A CONTEXTUAL PSYCHOLOGY APPROACH TO IMPROVING HEALTH OUTCOMES IN THE PERINATAL PERIOD

by

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A DISSERTATION

Presented to the Department of Psychology
and the Division of Graduate Studies of the University of Oregon
in partial fulfillment of the requirements
for the degree of
Doctor of Philosophy

June 2021

DISSERTATION APPROVAL PAGE

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Title: A Contextual Psychology Approach to Improving Health Outcomes in the Perinatal Period

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Degree awarded June 2021

DISSERTATION ABSTRACT

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June 2021

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The United States holds alarming records for highest infant and maternal mortality rates in the developed world. The US infant mortality rate is on par with many low and middle income countries, and despite the decline in maternal mortality rates globally, pregnancy-related deaths in the US have trended upwards. The Birth Your Way perinatal health promotion program was designed to address this US public health crisis by amplifying the ability of federal maternal child health programs to mitigate the primary infant mortality risk factors, Neonatal Intensive Care Unit (NICU) admissions, low birthweight and preterm deliveries, and the key maternal mortality risk factor, Cesarean delivery. The federal Medicaid program buffers mortality risk via increased access to perinatal healthcare services; while the federal Women, Infants and Children supplemental nutrition program (WIC) improves health outcomes via improved prenatal nutrition. Employing an implementation science approach, the Birth Your Way intervention has been developed and evaluated in collaboration with Medicaid and WIC partners in a model public health test site. The Birth Your Way intervention is the first to utilize an Acceptance and Commitment Therapy (ACT) approach to increase pregnant individuals' adherence to the WIC prenatal nutrition protocol via increases in psychological flexibility, the psychological mechanism underlying ACT. A pragmatic

randomized clinical trial was conducted to examine Birth Your Way program effects on psychological flexibility, perinatal nutrition and infant and maternal birth outcomes. Results from the Birth Your Way pragmatic randomized clinical trial demonstrate the ACT-based intervention's potential to bolster WIC program effects and mitigate poor infant birth outcomes when a minimum dose is received. The current study documents a promising role for the application of ACT in the prenatal period to increase maternal engagement in values-directed actions and healthy dietary behaviors and to decrease the likelihood of NICU admissions, low birthweight, and preterm deliveries. Expanding the reach of ACT-based programs across Medicaid distributors to amplify WIC program engagement could prove a critical component in the public health effort to mitigate the US infant and maternal mortality crisis.

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Laurent, Heidemarie K., Laurent, Sean M., Lightcap, April, Nelson, Benjamin W. (2016). How Situational Mindfulness During Conflict Stress Relates to Well-Being. *Mindfulness,* 1-7.

Jones, L. B., Whittingham, K., Coyne, L., & Lightcap, A. (2015). A contextual behavioral science approach to parenting intervention and research. In R. Zettle, S. Hayes, A. Biglan, & D. Barnes-Holmes (Eds.), *The Wiley Handbook of Contextual Behavioral Science*. New York: Wiley & Sons.

ACKNOWLEDGMENTS

I wish to express my sincere appreciation to my advisor, Dr. Elliot Berkman, for helping me see that my ideas have value. I want to thank everyone who has touched or been touched by Birth Your Way. I am grateful for the lifelong connections I have made with our research staff, perinatal interns, and community collaborators. I would like to thank my parents, Mark and Darlene Lightcap, for teaching me to work hard towards the stuff that really matters in life. I am thankful for my beautiful extended and blended family for caring for our three amazing kids, Miles, Julian and Stella, so I could give back to the greater community. Finally, I owe my biggest thanks to my husband, Daniel Cohn. You are the reason I have accomplished my dreams. I love you a lot, lot.

This dissertation is dedicated to my grandmother, Patsy Gomes.
You carry me through life on the wind.

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CHAPTER I

FOUNDATIONAL PRINCIPLES OF HUMAN LEARNING AND BEHAVIOR

Relational Frame Theory (RFT) is the psychological theory that underpins third wave mental health treatment approaches that are widely used by mental health practitioners today (S. C. Hayes, Barnes-holmes, & Wilson, 2012). The most commonly implemented RFT treatment approach, Acceptance and Commitment Therapy (ACT), has been evaluated in over 500 randomized clinical trials (A-Tjak et al., 2015). RFT is a cohesive psychological account of human learning and cognition aimed at revealing the underlying psychological levers that can be pulled to influence and shape human behavior (Fletcher & Hayes, 2005). For the past thirty years, RFT principles have been applied to a vast array of treatment domains and special populations (Montoya-Rodríguez, Molina, & McHugh, 2017). With this dissertation, I provide an RFT conceptualization for the perinatal period and demonstrate how RFT principles can be applied to shape prenatal health behaviors to improve downstream maternal child health outcomes. To illustrate the perinatal RFT conceptualization, I present findings from a randomized clinical efficacy trial evaluating the promise of the Birth Your Way intervention, an ACT-based prenatal intervention, to improve birth outcomes for mothers and their newborns.

Contextual Behavioral Science (CBS) is a functional contextual research paradigm that informs the development and evaluation of RFT and RFT-based treatments, such as ACT (Barnes-Holmes, Barnes-Holmes, Hussey, & Luciano, 2015). Key to Functional Contextualism is the philosophical assumption that to effectively understand and shape

human behavior, scientists must analyze the function of a behavior given the context in which it occurs (Biglan, Hayes, Long, Sanford, & Monestès, 2015). The context, or setting in which the behavior occurs, contains the antecedent elements and reinforcing/punishing consequences of the setting that influence why, how and when a behavior occurs (Torneke, Luciano, & Salas, 2008). From a CBS paradigm, the context includes the observable environmental factors as well as the unobservable psychological processes that interact to influence human behavior (Hughes & Barnes-Holmes, 2015). Since topographically similar behaviors can take on completely different functions depending on the context in which they occur, contextual behavioral scientists aim to predict and influence human behavior by analyzing the functional relationships between behaviors and their antecedents and consequences (Torneke et al., 2008).

The goal of ACT is to help clients live a rich, full and meaningful life via committed engagement in mindful awareness and values-aligned behaviors (Flaxman, Blackledge, & Bond, 2010). Contextual behavioral scientists are not interested in uncovering the "true reality," choosing instead to employ a pragmatic truth criterion because it is a useful method for understanding and influencing human behavior (Newsome, Newsome, Fuller, & Meyer, 2019). RFT utilizes a pragmatic truth criterion, thus in RFT-informed treatments such as ACT, effectiveness is determined by assessing the workability of a client's behavior within its context, as measured against the client's own overarching, core, personal values (S. C. Hayes, Levin, Plumb-vilardaga, & Villatte, 2013). In ACT-based treatments, reduction in psychopathological symptoms is conceptualized as a concomitant effect of increasing psychological flexibility via

expansion of one's values-directed behavioral repertoire, in service of a rich, full and meaningful life (Dindo, Liew, & Arch, 2017).

RFT provides a cohesive rationale for using a pragmatic truth criterion, with an evolutionary account of human learning and cognition. CBS scholars have published volumes describing RFT's evolutionary account in detail, so I provide here a concise summary aimed at highlighting the most relevant theoretical elements (Barnes-holmes & Barnes-holmes, 2000; S. C. Hayes & Long, 2013; S. C. Hayes, Sanford, & Chin, 2017; D. S. Wilson, Hayes, & Biglan, 2018; K. G. Wilson, Whiteman, & Bordieri, 2013). Central to RFT is the concept that human languaging, also known as symbolic relating, evolved as a cooperative human behavior that enabled survival of the human species (S. C. Hayes & Sanford, 2014; Monestès, 2015). Language is a relatively new phenomenon in the human species, coming on the scene less than 100,000 years ago, whereas, older psychological processes that impact human behavior today, classical and operant learning, have been evolving in the planet's species for over 500 million years (Barnes-holmes & Barnes-holmes, 2000; Ginsburg & Jablonka, 2010; S. C. Hayes & Long, 2013; S. C. Hayes & Sanford, 2014; S. C. Hayes et al., 2017; Nichols, 1992; D. S. Wilson et al., 2018; K. G. Wilson et al., 2013). These older evolutionary behavioral processes are central to understanding RFT principles, because from a CBS perspective, human language (symbolic relating) alters their functions on human behavior (Levin & Hayes, 2009; Morrison, 1999; Villatte, Villatte, & Hayes, 2015; D. S. Wilson et al., 2018)

Classical conditioning, or respondent learning, is learning that occurs by association when a neutral stimulus and unconditioned stimulus are paired in the antecedent setting, transforming the function of the neutral stimulus to trigger the innate

response associated with the unconditioned stimulus (Ginsburg & Jablonka, 2010; Nichols, 1992). Pavlov, the founder of classical conditioning, illustrated respondent learning with his famous work pairing a ringing bell (neutral stimulus) with presentation of dog food (unconditioned stimulus) to trigger the innate dog salivation response (unconditioned response) in reaction to the ringing bell (conditioned response). To be classified as respondent learning, the response must be biologically-based, reflexive in nature and must occur in response to a stimulus present in the antecedent setting, rather than an earlier consequence (Pavlov, 1927). Human emotions are biologically-based reflexive responses that can be conditioned through respondent learning (Lang & Davis, 2006). For example, encountering a mountain lion (unconditioned stimulus) on a walk through the woods (neutral stimulus) could trigger the innate fear response (unconditioned response) in reaction to the woods (conditioned response) even when no mountain lion is present. Psychopathologies, such as post traumatic stress disorder, are related to respondent learning processes and are common targets of psychological treatments delivered today.

Operant learning is learning that occurs through the reinforcing and punishing functions of consequences, rather than through associations between antecedent stimuli, however operant learning processes interact with respondent learning to transform the functions of antecedent stimuli on behavior (Critchfield, 2012). A consequence is defined by its functional relationship to a behavior, with rewarding consequences (reinforcers) increasing the probability of a behavior occurring, and aversive consequences (punishers) decreasing the probability of a behavior occurring. Regardless of whether a consequence functions to increase or decrease the probability of a behavior occurring, a positive

consequence involves adding something, whereas a negative consequence involves subtracting something. A reprimand from a teacher (adding something) for talking with friends during the teacher's lesson is a positive punisher if it decreases the likelihood of talking with friends during the teacher's lesson, and it is a positive reinforcer if it increases the probability of talking with friends during the teacher's lesson. However, if ignoring the talkative students (subtracting something) decreases the likelihood of talking during the teacher's lesson it is a negative punisher, and if ignoring increases the likelihood of talking during the lesson it is a negative reinforcer. The teacher in this scenario will be more effective at applying consequences that reduce the probability of students talking during the lesson if the teacher first understands the reinforcing and/or punishing functions the consequences exert on students' behavior given the antecedent setting. Operant and classical conditioning are both forms of contingency learning, establishing "if...then" relations between antecedent stimuli in the case of classical conditioning and between antecedents and consequences in the case of operant learning (Shanks, 2007).

Contingency learning can lead to behavioral generalization, whereby a behavior becomes more likely to occur in settings that contain elements similar enough to the setting where the behavior originally occurred (Houwer & Beckers, 2002). In classical conditioning, settings that contain similar antecedent elements can take on the stimulus functions of the original setting. For example, the fear response elicited when the hiker encounters a mountain lion on their walk in the woods may generalize to settings that contain similar enough antecedent elements to the original wooded setting. In operant learning, the reinforcing or punishing functions of consequences in one setting may

generalize to multiple settings. That is, the decrease in students talking during the teacher's math lesson in response to a punishing reprimand may generalize to the teacher's history and science lessons. The therapeutic implications of behavioral generalization are vast, as therapists target these learning processes to promote generalization of skills learned in therapy across clients' multiple life domains (Ramnerö & Törneke, 2008). Problems related to behavioral generalization are common targets of psychological treatments as well, with clients seeking therapy to learn to alter anxiety or trauma responses that have generalized to settings where they are not workable (Torneke et al., 2008).

