lead to distal improved health outcomes.

Of course, there are things our study will not be able to address, such as how generalizable intervention effects we might find in our protocol are across time, or whether various parameters such as the timing and dose of the intervention can affect its effects. We also will not be able to determine how portable the assays or interventions would be to other settings, or establish longitudinal effects on medical regimen adherence. The next set of research questions to ask will build on the findings from the current study and the other projects that are part of this initiative to build the toolkit necessary to address behavior change. In addition, future research might explore potential moderators of intervention effect on coercion or health behaviors. For example, a

recent study linked adult attachment to oral health outcomes (Meredith, Strong, Ford, & Branjerdporn, 2016). Attachment-coercion interplay, if it exists, may thus have implications for related health behaviors (e.g., diet and oral hygiene maintenance).

7. Implications

This research focuses on what many (e.g., Dishion & Snyder, 2016) believe to be *the* active ingredient in noxious, health compromising environments: coercive family processes, which are observed in couple and parent-child dyads. The studies we summarize above include several advances over prior work. Among these, we are unifying disparate research areas with identical assays, interventions, and health behaviors. We are studying conflict in parallel ways in two interpersonal contexts: parent-child and couple relationships. To date, this has not been done in contexts of health behaviors. We believe this approach has significant potential to allow researchers in diverse areas to address how coercive conflict in any interpersonal context relates to health outcomes. We are also isolating the most promising assays for indicators of coercion and developing/validating new assays to fill identified gaps. Coercive processes are expensive to assess precisely. Specifying relations among assays, and validating new, real-world-friendly assays as needed, will set the stage for research advances in the future. Most studies of coercive processes have been on phenomena related to coercion (e.g., likelihood of partners' reciprocating negative behavior, child noncompliance, harsh parenting) but not on precise tests of coercion. Ours is the first study to use multi-method, direct test of coercive processes in couple and parent-child dyads. We are testing highly focused interventions to quickly, effectively, and transportably target coercion. Existing interventions for coercive processes are cumbersome. Highly focused transportable interventions would add tremendously to the toolkit for addressing coercive conflict.

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