While early behaviorists sought to influence contingency learning processes by targeting observable external behaviors, cognitive psychologists sought to influence human behavior via manipulation of unobservable internal mental processes (Weiner & Craighead, 2010). After decades of defending divergent camps, cognitive and behavioral psychologists recognized that intervening upon both external human behavior and internal mental processes - and their interaction - was more effective than a narrower treatment approach (Craske, 2010). Coining the term radical behaviorism towards the end of his career, the father of Behaviorism B.F. Skinner, defined human behavior to encompass all activities, observable and symbolic, that a human organism does. Skinner coined the term "verbal behavior" to describe the unobservable symbolic activities today's psychologists refer to as mental cognition, and unlike the cognitive psychologists at the time whose focus was on addressing the content of mental activity, Skinner was interested in understanding and intervening upon the functions of verbal behavior according to contingency learning principles (Skinner, 1965).

In 1966 Skinner published his late career work, “An operant analysis of problem solving,” in which he presented the concept of rule-governed behavior, demonstrating the application of operant learning principles to verbal behavior and establishing the foundation on which RFT was built. Rule-governed behavior is broken down into three types of verbal rules: 1) pliance, whereby following the verbal rule is its own contingency, 2) tracking, when the verbal rule and real world contingencies are coordinated, and 3) augmentation, whereby the consequences specified in pliance and tracking are altered. Pliance benefits society as humans do not have to come in contact with real world contingencies for behavior to be reinforced. For example, a child may wait to cross the street until they take their parent’s hand based on the verbal rule, “Don’t cross without a parent or you could get hit by a car.” Pliance allows the child’s behavior “waiting at the street corner” to be reinforced without contacting potentially dangerous real world contingencies. Tracking builds from pliance through social learning as children establish relations between verbal rules and corresponding real world contingencies. If the child who is waiting for their parent at the street corner in response to the verbal rule, “Don’t cross without a parent or you could get hit by a car,” witnesses a car speeding quickly past as they wait, the child may track the correspondence between the verbal rule and the real world contingencies, thus strengthening the credibility of verbal rules generally.

Augmentation intervenes on pliance and tracking by transforming the strength (or reinforcing value) of consequences, specifying contingencies that can be abstract and that do not need to be directly experienced in order to alter behavior. That is, if the child waiting at the street corner has been taught via social learning that “safety is important,”

the abstract value “safety” may amplify the consequences specified in the verbal rule, “Don’t cross without a parent or you could get hit by a car,” reinforcing tracking when real world contingencies coordinate with the verbal rule, and reinforcing pliance when the verbal rule is followed “for the rule’s sake”.

Psychological treatment approaches that primarily target contingency learning processes, such as behavioral activation, contingency management and exposure therapy, have demonstrated considerable effectiveness, though more recent research on the mechanisms underlying these approaches reveals the all encompassing influence language processes exert on contingency learning (Barnes-Holmes, Barnes-Holmes, Stewart, & Parling, 2019; Vilardaga, Hayes, & Levin, 2009). Many animal species are capable of learning to relate objects in the environment according to the objects’ intrinsic properties (Penn, Holyoak, & Povinelli, 2008). However, the evolution of human language affords humans the unique ability to relate objects and events symbolically (S. C. Hayes et al., 2012). Children first learn to relate objects based on their intrinsic properties (a nickel is bigger than a dime), and acquire the capability to relate objects symbolically through social learning (a dime has greater value than a nickel).

For humans, symbolic relations are mutually entailed. Mutual entailment refers to the inherent bidirectional nature of symbolic relations, according to the functional context specified between stimuli. That is, if A is related to B in a particular context (bigger than), then the reverse relation, B is related to A (smaller than) is derived. Mutual entailment allows humans to derive symbolic relationships that are not explicitly taught, such as, if a dime is bigger than a nickel, then a nickel is smaller than a dime. For humans, the reverse relation “a nickel is smaller than a dime” is derived and does not

need to be explicitly taught. In this example, the contextual cue "bigger than" specifies a relationship of *comparison* between symbolic objects and events.

Comparison, coordination, condition, distinction, opposition, deictic and hierarchy are some of the symbolic relationships, or relational framings, that children learn to apply arbitrarily through multiple exemplar training in their social environment (see Table 1; Roche, Barnes-Holmes, Barnes-Holmes, Stewart, & O'Hora, 2002; Villatte et al., 2015). Through social learning, children first learn to name objects in their environment by establishing symbolic relations based on coordination (sound "apple" = object "apple") and distinction (sound "banana" ≠ object "apple"). When the child receives the object "apple" in response to making the sound "apple," a more complex symbolic relation is derived based on conditionality (if sound "apple," then object "apple"). Through contingency learning, children first build symbolic relations based on real world contextual features (sound "apple = object "apple"), and over time learn to apply relations arbitrarily (sound "apple" = picture "apple" = written word "apple"). The unique human ability to arbitrarily apply derived symbolic relations affords humans a great evolutionary advantage, enabling the social community to communicate about objects and events that are not in the present environment.

Due to the generativity of language, once children learn basic contextual cues that signal the function of relations (if-then, same as, different than, is like, before now, part of, you-there-then) they can apply those flexibly to a variety of situations to derive new relations, and relations among networks of relations, that had not previously existed (Barnes-Holmes, Finn, McEnteggart, & Barnes-Holmes, 2018). Combinatorial entailment refers to the derivation of novel symbolic relationships from combinations of mutual

relations, such as, if a penny is smaller than a nickel and a nickel is smaller than a dime, then a dime is bigger than a penny. Through derivation, these combinatorial entailments expand to form networks of mutual relations that then transform the functions of antecedents and consequences via relational framing. Arbitrarily applicable derived relational responding, or relational framing as it is commonly referred, enables the transformation of functions among any of the elements contained in relational networks, including thoughts, images, memories, beliefs, affect, mood, physical sensations, conscious awareness and anything that a human organism experiences. Through relational framing humans alter their experience of the world, forming relations in their symbolic world that transform the meaning of objects and events. Thus, RFT posits that the effectiveness of psychological treatments will be improved if contingency learning principles are targeted within the context of symbolic relating.

Table 1. Types of Relational Framings

Relational Framing	Contextual Relationship	Sample Contextual Cues
Coordination/ Similarity	Equivalence	Same as/ Is like
Distinction	Exclusion	Different from
Oppositional	Opposition	Opposite of
Conditional	Cause and Effect	If-Then
Comparison	More-Less	Bigger than
Interpersonal	Person	I-You
Spatial	Place	Closer than
Temporal	Time	Before now
Deictic	Point of View (Person, Time and Place)	I-Here-Now
Hierarchical	Class Membership	Part of

Based on these principles, drawn from contingency learning, radical behaviorism, and RFT, the aim of ACT-based treatments is to train clients to strengthen and relate networks of relations that encompass core personal values to real world consequences, thereby promoting effective augmentation of behavior change that increases behavioral flexibility and persistence towards longer-term goals.

Across the following two chapters, I present an RFT conceptualization for the perinatal period, building on Villatte's (2015) formulation of RFT clinical applications by describing how relational framing processes and rule-governed behavior can be intervened upon in the prenatal period to promote effective augmentation of behavior change that persists to improve maternal child health outcomes.

CHAPTER II

SYMBOLIC RELATING PROCESSES AND THE PERINATAL PERIOD

Problems Linked to Symbolic Relating

The symbolic relating processes that distinguish humans from other animals afford humans a great evolutionary advantage; as humans flexibly respond to ever-changing natural and social contexts, and predict and plan for future contexts without having to directly experience potentially dangerous real world contingencies. Symbolic relating is also a great source of difficulty for humans, as mutual entailment enables virtually any stimuli to function as a source of pain, whether or not an actual threat exists in the material world. Mutual entailment means that symbolic relations are inherently bidirectional, if A=B, then B=A. For example, a pregnant person who had previously experienced painful emotions at an obstetrician appointment in response to learning their pregnancy was not viable, may now experience a similar triggering of painful emotions at a later obstetrician's appointment that shares similar antecedent stimuli, despite hearing their growing baby's heartbeat and the obstetrician's words, "your baby's heartbeat sounds healthy." If while in the original setting painful emotions are triggered (if A=B), then painful emotions can be triggered in settings that contain stimuli that share a relation of equivalence with the original setting (then B = A). Thus, for humans painful responses can be elicited in the unlikeliest of settings, and relational framing explains the all encompassing human propensity for experiencing psychological pain.

Experiential Avoidance

Given the human propensity to experience psychological pain via mutual and combinatorial entailment of symbolic stimuli, it makes sense that humans would seek to

avoid symbolic aversive experiences much like they avoid real world aversive experiences. Experiential avoidance refers to human attempts to suppress or avoid symbolic activity at the expense of longer-term goals and core personal values. Suppose later that evening, the pregnant person in this scenario watches a film whose fictional protagonist attends a doctor's appointment. As the scene unfolds, coordination framing relates stimuli from the fictional doctor's office with memories of the painful response elicited during the obstetrician visit earlier that day, transforming the stimulus function of the fictional doctor's office to produce the painful emotions elicited by the memory of the obstetrician's office. The pregnant person may turn off the film in an attempt to escape the painful sensation, only to discover painful emotions returning in response to symbolic stimuli for which there is no off switch. Although all animals engage in avoidance behaviors that enable circumvention of dangerous real world contingencies, human attempts to apply these principles to our symbolic world are ineffective and costly. The pregnant individual in this example may engage in attempts to avoid symbolic stimuli (thoughts, feelings, physical sensations, memories, etc.) to avoid the aversive response (painful emotions), even though human efforts to suppress symbolic stimuli paradoxically reinforce their functions. If the pregnant person avoids attending prenatal appointments in an attempt to avoid the painful emotional response associated with the setting, they may compromise their longer-term goal for their baby's health and their values related to parenting.

Context Insensitivity and Response Inflexibility

Experiential avoidance includes problems related to context insensitivity and response inflexibility. Context sensitivity refers to the extent to which elements of the

real world and symbolic contexts are observed and responded to. Insensitivity to some contingencies in the context can be useful when in the service of desirable longer-term goals. A pregnant person may ignore their morning sickness as they engage in physical activity in the service of their longer-term goal to give birth to a healthy infant. Context insensitivity becomes problematic through generalization of pliance, or rule-following that lacks coordination with real world contingencies. If a pregnant person avoids physical activity in pliance to the verbal rule, "I can't exercise when I'm experiencing morning sickness," other sources of influence in the context that could stimulate effective responding are missed.

Context insensitivity, or lack of sensitivity to real world contextual sources of influence via generalized pliance, leads to inflexible responding. Inflexible responding refers to behavioral engagement that lacks coordination with real world contingencies at the expense of longer-term goals. Ineffective tracking reinforces inflexible responding. If a pregnant individual operates in pliance to the verbal rule, "painful emotions are intolerable," despite the rule's lack of coordination with real world contingencies (painful emotions are uncomfortable yet tolerable), they may engage in unhealthy prenatal behaviors whose short-term consequences (temporary relief from painful emotions) are tracked, thus reinforcing unhealthy prenatal behaviors at the expense of desirable longer-term goals (healthy newborn).

Essential Coherence

Essential coherence refers to attempts to maintain consistency between relational networks based on intrinsic equivalency that does not coordinate with real world contingencies. Essential coherence is another feature of experiential avoidance and

includes problems related to context insensitivity and response inflexibility. Given that the evolutionary function of language is to establish common meaning and predictability that benefits the social group, the social community trains children to provide and demand coherence in accounts of thoughts, feelings and behaviors. However, generalization of pliance promotes essential coherence, whereby symbolic relations "feel coherent" despite their lack of coordination with real world consequences. Essential coherence leads to rigid and ineffective responding, as arbitrary justifications that do not fit with real world contingencies are used to maintain coherence by ascribing features to the real world context that actually exist in the symbolic context. If a pregnant person establishes essential coherence between a relational network encompassing the self concept, "I am a natural birth person" to their real world context (despite the lack of real world coordination), they may limit their ability to respond effectively based on real world contingencies. That is, they may be less likely to choose medical interventions according to medical necessity, because these options don't fit with their rigid self concept.

The Overarching Goal

Our relational networks can only be expanded upon, not deleted, making it nearly impossible for humans to avoid stimuli that trigger aversive responses, thus experiential avoidance, or human attempts to suppress symbolic activity at the expense of longer-term goals and core personal values, is a central target of ACT and other RFT-based treatments (S. C. Hayes et al., 2013; Levin & Hayes, 2009). Although symbolic relations cannot be deleted and verbal rules cannot be unlearned, relational framing processes can be evoked to transform the stimulus functions of verbal rules from pliance and ineffective

tracking to augmentation of behavior change that coordinates with real world consequences, longer-term goals and core personal, overarching values (Barnes-Holmes et al., 2018; Hughes & Barnes-Holmes, 2015). From an ACT perspective, eliciting framing processes in this manner promotes increases in psychological flexibility. In ACT, psychological flexibility is the theoretical opposite of experiential avoidance and is promoted via construction of hierarchical networks whereby top-level values are linked to intermediary longer-term and shorter-term goals, and a wide and varied base of specific actions (Villatte et al., 2015). In the following chapter, I describe the ACT conceptual model and provide a detailed description of the framing processes that can be evoked to target psychological flexibility via construction of hierarchical networks that encourage living a rich, full and meaningful life via engagement in values-directed actions (see chapter 3).

The perinatal period is an especially salient context for building such hierarchical networks, because the real world context contains the elements that are needed to construct them. Creating and bringing new human life into the world is inherently valuable to humans, thus top-level values (health) are readily accessible. Additionally, desirable longer-term goals (delivering a healthy newborn) and shorter-term goals (growing a healthy baby) are rooted in real world contingencies and can easily be linked to top-level values. Finally, preparing for these intermediary goals by generating possibilities for specific actions that are congruent with real world contingencies is an expected feature of the pregnancy context. Thus, a variable and wide base of specific actions (healthy dietary behaviors, physical activity, attending prenatal visits) can easily be generated and linked to intermediary goals and top-level values. These hierarchical

networks provide inexhaustible sources of motivation to persist in meaningful actions despite barriers inherent in living. Before hierarchical networks can be constructed in a way that sustains motivation to persist in actions towards meaningful life directions, despite inherent life stressors, symbolic relating processes must be elicited to promote context sensitivity, response flexibility, and a stable, functionally coherent and flexible self concept.

Increasing Context Sensitivity: Observation of Symbolic Stimuli

Pregnant people will face difficulties choosing, committing to and following through with prenatal behaviors that align with their longer-term goals and overarching values, without first developing the ability to notice and name symbolic stimuli and to track their correspondence to present moment contingencies. For example, as a pregnant mother recounts distress she experienced earlier that morning upon discovering a parking ticket, spatial and temporal framing can be elicited to promote present moment awareness and tracking of symbolic activity. Employing contextual cues that orient the pregnant mother to the spatial and temporal elements of the context, such as, “Where did you feel the stress in your body this morning?” and “Where do you feel it now?” can help increase context sensitivity as the mother tracks the direct contingencies of symbolic events in the present moment. It can be difficult for birthing people to observe symbolic activity directly, thus analogical and deictic framing can be used to facilitate context sensitivity. The pregnant mother in this scenario could be asked to imagine her thoughts as tree branches in a storm (analogical cue), or to imagine her feelings from the perspective of a pregnant friend (deictic cue), to facilitate distinction between the pregnant mother and the contents of her mind.

Increasing Context Sensitivity: Labelling of Symbolic Stimuli

Building upon skills in observation of internal symbolic events, effective naming of symbolic activity can be reinforced by eliciting coordination and hierarchical framing. A birthing person describing their struggles with morning sickness can be asked, "What does the sensation feel like?" to cue coordination framing. If the birthing person replies, "It's just awful" hierarchical framing can be elicited with cues like, "What does 'awful' feel like?" to encourage more effective and less judgmental describing of symbolic experiences. Cues that evoke distinction and comparison framing with a sense of curiosity, such as, "Is the sensation more intense before the prenatal appointment? How is it different during? And after?," can be useful in fine-tuning descriptions of symbolic activity and encouraging context sensitivity. Uncomfortable physical sensations that are a normal part of pregnancy and childbirth can be challenging to describe, thus analogical framing can be elicited with cues like, "If the sensation were an object, what shape would it be?," to help the pregnant person gain some distance from the discomforts they are experiencing. To further promote effective naming of psychological stimuli, deictic framing can be elicited with cues such as, "Imagine your pregnant friend in the situation, what thoughts do you guess might come up for her?". To counter generalized pliance and increase context sensitivity, these framing processes can be elicited to help pregnant people more effectively notice and name their psychological experiences and to track those symbolic stimuli to present moment contingencies.

Reducing Pliance in Observation and Labeling of Symbolic Stimuli

As pregnant people gain skills in observing, describing and tracking symbolic stimuli to present moment contingencies, it is important to normalize psychological

experiences, emphasizing utility over accuracy, to decrease essential coherence and increase flexible responding. For example, as a client with a breech pregnancy describes staying in bed most of the day, paralyzed by her fear of the upcoming cesarean surgery, normalization can be promoted by cueing coordination framing with statements such as, "Your fear is normal," and conditional framing with cues such as, "Given your past experiences with hospitals, it makes sense you would feel especially fearful when thinking about your upcoming surgery". Deictic framing, a potentially powerful tool for normalizing psychological experiences, can be evoked with statements such as, "I hear many pregnant mothers describe feeling fear when thinking about undergoing cesarean surgery." Guiding pregnant people in assessing the function of their responses to psychological stimuli (rather than essential truth) is important for developing effective tracking without inadvertently reinforcing pliance. This can be promoted by evoking temporal and conditional framing in a way that guides pregnant people to relate behaviors to sources of meaning, with prompts such as, "When you feel fear and stay in bed most of the day, do you feel closer or further away from what you really care about for this pregnancy?" Hierarchical and comparative framing can then be evoked to help the client explore alternative behaviors that may better fit with the sources of meaning they have derived, with statements such as, "So, when you stay in bed the fear goes away for a little while, but then you worry about your baby's health; and when you get out of bed, your fear increases but your baby gets more oxygen and nutrients." Developing contextual control in this manner helps clients contact reinforcing consequences (sources of meaning) that are inexhaustible and available regardless of specific outcome.

Increasing Response Flexibility: Altering Symbolic Antecedent Context

Increasing response flexibility can be accomplished by altering either the symbolic antecedent context or the response context to transform the stimulus function of the source of influence on the behavioral response. A pregnant individual whose insecurity, in response to the appearance of stretch marks on their growing belly, interferes with their ability to be intimate with their partner, can be prompted to describe the stretch marks based on intrinsic properties (length, shade, width, pattern) with the aim of augmenting the intrinsic functions without challenging the insecurity directly. Hierarchical framing can be evoked to help the birthing person distinguish their observing self from the psychological activity they experience, by responding to statements of equivalency, such as, "I *am* undesirable" with prompts that place the symbolic activity in a hierarchy under the observing self, like "When that thought shows up for you, how do you feel?" Flexible responding can be promoted in this scenario, as the pregnant person describes "I want to be intimate with my partner, *but* I am insecure," and coordination framing is cued with the response, "You want to be intimate with your partner, *and* you feel insecure," thus expanding new possibilities for responding. Evoking deictic framing with prompts such as, "Imagine your best friend in the same situation with her partner. What would you tell her?" can help the client generate novel possibilities for responding as well. As the individual in this scenario shares, "When I feel insecure like this, I get super needy, criticize my partner for not doing enough to make me feel okay, and we end up in a fight," oppositional framing can be cued to elicit flexible responding with prompts such as, "Nice work making that connection. Now that you've noticed the pattern, could it be an opportunity to try something totally different?"

Finally, comparative framing can reinforce flexible responding with prompts such as, “I can tell it was challenging for you to be intimate with your partner while feeling all that insecurity. How do you think you’d be feeling now, if you had criticized and argued with your partner?” These are just a few of the framing processes that can be elicited to alter the symbolic antecedent context to transform the function of symbolic stimuli on behavior.

Increasing Response Flexibility: Altering Symbolic Response Context

Stimulus functions can be transformed by altering the context surrounding the response as well. Through the use of metaphor, analogical framing can be elicited to change the response context to promote openness and curiosity. As the pregnant person shares, “The insecurity is too painful. I can’t talk about it,” they can be invited to imagine they are a curious explorer who has stumbled upon this emotion for the first time, thus promoting openness and curiosity in the response context. Further altering the response context, the pregnant person can be prompted to describe their sensation of insecurity in terms of its intrinsic properties, e.g., location(s) in the body, temperature, movement, etc. As the pregnant person shares, “The sensations are awful. I feel like running away,” they can be encouraged to track the flexibility in their novel response, “talking about insecurity,” while in the presence of uncomfortable sensations related to insecurity, thus transforming the stimulus function of insecurity on behavior. There are infinite possibilities for targeting the symbolic antecedent and/or response context to guide pregnant clients in increasing their response flexibility, although these novel responses must be tracked to real world consequences over time to promote effective tracking over generalized pliance.

Reinforcing Context Sensitivity and Response Flexibility

Increasing context sensitivity and response flexibility will help pregnant individuals to initiate changes in their behavior. However, to effectively shape behavior change, the pregnant person's progress towards engaging in desired behaviors needs to be reinforced over time. Framing processes that enabled the client to increase context and response flexibility to activate behavior change, can now be evoked to help the pregnant person contact the reinforcing elements of the real world consequences of their behaviors between sessions. Imagine this scenario, a pregnant woman who has been told by her doctor that she must avoid sugary drinks due to her gestational diabetes, describes drinking from her water bottle on her way to work while walking past the smoothie shop she typically visits to calm her work anxiety. As the pregnant woman reports, "My anxiety was horrible, but my doctor will be happy with me," comparison and conditional framing can be evoked with, "I imagine walking past the smoothie shop with all that anxiety must have been really challenging. Why did it matter to you to follow through despite the anxiety? Just for your doctor, or...?." As the mother replies, "Well, I want to grow a healthy baby," prompts such as, "And when you drink water and skip the smoothie, what are you giving your baby?" can help the pregnant mother contact the natural reinforcing elements of the consequence, as she relates satisfaction embedded in the consequence "giving my baby more nutrients" to her novel behavior "drinking water while walking past the smoothie shop." Executing these exchanges with care can help discourage generalized pliance and promote reinforcement of effective tracking, whereby intrinsic satisfaction becomes the reinforcing consequence, rather than rule-following generally.

Building a Flexible, Functionally Coherent and Stable Self Perspective

The relational framing processes outlined above help bring symbolic activity under contextual control that stimulates and reinforces effective responding. These same methods can be applied to the level of "self" to encourage patterns of responding that are stable and functionally coherent, yet variable and flexible. Since reformulations of self concept are an inherent aspect of the transition to parenthood, the perinatal period is a particularly salient context for intervening at the level of self, as the label "parent" re-works itself into relational networks.

Promoting a Flexible Self Concept

First, continually redirecting a pregnant person to notice their symbolic experiences from a present moment context, can help them form distinctions between their self concept and the constant and ever-changing stream of experiences that make up their life. For example, a pregnant individual who reports, "I'm feeling so stressed out right now. I'm just an anxious person," can be prompted to describe the present moment physical sensations they're experiencing that relate to the "anxious person" self-label. Evoking shifts in perspective taking, whereby the pregnant client explores their symbolic experiences across many situational contexts, can further aid the client in detaching from unhelpful self-labels as they build awareness of the variability of their experiences. That is, the pregnant person can be guided to explore the extent to which the "anxious person" self-label makes sense in varying contexts, e.g., with friends, family, co-workers, supervisors, teachers, etc.

Deriving a Stable Self Concept

Second, to develop a stable sense of self that is less affected by changes in the

context, the pregnant individual can be prompted to notice the perspective they can take that is common across all situations, a sense of self that observes experiences but is separate from those experiences. Once the pregnant client has explored the variability of their self-label across many life scenarios, they can be prompted with questions like, "Across all these situations you have described, who is doing the noticing?" to begin developing a stable perspective to observe symbolic activity without attaching to unhelpful self-labels.

Encouraging a Functionally Coherent Self Concept

Third, to promote a sense of self that is functionally coherent, pregnant clients can be guided to integrate their awareness of the variability of symbolic experiences with their stability in perspective taking under symbolic hierarchies where the self is the context that contains all experiences. As the pregnant individual shares, "I'm going to get fired. I'm just such an anxious person.," they can be directed to organize their thoughts, feelings and actions into a symbolic hierarchy with their observing self at the top, with prompts such as, "and when you're feeling anxious at work, what do you do?"

Reinforcing a Stable, Flexible and Functionally Coherent Self Perspective

Finally, to develop a sense of self that is functionally coherent and enables flexible responding to ever-changing contexts, pregnant clients can be guided to perform their own functional analyses by evaluating the impact of antecedent contexts on their behaviors, and by tracking the real world consequences of their behaviors. The pregnant person who has recently smoked tobacco after having quit the week before, could be prompted to explore the antecedent elements (time, place, people, objects, urges) related

to their smoking behavior, and they could also be prompted to explore the consequences of refraining from smoking behavior for the days they did so.

Building and Sustaining Motivation

Guiding pregnant clients to build a more flexible, stable and functionally coherent self-concept is an important step in helping pregnant people engage in healthy prenatal behaviors that positively impact fetal development, however, the goal of RFT-informed treatments, such as ACT, is to assist clients in living a rich, meaningful life according to their core, personal values. With this goal in mind, framing processes are elicited so that enduring sources of meaning are linked to present moment actions so that distant consequences augment the impact of immediate reinforcers to build and sustain motivation that persists despite life's inevitable setbacks.

The perinatal period provides a particularly salient context for intervening upon contextual control processes that build and sustain motivation and life purpose. In the next chapter, I introduce the Birth Your Way 6-week (15 hours) prenatal health promotion intervention, an ACT-based intervention designed to help pregnant individuals track sources of meaning (care for their growing baby) to present moment actions (prenatal diet, physical activity), so that longer-term consequences (healthy newborn) can buffer the impact of immediate stressors on prenatal behavior.

CHAPTER III

THE BIRTH YOUR WAY PROGRAM

ACT Conceptual Model

The 6-session (2.5 hours per session) Birth Your Way intervention is grounded in an Acceptance and Commitment Therapy (ACT) approach to shaping behavior change. ACT-based programs target psychological flexibility, the hypothesized psychological mechanism underlying ACT's effectiveness. Psychological flexibility is conceptualized in ACT as the degree to which actions are aligned with core personal values. Experiential avoidance is the theoretical opposite of psychological flexibility and is conceptualized as the degree to which attempts to avoid internal events compromise engagement in values-directed actions. The ACT conceptual model is illustrated with a hexaflex that includes the six interdependent acceptance and change processes involved in psychological flexibility: contact with the present moment, acceptance, cognitive defusion, self as context, values, and committed action (see Figure 1). The six interrelated psychological processes that make up psychological flexibility are defined in ACT terms below, and are explained in detail using an RFT conceptualization in the next section.

Contact with Present Moment. Sometimes referred to as pure awareness, contact with the present moment describes the process of bringing awareness to present moment experiences.

Acceptance. From an ACT perspective, acceptance is the process of allowing internal events to unfold without engaging in attempts to control or manipulate them.

Cognitive Defusion. Cognitive defusion refers to the process of forming distinctions in the present moment between the content and context of internal events.

Self as Context. Self as context is a process occurring in the present moment whereby internal events are noticed and responded to from a self-perspective that is the container for all internal events and cannot itself be observed.

Values. In ACT, values represent the present moment process of contacting sources of meaning that are overarching, inexhaustible and available regardless of context.

Committed Action. Committed action in ACT is the process of committing to short-term and long-term goals made up of specific behaviors that align with core, personal values.

Figure 1. Hexaflex of Interdependent Psychological Processes Targeted by ACT

In ACT-based approaches experiential activities are performed before didactic lessons to circumvent language processes that reinforce pliance, or rule-following that lacks sensitivity to real world consequences. Each Birth Your Way session includes

experiential activities that target the six interrelated acceptance and change processes that make up the ACT Hexaflex (see Table 2). The following section includes a detailed description of the relational framing processes that are evoked in experiential Birth Your Way activities to target each of the interrelated psychological processes that make up psychological flexibility.

Table 2. Curriculum for Birth Your Way 6-Session Group Series

	Didactic Lessons	Experiential Exercises	Home Practice Review
1	• Labor process overview • Role of stress on fetal health and labor progression • Early labor phase	• Breathe with Baby • Don't Wants to Wants for Birth • Cat Under the Porch • Early Labor Menu	
2	• Labor process review • Role of stress review • Active labor phase	• Stress Where • Notice 5 Things • Passengers on the Bus • Comforts for Active Labor	• Breathe with Baby • Early Labor Valued Action
3	• Labor process review • Role of stress review • Transition labor phase • Role of health behaviors on fetal health	• Pebble on the Water • Notice Your Emotion • What's Wrong to What's Missing for Health Behavior • How I'm Growing Baby	• Notice 5 Things • Active Labor Valued Action
4	• Labor process review • Role of stress review • Fetal/placental ejection	• Tree in the Storm • Tree Breathing • Values-based Communication	• Notice Your Emotion • Growing Baby Valued Action
5	• Labor process review • Role of stress review • Risks/benefits labor strategies • Early postpartum care	• Connect with Baby • Pebble on the Water • Tree in the Storm: Values-based Birth Planning	• Tree Breathing • Communication Valued Action
6	• Labor process review • Role of stress review • Risks/benefits labor strategies • Newborn parenting	• See Hear Do for Baby • Letter to Baby • Pebble on the Water • Tree in the Storm: Values-based Birth Planning	• Connect with Baby • Birth Plan Valued Action

Birth Your Way in RFT terms

The experiential ACT exercises embedded in the 6-session Birth Your Way intervention are designed to elicit symbolic derivation processes that enable pregnant individuals to transform the stimulus function of stressors into the motivation to initiate and persist in actions that align with their core personal values. Described in RFT terms, Birth Your Way's experiential ACT exercises evoke hierarchical and deictic framing processes in a particular sequence to promote building of hierarchical networks in which overarching sources of meaning (values) reside on top, desirable, longer-term goals are in the middle, and shorter-term goals and patterns of behavior make up a wide base. When hierarchical networks are arranged in this fashion, healthy prenatal behaviors (preparing healthy meals) are linked to longer-term goals (delivering healthy baby), and are reinforced through contact with overarching values (care for baby's health), thus overriding the influence of immediate consequences (stress) on behavior. Care must be taken when evoking symbolic relating processes to avoid reinforcing ineffective rule following, and to promote augmentation of behavior change, whereby contact with values provides an ever present and inexhaustible source of motivation.

In the Birth Your Way series, this is accomplished by first guiding pregnant families to identify and build overarching qualities of action that fit with their desirable long-term goals. The "Don't Wants to Wants for Birth" and "Breathe with Baby" activities are combined in the first session to allow pregnant families to draw out the higher functions of their specific goals. By drawing out the higher function (meaningful purpose) of a specific goal, a hierarchical network is derived that allows satisfaction to be contacted from a wider variety of behaviors, even when the specific goal cannot be

achieved. For example, if a pregnant mother who has a specific goal to deliver her newborn using behavioral (non-medical) labor strategies, identifies autonomy as her overarching value influencing that specific goal, she can derive satisfaction engaging in a wide range of labor strategies (medical and non-medical) as long as they align with her value of autonomy given the real world contingencies.

The Don't Wants to Wants for Birth activity is designed to help pregnant families extract sources of meaning from the inevitable worries that come with preparing for childbirth. As pregnant families see their group brainstorm of "Don't Wants" for their upcoming birth experience written on the whiteboard, distinction framing between the content and context of worried thoughts promotes *cognitive defusion*, and coordination framing of the presence of worried thoughts among group members promotes *acceptance*. To promote *self as context*, analogical framing is elicited with the use of the metaphor "storm of thoughts and feelings" to enable pregnant families to link internal events (worried thoughts and feelings) to the temporary yet uncontrollable qualities underlying real world weather events. Aiming to increase pregnant group members' context sensitivity, the Breathe with Baby activity is delivered to promote *contact with the present moment* via deictic framing that directs pregnant families to track the present moment contingencies (physical sensations) related to their "storm of thoughts and feelings". Through the use of deictic and conditional framing pregnant families are invited to imagine what their growing baby might also be experiencing in the present moment. The Breathe with Baby activity couples a specific action (mindful breathing) with a shorter-term goal (giving baby more oxygen and nutrients). This is an important first step in helping pregnant families identify sources of meaning that are highly

motivating and inexhaustible. However, it is critical to normalize the presence of "symbolic storms" and to highlight their uncontrollable and temporary qualities, to avoid reinforcing experiential avoidance.

Then, returning to the Don't Wants to Wants activity, oppositional framing is elicited to promote the process of contacting *values* with prompts such as, "If you don't want 'rude medical staff at your birth, what is it you want instead?". Pregnant families' will often respond with statements reflecting their longer-term goals (respectful medical staff at birth), so comparison framing is elicited with prompts such as "why does it matter to you to have respectful medical staff at your birth? What do you care about most?" to guide pregnant families in building hierarchical networks with overarching values (respect) at the top and longer-term goals (respectful medical staff at birth) underneath. Over time, as pregnant individuals build hierarchical networks by tracking overarching sources of meaning (respect) to longer-term goals (respectful medical staff at birth), shorter-term goals (selecting a respectful medical team), and a wide variety of specific actions (asking questions at a prenatal appointment), effective augmentation of behavior change is strengthened. The Don't Wants to Wants for Birth experiential activity enables pregnant group members to extract sources of meaning from problems, and typically results in a brainstorm of value labels that includes: competency, planfulness, knowledge, comfort, ease, compassion, safety, health, autonomy, and respect (see Figure 2).

Value labels are not goals that can be achieved, and instead describe overarching qualities of actions that provide inexhaustible sources of intrinsic motivation to engage and persist in actions towards desirable goals. Thus, the Don't Wants to Wants activity is completed by evoking analogical framing with a metaphor that links qualities associated

with “rafting down a river” to pregnant families’ experiences engaging in actions that align with their core personal values. As pregnant group members brainstorm qualities related to “rafting down a river,” symbolic antecedents for later behavior change are established as pregnant families track qualities such as “effortful, alert, sensitive to real world context, limited control, variable experiences, and common observer of experiences” to their developing self-conceptualization of values-directed behavioral engagement.

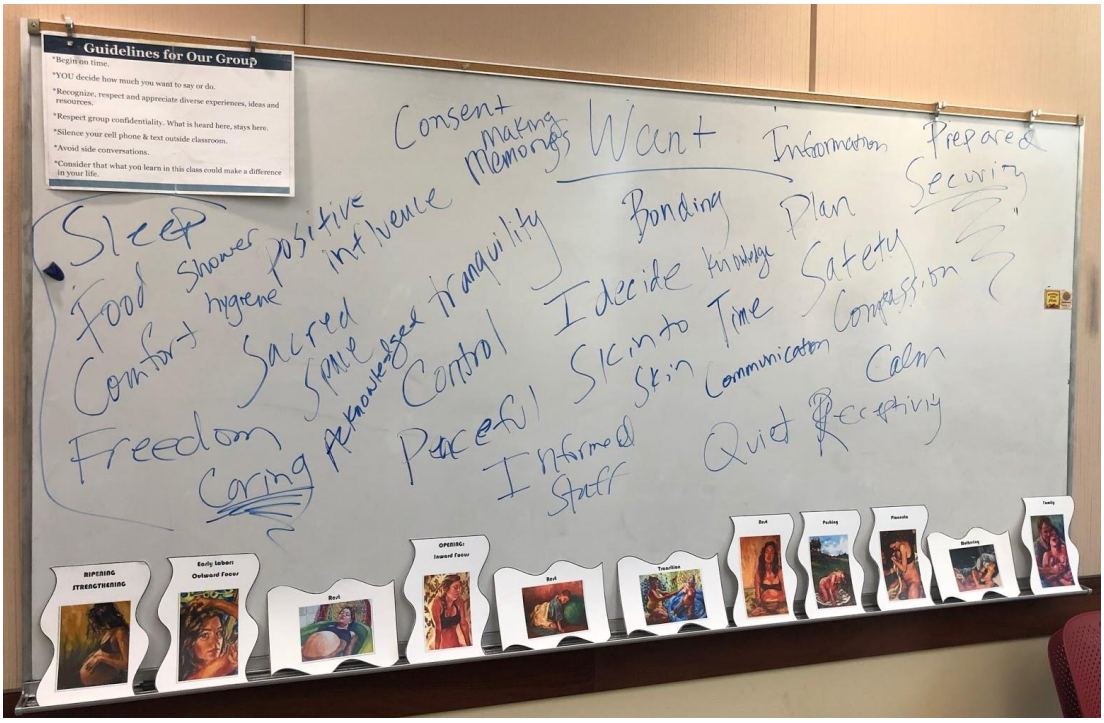


Figure 2. Photograph of "Wants" from Session 1 "Don't Wants to Wants" Activity

Conditional and comparison framing is evoked to encourage pregnant group members to assess the satisfaction and utility derived from engaging in a “rafting down a river” approach to life despite its inherent challenges, in contrast to engaging from a “stuck in the storm” self-perspective (see Figure 3). Once again, to avoid reinforcing

experiential avoidance, coordination framing is elicited to stimulate self-compassion as group members normalize their shared human experience of "getting caught up in storms of thoughts and feelings." Finally, *committed action* is promoted as group members brainstorm possibilities for using the Breathe with Baby exercise in their real world situations to "gain enough distance" from symbolic storms that arise so that guiding values can be contacted and acted upon.

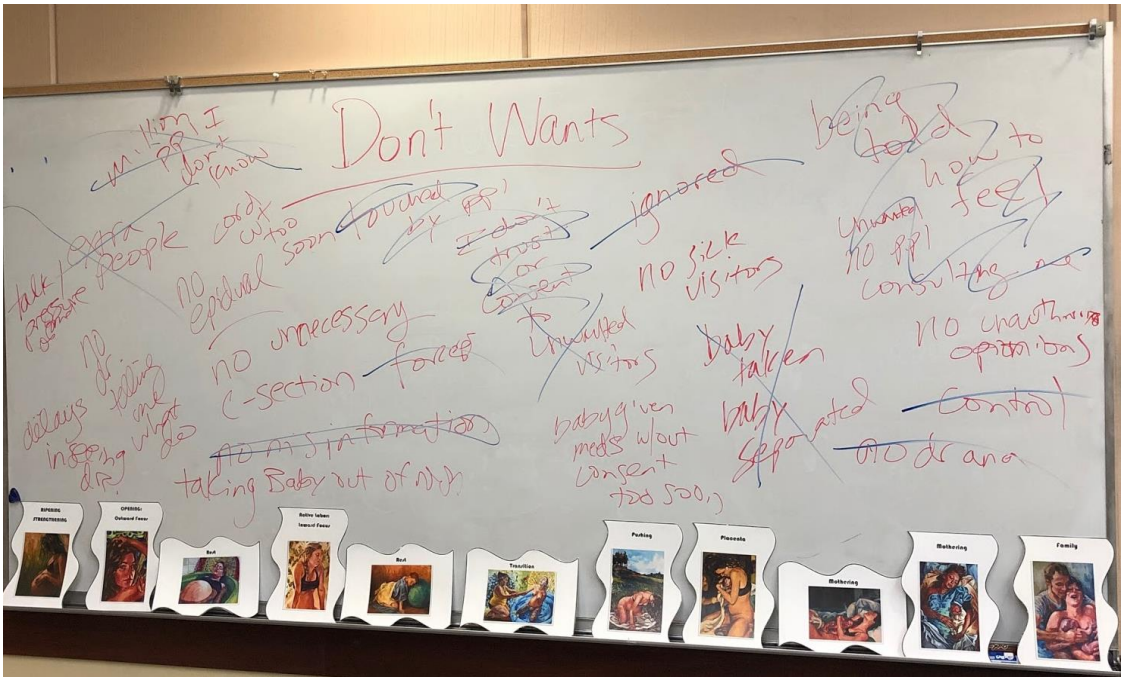


Figure 3. Photograph of "Don't Wants" from Session 1 "Don't Wants to Wants" Activity

In each Birth Your Way session experiential activities are combined in a similar way to encourage pregnant clients to increase their context sensitivity and derive from stressors sources of meaning that can serve to motivate later behavior change. Symbolic relating processes evoked in session one with the Don't Wants to Wants and Breathe with Baby activities are re-elicited in session two with the Passengers on the Bus and Notice 5 Things activities, in session three with the Notice Your Emotion and What's Wrong to

What's Missing for Health activities, in session four with the Tree in the Storm and Tree Breathing activities, in session five with the Connect with Baby and Tree in the Storm Birth Planning activities, and in session six with the See, Hear, Do for Baby and continuation of Tree in the Storm Birth Planning activities (see Table 2). With experiential exercises combined in this way, group members increase their context sensitivity and derive sources of meaning that provide motivation to initiate engagement in values-directed actions.

Additional experiential activities are embedded in each Birth Your Way session that guide pregnant group members to construct hierarchical networks that sustain pregnant individuals' motivation to persist in values-directed actions despite the inevitable barriers that arise. The experiential activities that promote these symbolic processes are the Early Labor Menu activity from session 1, the Comforts for Active Labor activity from session 2, the How I'm Growing Baby activity from session 3, the Values-based Communication activity from session 4, and the Tree in the Storm: Values-based Birth Planning activity from sessions 5 and 6. Effective augmentation of behavior change is reinforced as pregnant group members track their engagement in specific actions to the intrinsic satisfaction derived from contacting top-level sources of meaning. In each Birth Your Way session, group members prepare a specific action to engage in later in the week, and create a valued action plan that ties the specific action to their mid-level goals and top-level values. Then, at the beginning of the following session, pregnant clients debrief their experience from the prior week, and as they describe the degree to which the specific action was engaged in as planned, sources of meaning are extracted that reinforce engagement in values-directed actions, even in cases where the specific

goal was not achieved. These experiential activities are included to sustain pregnant group members' motivation via construction of symbolic hierarchies whereby top-level values function as sources of meaning for a wide and variable base of specific actions that are tied to an intermediate level of shorter and longer-term goals.

The relational framing processes evoked to promote formation of these symbolic hierarchies will be illustrated by describing the experiential Early Labor Menu activity from session one. First, pregnant group members are encouraged to formulate a longer-term goal for early labor that is functionally coherent and framed in terms of approach towards a desirable outcome, rather than avoidance of an undesirable outcome. Goals that contain these two components (functionally coherent and stated in the positive) increase motivation by providing a meaningful direction for behavior. A rubber band metaphor is used to describe the overall process of labor so that pregnant group members formulate goals and specific actions that are functionally coherent given the varying qualities of each phase and stage of labor. In the three opening phases of labor the top of the uterus (fundus) pulls open the bottom of the uterus (cervix) much like stretching a rubber band. The pushing stage of labor is similar to letting go of the fundal end of the rubber band (fetal ejection reflex). Group members build the metaphor together and derive that the overall purpose of the opening stage of labor (stretching the rubber band) is to build power and open a space to push baby out (letting go of the rubber band). As analogical framing is evoked, pregnant group members compare the intensity of stretching a rubber band from 0% - 75% (early labor), 75% - 95% (active labor) and 95%-100% (transition), deriving that early labor is the longest and least intense labor phase, active labor is much shorter and more intense, and transition is extremely short and very intense. The

experiential exercise is followed up with didactic information about the role oxytocin and the human stress response play in cervical dilation, and pregnant group members discuss labor strategies tailored to the context of each phase of labor to promote cervical opening.

Then, zooming in on early labor, deictic framing is evoked and pregnant group members imagine themselves discovering that early labor has just begun. As group members share their nervousness, excitement and urge to get active in this imagined future scenario, conditional framing is elicited with "if you're active throughout early labor, how might you feel when it's time to push baby out?" and "if you're sedentary throughout early labor, what might be going on with your oxytocin levels?". Eliciting framing processes in this way enables pregnant group members to formulate a longer-term goal for early labor that is functionally coherent (makes sense given the real world early labor context) and is stated in the positive (based on approach not avoidance). To begin constructing symbolic hierarchies that can sustain motivation, pregnant group members are prompted to track their longer-term goal for early labor to a top-level value. While referring back to the value labels elicited earlier in the session, hierarchical framing is evoked with the prompt "why does it matter to you to follow through with your goal for early labor?". As group members track their longer-term goals (engage in activities during early labor that help labor progress) to top-level values (health), they begin constructing symbolic hierarchies that can sustain motivation. However, in order for these symbolic hierarchies to promote effective augmentation of behavior change, a wide and varied base of specific actions and shorter term goals must be tracked to the top-level value.

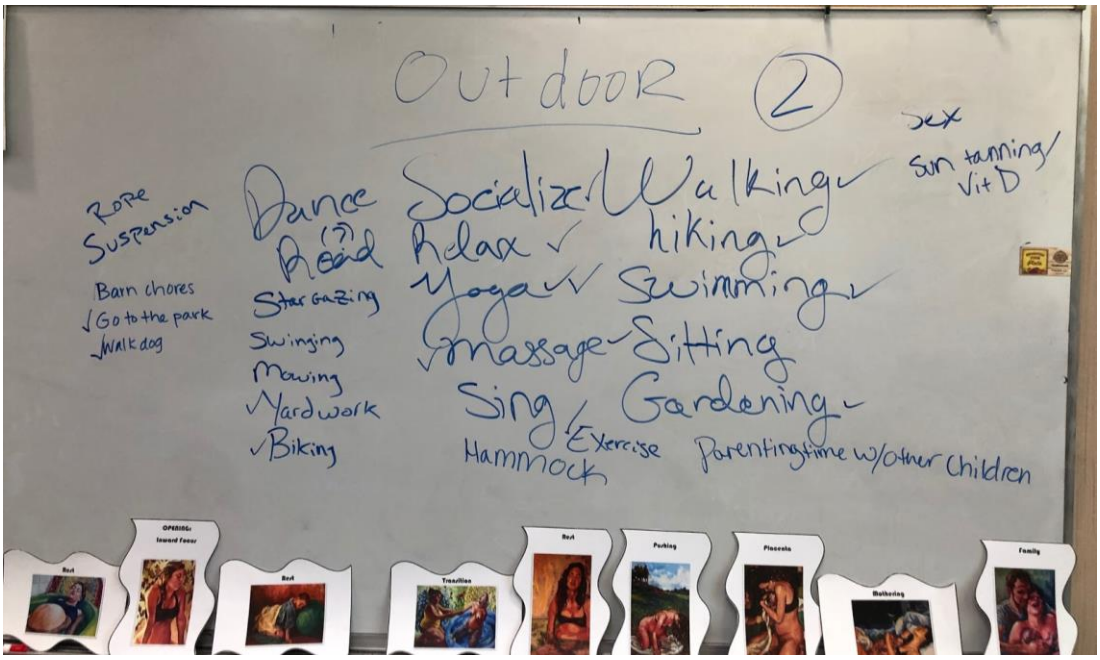


Figure 4. Photograph of Early Labor Specific Action Brainstorm from Session 1

With this goal in mind, oppositional framing is elicited to help pregnant members generate a wide range of possibilities for future actions that fit into six behavioral categories: restful vs. active, indoors vs. outdoors, and alone vs. with others (see Figure 4). Deictic framing is evoked as group members are prompted to brainstorm activities they engage in now that bring satisfaction and enjoyment. Group members are encouraged to report all activities they find satisfying within these categories, regardless of their utility for early labor, and coordination framing is elicited to guide clients to track inherent sources of satisfaction contacted in the present moment to their longer-term goal for early labor. Next, distinction and conditional framing are elicited to guide pregnant group members to build a personalized Early Labor Menu that contains specific actions that fit the real world early labor context, are inherently satisfying, and align with the client's top-level value and longer-term goal for early labor. Finally, deictic and conditional framing are elicited as group members re-imagine themselves facing barriers

during early labor and assess the utility of using their Early Labor Menu for overcoming imagined future barriers.

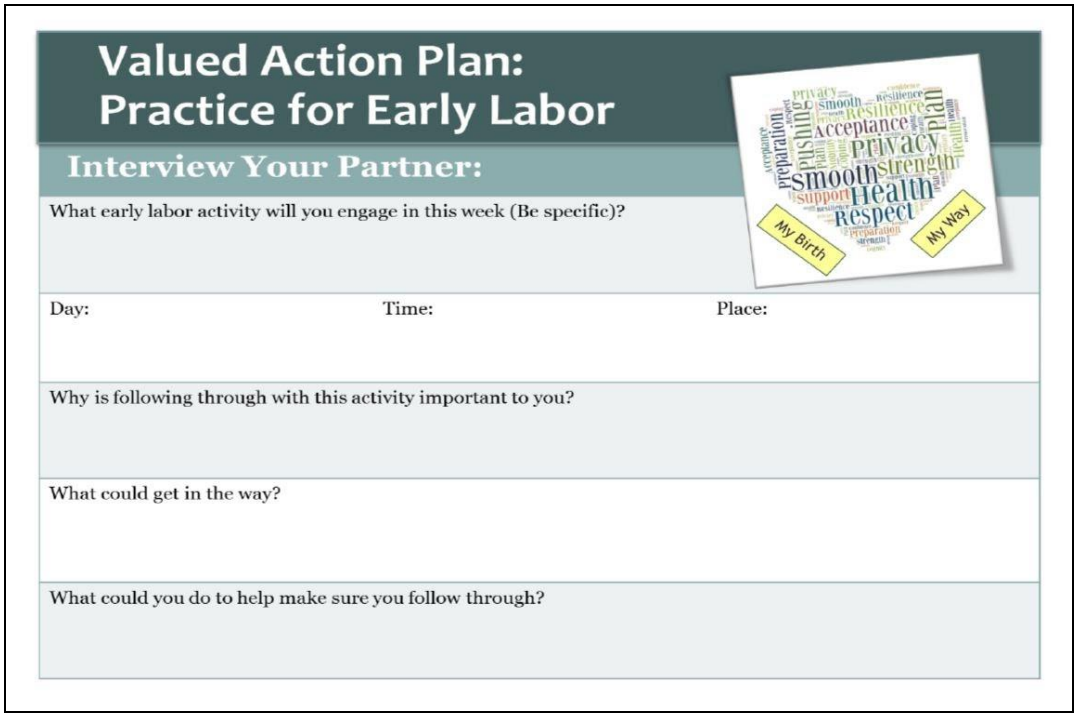


Figure 5. Valued Action Plan Handout from Session 1

Then, pregnant clients choose one specific action from their Early Labor Menu to engage in the upcoming week and create a valued action plan that guides them to track their specific action (walk around the block Thursday before dinner) to their top-level value (health), to their shorter-term goal (give growing baby more oxygen and nutrients), and to their longer-term goal for early labor (engage in activities that keep labor progressing). Deictic framing is elicited to prompt pregnant group members to imagine the real world and symbolic barriers that may arise when they attempt to engage in their valued action at the planned time (see Figure 5). Group members generate possibilities for overcoming imagined barriers, and conditional framing is evoked to guide pregnant

clients in assessing the utility of various strategies for overcoming real world and symbolic barriers. As pregnant clients share about symbolic storms they anticipate may arise when attempting to engage in their planned valued action, conditional framing is re-elicited to prompt clients to assess the utility of using the Breathe with Baby exercise to help them follow through with their valued action plan.

These hierarchical networks are reinforced at the beginning of the following session, as pregnant group members debrief their valued action plan experience from the prior week while referring to a values compilation handout displaying "Wants" derived from the "Don't Wants to Wants" activity in the first session (see Figure 6). At the beginning of sessions 2-6, symbolic relating processes are stimulated to guide the client to strengthen relations between their specific actions, intermediary goals and top-level values. To increase the probability that a completed action will be repeated, temporal framing is elicited to help pregnant group members contact the reinforcing elements of their completed action by drawing out satisfaction inherent to the completed action and connecting it to top-level values. When the valued action is not completed, pregnant group members explore "what got in the way" and are guided to derive sources of meaning that motivate re-commitment to engage in values-directed actions. Altogether, the experiential Early Labor Menu activity from session one (and corresponding activities from sessions two through six) stimulate symbolic relating processes that guide pregnant group members to derive symbolic hierarchies that sustain motivation to persist in values-directed actions despite inevitable barriers.

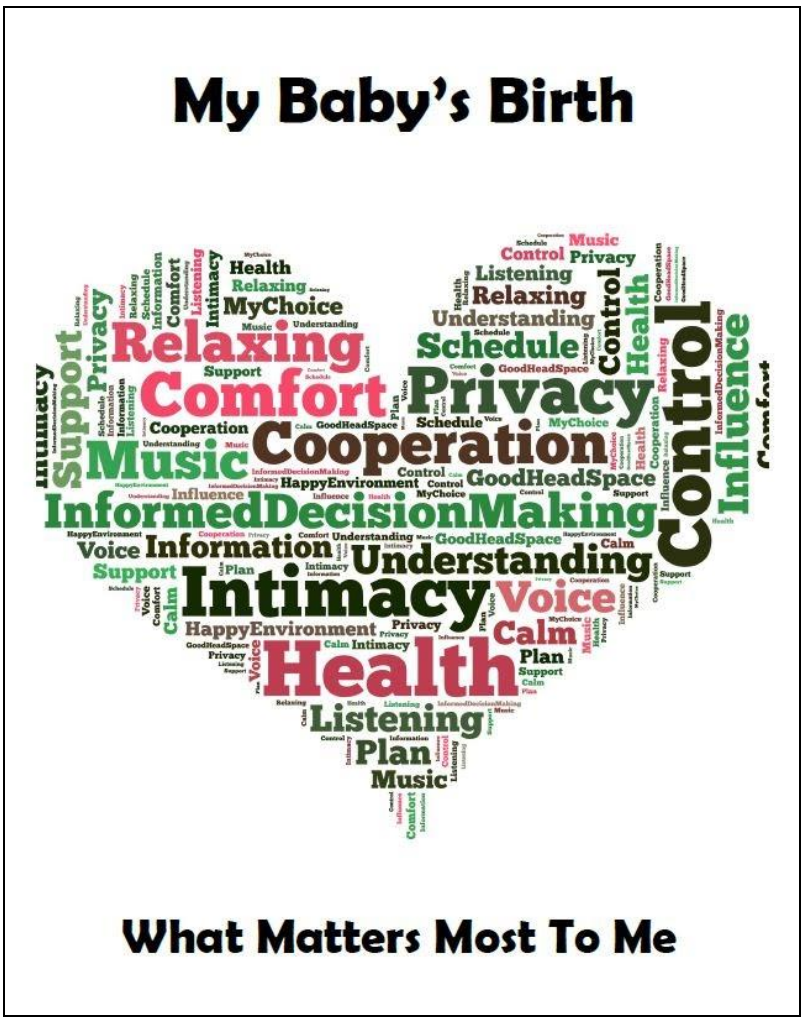


Figure 6. "Don't Wants to Wants" Values Compilation Handout from Sessions 2-6

Implementation Framework

Since 2012, we have utilized the RE-AIM framework to develop and evaluate the Birth Your Way program in collaboration with our public health partners in our model test site, a mid-size county in Oregon that includes a small metro valley region surrounded by a sprawling rural population spanning mountainous and coastal regions (Gaglio, Phillips, Heurtin-Roberts, Sanchez, & Glasgow, 2014; Russell & Alfred, 2003). Developed over two decades ago, the RE-AIM (Reach, Effectiveness, Adoption, Implementation, and Maintenance) framework promotes equitable translation of lab-

based discoveries to positively impact health outcomes within real world public health settings (Glasgow et al., 2019). To assess implementation factors and promote Birth Your Way program adoption, we formed strong community partnerships with the county's Medicaid distributor and Women Infants and Children (WIC) supplemental nutrition program prior to developing the Birth Your Way intervention. We chose to partner with federally-implemented maternal child health programs to maximize reach and impact of the Birth Your Way program. Available to pregnant low SES individuals in every county and/or parish in the United States, the Medicaid program is mandated to provide low or no cost prenatal healthcare, while the WIC program provides access to healthy prenatal nutrition. Nearly half of all pregnant individuals living within our model test site receive Medicaid and WIC services and face increased risk of poor infant and maternal birth outcomes (PeaceHealth Peace Harbor Hospital, 2016). During formative development (2012 - 2014), dissemination pipelines for the Birth Your Way program were established based on qualitative and quantitative interviews with maternal child health caseworkers and their supervisors at our partner Medicaid and WIC sites. During this period, several rounds of needs assessments, focus group testing and small scale community-embedded pilot intervention trials were conducted with pregnant Medicaid and WIC clients. For the past eight years, maternal child health caseworkers from our partner Medicaid distributor have promoted Birth Your Way to pregnant Medicaid enrollees, and our WIC partner has incorporated Birth Your Way programming as an add-on component for its pregnant clients. The Birth Your Way pragmatic randomized clinical trial was conducted within our model test site from 2014 through 2018 to assess efficacy of the 6-week (15 hours)

Birth Your Way intervention and its underlying psychological treatment approach in a real world public health setting (see Chapters 4-7).

Program Adoption and Implementation

Since 2013, maternal child health caseworkers at our partner Medicaid distributor site have provided pregnant Medicaid enrollees with information about the Birth Your Way program, signing up nearly half of all pregnant Medicaid enrollees in the county within their first trimester of pregnancy. Throughout the pragmatic randomized clinical trial evaluation period (2014 - 2018), the original, 6-week (15 total hours) group-based Birth Your Way series (available in English only) was the sole program version available to clients (see Chapters 4-7). Operating in parallel to the randomized clinical trial, the Birth Your Way series was offered to all interested pregnant Medicaid referrals who signed up for WIC services, regardless of study eligibility. One-third of clients referred by Medicaid caseworkers between January 2013 and March 2020 participated in the 6-week group series held in the county's WIC site classroom in cohorts of 5-15 families organized by expected due date. Since the onset of the COVID-19 pandemic in March 2020, the group-based series has been on hold as our partner WIC site closed its physical location due to safety concerns. Plans to adapt the group-based intervention for virtual delivery are underway, and internal program data suggest that virtual delivery of the 6-week group series may increase implementation feasibility.

We analyzed internal program data spanning 2013 - 2018 and learned that a majority (65%) of pregnant Medicaid clients referred to Birth Your Way faced barriers that impeded their ability to participate in the group-based series held in-person at the county WIC site. The top attendance barriers clients reported from 2013 - 2018 were: 1)

lack of transportation (52%), 2) rural location (17%), and 3) work conflict (31%). Upon completion of the Birth Your Way pragmatic randomized clinical trial in 2018, we began offering a 90-minute individual birth preparation session at a time and location convenient to the client, delivered by a perinatal intern with extensive training in ACT psychoeducation. We analyzed clients' satisfaction and use ratings from the 6-week group series and selected lessons with the highest endorsements to be included in the 90-minute session. Between 2018 and 2020, in the post-randomized clinical trial period, one-third of Medicaid clients participated in the group-based series, another one-third received the individual session with an ACT psychoeducator, and the remaining one-third received a digital self-guided version of the individual session designed to be completed independently at the client's own pace. To date, the 6-week group based Birth Your Way series is the only program version that has been evaluated in a randomized clinical trial (see Chapters 4-7).

To respond to the COVID-19 pandemic, the 90-minute individual birth preparation session was rapidly adapted to a 100% virtual delivery format in March 2020. Since transitioning to virtual delivery one year ago, over 90% of Medicaid clients referred to Birth Your Way have participated in at least one individual birth preparation session with a trained ACT psychoeducator, with the remainder receiving the self-guided digital session.

To improve feasibility of implementation, Birth Your Way's intern implementation model was developed in 2018 to address low SES pregnant families' need for perinatal health promotion services that are brief, individualized and offered at flexible times and convenient locations. Undergraduate and post-baccalaureate students

who are pursuing careers in Psychology, Human Physiology, and/or Public Health related fields, and who have an interest in perinatal health, are invited to apply for a minimum 15-month ACT psychoeducator internship position. Up to four interns are selected per year to participate in the rigorous 12-week perinatal ACT psychoeducation training program. Interns complete individualized education plans that illustrate how the internship will help them achieve their professional development goals. Interns who complete the ACT psychoeducator training and demonstrate competency in delivering the 90-minute individual session in role-plays with peers, are invited to begin conducting sessions with pregnant WIC clients. New interns participate in weekly consultation team meetings to discuss current client issues and to receive ongoing training in the ACT psychoeducator approach. Advanced interns who have demonstrated proficiency in their work with pregnant clients for a minimum of nine months, are invited to work more independently with clients, meeting once per month for advanced ACT psychoeducator trainings.

Expanding Reach

Since 2018, we have utilized the Hybrid Prevention Program Model (HPPM) to culturally adapt the 90-minute Birth Your Way session for Latinx and Black birthing families (Castro, Barrera, & Martinez, C. R., 2004). An implementation framework in its own right, the HPPM cultural adaptation method's central goal is to enable adaptations of evidence-based treatments that balance program fidelity with fit to the local context. In 2018, we leveraged public health partnerships established using the RE-AIM implementation framework in 2012, to form key relationships with bicultural staff within the local public health apparati that work directly with Black birthing families and

Spanish speaking Latinx communities. Employing the HPPM cultural adaptation method, we conducted needs assessments with bicultural staff from our partner Medicaid and WIC agencies before performing several rounds of iterative intervention testing with pregnant Black and Spanish speaking Latinx WIC clients. Having demonstrated good acceptability and feasibility in our preliminary community-embedded intervention trials, the culturally adapted Birth Your Way sessions are delivered to Black and Latinx families both in our original and secondary model test sites. Given that approximately 60% of Black and Latinx families who are eligible for WIC participate in the program, compared to 41% participation among WIC-eligible white families, our second model test site includes Medicaid and WIC partners from the most populous county in Oregon, a racially and ethnically diverse metropolitan region (Carlson & Neuberger, 2021; Harvey, Gibbs, Oakley, Luck, & Yoon, 2020). The culturally adapted sessions currently make up one third of all individual Birth Your Way sessions delivered across both model test sites (20% Latinx families, 13% Black families).

It is not yet clear the extent to which the 15-hour group series may provide health benefits beyond the 90-minute individual session. Although internal program data show promise for the individual session, only the 6-week group series has been evaluated in a randomized clinical trial. In the chapters that follow, I present findings from the Birth Your Way pragmatic randomized clinical trial conducted within our original model test site between 2014 - 2018 to compare efficacy of the 6-week group-based Birth Your Way program against a WIC only comparison group.

CHAPTER IV

BIRTH YOUR WAY PRAGMATIC RANDOMIZED CLINICAL TRIAL

Public health significance

The Birth Your Way prenatal health promotion program was designed to address an alarming public health crisis in the United States. Despite being the wealthiest country worldwide, the United States has the highest maternal and infant mortality rates in the developed world (Organization for Economic Cooperation and Development, 2019). Systemic inequities explain poor public health outcomes in the U.S., as racially, economically and culturally marginalized communities struggle under the burden of highest mortality risk (J. A. Jain et al., 2018; Moaddab et al., 2018; Petersen et al., 2019).

Despite the steady decline of infant mortality globally since 1990, the United States ranks 33rd among the 36 member countries that make up the Organization for Economic Cooperation and Development (OECD), demonstrating worse outcomes than many low and middle income countries (United Health Foundation, 2021). Infant mortality risk in the U.S., or the risk of infant death in the first 12 months of life, is on par with developing nations Serbia and Qatar (Organization for Economic Cooperation and Development, 2019). An infant born in the U.S. is three times more likely to die within the first year of life than an infant born in Finland or Japan (Kim & Saada, 2013; Kochanek, Xu, Murphy, Minino, & Kung, 2012). Inequities based on socioeconomic status (SES) and a structural history of racial oppression are the primary reasons for infant mortality disparities within the United States (Callaghan, 2014; Kochanek et al., 2012). Poor birth outcomes make up the primary determinants of increased infant mortality risk, with low birthweight deliveries, preterm births and Neonatal Intensive

Care Unit (NICU) admissions predicting significantly increased risk of infant death in the first 12 months of life (Kim & Saada, 2013). A newborn is considered preterm if delivered prior to 37 weeks gestational age. An infant is defined as low birthweight if weighing less than 2500 grams at birth, and very low birthweight if weighing less than 1500 grams at birth. The Birth Your Way program aims to prevent NICU admissions, preterm births and low birthweight deliveries because these birth outcomes are the most significant predictors of infant mortality (Kochanek et al., 2012).

To mitigate poor birth outcomes, massive federal programs target the structural factors known to increase infant mortality risk, (e.g., food insecurity and lack of prenatal medical care). Nationally implemented maternal child health programs target these structural barriers through increased access to healthy prenatal nutrition and early and adequate prenatal medical care. Although implementation of federal maternal child health programs varies slightly depending on state governance, these programs enjoy wide reach and are available in every county or parish in the United States (Bitler & Currie, 2005; Medicaid and CHIP Payment and Access Commission, 2019).

The federal Medicaid health insurance program provides pregnant low SES Americans with free or low cost insurance coverage for prenatal, childbirth and postpartum medical care (Markus, Krohe, Garro, Gerstein, & Pellegrini, 2017). The expansion of Medicaid under the Affordable Care Act is associated with improved birth outcomes, and although program implementation varies by state, the Medicaid program enjoys excellent reach nationally (Harvey et al., 2020). Nearly half of all U.S. births are covered by Medicaid with 70% of pregnant beneficiaries receiving managed care

services; whereby caseworkers promote prenatal medical care engagement within the first trimester of pregnancy (Medicaid and CHIP Payment and Access Commission, 2019).

Upwards of 593 billion in federal and state tax dollars are directed annually to the Medicaid program budget (Rudowitz, Hinton, Diaz, Guth, & Tian, 2019). The Medicaid program is burdened with covering costs for the nation's highest risk pregnancies and most complicated birth outcomes (Markus et al., 2017). Average cost of NICU admission ranges from $15,000 to $90,000 per infant with average daily NICU stays exceeding $3000 per day (Centene Corporation, 2018). Pregnant Medicaid recipients are significantly more likely to require NICU services for their newborns than privately insured Americans. Although the wide network of private and non profit Medicaid distributors in the U.S. is complex and varied, Medicaid distributors have a shared goal to improve birth outcomes to reduce their disproportionate cost burden associated with high risk deliveries (Medicaid and CHIP Payment and Access Commission, 2019).

The federal Special Supplemental Nutrition Program for Women Infants and Children, WIC, spends 6 billion dollars annually to improve maternal child health outcomes by reducing food insecurity (Center on Budget and Policy Priorities, 2018). WIC provides low income families, prenatal to five years of age, with vouchers to purchase pre-approved foods deemed nutritionally sound by U.S. Department of Agriculture nutrition scientists. Receipt of food vouchers is contingent upon WIC client members' engagement in didactic lessons on healthy nutrition. Certified WIC nutritionists deliver nutritional recommendations varied by clients' developmental stage (United States Department of Agriculture, 2020).

Since the WIC program's inception in 1974, multiple large-scale impact reports demonstrate the program's effectiveness in preventing NICU admissions, low birthweight and preterm deliveries via improved access to nutritious prenatal foods (Carlson & Neuberger, 2021; Center on Budget and Policy Priorities, 2018; Food Research and Action Center, 2019; United States Department of Agriculture, 2020). These same reports point to clients' high levels of chronic stress as a key barrier to their following through with nutritional recommendations. The low SES WIC population experiences disproportionately high levels of prenatal stress. The WIC program currently does not target prenatal stress within its curriculum despite the fact that stress impedes client engagement (Johnelle Sparks, 2009). Mounting evidence suggests that prenatal stress plays a key role in impeding the federal WIC program's ability to maximize positive health impacts on a national scale (Fingar, Lob, Dove, Gradziel, & Curtis, 2016).

Interestingly, similar to prenatal nutritional intake, prenatal stress is a primary psychosocial determinant of the poor birth outcomes that increase infant mortality risk. Chronic prenatal stress increases fetal glucocorticoid exposure in utero which increases the risk of fetal growth restriction, spontaneous preterm delivery and complications requiring NICU services (Christian, 2014). There are currently no federally-funded maternal child health programs that target prenatal stress, despite increasing evidence that chronic prenatal stress functions to increase infant mortality risk (Organization for Economic Cooperation and Development, 2019). Low SES families experience disproportionately harmful levels of prenatal stress than middle class families and intersecting racial disparities compound these effects (Johnelle Sparks, 2009). When compared to white U.S. families, African American families experience

disproportionately higher rates of low birth weight and preterm deliveries (Medicaid and CHIP Payment and Access Commission, 2019). Within the Medicaid population, African American mothers have the highest rates of preterm and low-birth-weight deliveries than all other racial/ethnic groups (Markus et al., 2017). African American newborns are twice as likely to die within their first year of life compared to white newborns in the U.S (United Health Foundation, 2021). Increased risk of infant death suffered by African American communities can be partially attributable to chronic prenatal stress exposure triggered by racial discrimination experienced during the prenatal period (Gennaro & Hennessy, 2003; Saluja & Bryant, 2021).

Similarly, Latinx families experience structural racism and increased levels of prenatal stress resulting from discrimination based on immigration status, language and race/ethnicity that contribute to poor health outcomes (Halim, Moy, & Yoshikawa, 2017; Howell et al., 2017; Rhodes et al., 2015). Length of time since migrating to the U.S. is a key factor in predicting health outcomes for Latinx families (Koniak-Griffin et al., 2015). The Latina Health Paradox refers to the epidemiological paradox in which Latinx birthing people who have more recently immigrated to the U.S. deliver healthier newborns on average than Latinx mothers who have resided in the U.S. for a lengthier period of time. This holds true for Latinx mothers who encountered acute stressors and physiological challenges in their migration journey to the U.S (Molina, Alegría, & Mahalingam, 2013). The poor health effects associated with chronic discrimination stress increase with time spent living in the U.S (Reid et al., 2016). Earlier theories suggested that acculturation, specifically adoption of an unhealthy American diet and sedentary lifestyle, accounted for deteriorating health outcomes for Latinx communities in the U.S (Ramos, Jurkowski,

Gonzalez, & Lawrence, 2010). Growing evidence now suggests that intergenerational fetal transmission of prenatal stress hormones better explains the Latina Health Paradox phenomenon (Fox, Entringer, Buss, DeHaene, & Wadhwa, 2015; Saluja & Bryant, 2021; Sanchez-Vaznaugh et al., 2016).

Maternal mortality risk, or risk of death related to pregnancy and childbirth, is higher in the U.S. than it is in all other developed countries and many low and middle income countries (Organization for Economic Cooperation and Development, 2019). Once again, systemic racial disparities explain the U.S. lead in poor maternal health outcomes (Howell et al., 2017; Roth & Henley, 2012). Since 1986 the Centers for Disease Control (CDC) has conducted national surveillance on maternal mortality rates in the U.S., with its official Pregnancy-Related Mortality Ratio (PRMR). The PRMR indicates the number of maternal deaths per 100,000 live births that occurred during pregnancy or within one year of the end of pregnancy due to pregnancy-related issues. The PRMR for Black birthing people (40.8) is over 3 times higher than it is for white birthing people (12.7), with the majority of maternal deaths deemed preventable (Centers for Disease Control, 2020). A comprehensive analysis of PRMR trends from 2007 - 2016 provides critical evidence that structural racism and the chronic exposure to discrimination-related stress hormones experienced by Black families drives the high U.S. maternal mortality rate. A married, middle class, college educated Black woman experiences greater maternal mortality risk than a single, low income white woman with less than a high school diploma (Petersen et al., 2019). Birthing people in the U.S. face the highest risk of death from complications related to pregnancy, childbirth and postpartum, than their counterparts in any other developed nation, and racial

discrimination primarily explains this disparity (J. A. Jain et al., 2018; Moaddab et al., 2018).

Cesarean section is major abdominal surgery that has lasting health impacts on birthing people who undergo the procedure. The most common surgery undergone in the U.S., cesarean section is a lifesaving medical procedure that has been a key measure in reducing maternal mortality rates globally (Roth & Henley, 2012). However, overuse of the surgical procedure results in iatrogenic effects that are observable on a global scale. The World Health Organization (WHO) reports that cesarean rates below 5% or above 15% are associated with increased risk of maternal mortality (World Health Organization, 2015). The U.S. ranks 5th in the world for most cesarean surgeries performed per 1000 live births, with surgical deliveries accounting for 32% of U.S. births, far higher than the upper limit recommended by the WHO (Organization for Economic Cooperation and Development, 2019). Multiple public health reports point to reducing the U.S. cesarean surgery rate as the key recommended strategy for mitigating U.S. maternal mortality rates (Medicaid and CHIP Payment and Access Commission, 2019; Rudowitz et al., 2019; World Health Organization, 2015).

Medicaid families face the greatest maternal mortality risk in the U.S., and experience significantly higher risk of undergoing cesarean surgery than do privately insured families (Medicaid and CHIP Payment and Access Commission, 2019). Over two-thirds (68%) of Black families' births are covered by Medicaid, compared to 30% Medicaid coverage for white families' births. Black families undergo cesarean surgery for 36% of childbirth deliveries, compared to the 30.1% cesarean rate for white families (Petersen et al., 2019). Cesarean surgery is more likely to be over-utilized among low

SES, Latinx families in regions closer to the Southern US border, and under-utilized among low SES Latinx families living further from the US border with Mexico (Morris, Gomez, Naiman-Sessions, & Morton, 2018). Both over and under-utilization of cesarean surgery among Latinx families in the US contributes to increases in maternal mortality for Latinx birthing people, however, over-utilization of the surgical procedure presents the greatest mortality risk for Latinx families (Howell et al., 2017; J. A. Jain et al., 2018; Petersen et al., 2019). Even when the three primary predictors of increased Cesarean surgery risk are reduced: 1) labor induction, 2) epidural anesthesia, and 3) constant fetal heartbeat monitoring, cesarean surgeries remain disproportionately high among Black and Latinx birthing people (Vedam et al., 2019; Wu, Kataria, Wang, Ming, & Ellervik, 2019). This risk disparity in method of delivery persists despite evidence that the necessity of cesarean surgery is shared equally among birthing people from all racial groups, yet low SES and non-white Americans undergo cesarean abdominal surgery known to increase mortality risk at significantly higher rates than middle class white Americans (Yee et al., 2017). In the past five years, critical evidence has emerged that financial incentives within the Medicaid payment structure drive high rates of cesarean deliveries, rather than patient need, because hospitals and delivery staff receive half as many Medicaid dollars for vaginal deliveries than for surgical deliveries (Medicaid and CHIP Payment and Access Commission, 2019). The Medicaid system is disproportionately burdened with covering costs associated with cesarean surgeries that may not have been medically indicated, and Black and Latinx birthing people incur the greatest mortality risk associated with unnecessary cesarean surgeries.

The number one indication obstetricians give for performing cesarean surgery is known as, "failure to progress," which doctors assign to birthing patients when cervical dilation stalls or progresses more slowly than recommended (Cohen & Friedman, 2020). In humans as in other mammals, the sympathetic nervous system activates to slow or stall cervical dilation when threat is perceived in the birthing environment, (Peña, Monk, & Champagne, 2012). In the context of childbirth, this protective physiological response, better known as the fight or flight response, stalls labor to enable the birthing mammal to reach safety before resuming labor (L. Dixon, Skinner, & Foureur, 2013). In non-human mammal species, cervical dilation resumes the moment the birthing mammal determines the perceived threat does not present actual danger (Buckley & Obst, 2015). Unlike all other mammals, humans experience *psychological* threats that trigger this identical protective physiological response, resulting in slow or stalled cervical dilation even when no actual threat exists in the birthing environment (Kenkel, 2020; Romano & Lothian, 2008). Despite the key role stress plays in exacerbating the risk of undergoing cesarean surgery, no existing maternal child health programs target stress to mitigate maternal mortality risk.

The Birth Your Way Approach

Given the long-term goal to impact infant and maternal mortality rates on a national scale, the Birth Your Way program implementation model is designed to coordinate with Medicaid and WIC maternal child health programs to capitalize on their strengths, most notably their exceptional reach in distributing services that target the structural determinants of infant and maternal mortality risk (e.g., medical care, food security). The Birth Your Way intervention is designed to amplify WIC program effects

on improving prenatal nutrition and fetal health. The RE-AIM (Reach, Effectiveness, Adoption, Implementation, and Maintenance) framework was developed over two decades ago to enable equitable translation of scientific innovations to real world public health contexts (Glasgow et al., 2019). Employing an implementation science approach since 2012, we utilized the RE-AIM framework to develop and evaluate the Birth Your Way program in collaboration with Medicaid and WIC partners in our model test site. Our model test site is made up of a mid-size county in Oregon that includes a small metro valley region surrounded by a sprawling rural population that spans diverse geographic settings (e.g., mountain and coastal communities). Nearly half of all pregnant individuals living within our model test site receive Medicaid and WIC services and face increased risk of poor infant and maternal birth outcomes (PeaceHealth Peace Harbor Hospital, 2016). We conducted needs assessments and community-embedded pilot intervention trials from 2012 to 2014 with maternal child health caseworkers, supervisors and pregnant clients from our partner Medicaid and WIC agencies to establish acceptability of the Birth Your Way intervention and feasibility of the Birth Your Way implementation model. Since 2013, maternal child health caseworkers from our partner Medicaid distributor have promoted the Birth Your Way program to pregnant Medicaid enrollees (typically in the first trimester of pregnancy) as a value-added component that incentivizes WIC participation. For the past eight years, our WIC partner has incorporated Birth Your Way programming as an add-on component for its pregnant clients to promote increased engagement in the WIC prenatal nutrition protocol. The Birth Your Way pragmatic randomized clinical trial presented here was conducted within our model test site from 2014 through 2018 to assess efficacy of the Birth Your Way

intervention and its underlying psychological treatment approach in a real world public health setting.

Grounded in the evidence-based Acceptance and Commitment Therapy (ACT) psychological treatment approach, Birth Your Way programing targets prenatal stress, the key psychosocial determinant of increased mortality risk that is not addressed by federal maternal child health programs, including Medicaid and WIC. In ACT-based approaches, stress responses that typically function to stimulate engagement in unhealthy and avoidant behaviors, are transformed to elicit intrinsic motivation to approach and persist in values-directed actions (Assaz, Aniel, Roche, Kanter, & Oshiro, 2018). Birth Your Way programming aims to activate values-based behavioral engagement to increase prenatal Medicaid patients' engagement in the healthy dietary behaviors prescribed by the WIC nutrition program. ACT is a transdiagnostic mental health treatment approach that has shown effectiveness in improving physical and psychological health outcomes in over 500 randomized clinical trials (A-Tjak et al., 2015; Narayanan & Naaz, 2018; K. L. Williams et al., 2010). Thirty years of clinical trials provide strong evidence for ACT's effectiveness in mitigating stress and shaping health behaviors via improvements in psychological flexibility, or the degree to which behaviors align with core, personal values (Borgogna, McDermott, Berry, Lathan, & Gonzales, 2020; Cao, Mak, Li, & Leung, 2021; Fledderus, Bohlmeijer, Pieterse, & Schreurs, 2012; S. Hayes et al., 2004) Numerous studies conducted with a diverse range of populations highlight the key role ACT plays in preventing or buffering stress-related symptoms associated with common mental health impairments, including mood disorders, social and generalized anxiety disorder, and post-traumatic stress disorder (A-Tjak, Morina, Topper, & Emmelkamp,

2021; Abramowitz, Lackey, & Wheaton, 2009; Karekla & Panayiotou, 2011; Schlund, Magee, & Hudgins, 2011; Thompson & Waltz, 2010; Whittingham, Wee, Sanders, & Boyd, 2013; Zvolensky et al., 2015). ACT has also been shown to modify stress-related health outcomes in several key trials, including studies with chronic pain clients, palliative care patients, cancer survivors, migraine sufferers, and cardiovascular disease patients (Almarzooqi, Chilcot, & McCracken, 2017; Arch & Mitchell, 2016; Davis, Deane, Lyons, & Barclay, 2017; Duarte, Ferreira, Pinto-Gouveia, Trindade, & Martinho, 2017; Zamir, Gewirtz, Labella, DeGarmo, & Snyder, 2017). However, research that examines the role of psychological flexibility and efficacy of ACT-based treatments among perinatal populations has been scarce. Greco and colleagues (2003) found that psychological flexibility partially mediated mother's NICU-related stress and maternal adjustment to parenting a newborn after NICU discharge. In a foundational 2017 study conducted with psychiatric in-patients experiencing perinatal mood and anxiety disorders, a group-based ACT treatment showed promise for improving stress-related symptoms (Bonacquisti, Cohen, & Schiller, 2017). The Birth Your Way pragmatic randomized clinical trial is the first to examine the promise of ACT-based treatments for improving psychological flexibility among pregnant individuals.

There is also ample evidence for ACT's role in preventing poor health outcomes via improved health behavior engagement, including shaping of diet, physical activity, and gambling, tobacco, elicit substance and alcohol use behaviors (Bricker, Watson, Mull, Sullivan, & Heffner, 2020; Brown et al., 2008; M. R. Dixon, Wilson, & Habib, 2016; Dochat et al., 2020; Goodwin, Forman, Herbert, Butryn, & Ledley, 2012; Ii et al., 2019; Järvelä-Reijonen et al., 2018; Thekiso et al., 2015). Countless trials with clinical

and community-based populations spanning the past two decades demonstrate that increases in psychological flexibility explain the improvements in healthy dietary behaviors and downstream physical health outcomes among ACT recipients (Forman, Hoffman, Juarascio, Butryn, & Herbert, 2013; Hooper, Sandoz, Ashton, Clarke, & McHugh, 2012; Juarascio, Forman, & Herbert, 2010; Karekla et al., 2020; Merwin et al., 2015). No studies to date have examined the efficacy of ACT for shaping dietary behaviors among pregnant individuals, although studies conducted with overweight and eating disordered populations highlight ACT's effectiveness in shaping healthy dietary behaviors generally (Boucher et al., 2016; Merwin et al., 2014; Sairanen et al., 2017; Wallin, Parling, Weineland, & Dahl, 2018). The Birth Your Way program is the first to apply an ACT-based approach to prenatal health promotion, and the Birth Your Way pragmatic randomized clinical trial is the first to examine ACT's promise for improving birth outcomes by maximizing engagement in the WIC prenatal nutrition protocol.

Study Overview and Hypotheses

The Birth Your Way pragmatic randomized clinical trial was conducted within a mid-sized county public health system in Oregon from 2014 through 2018 to examine the efficacy of the Birth Your Way treatment, an ACT-based prenatal health promotion program, delivered to low SES pregnant mothers as an add-on to the WIC supplemental nutrition program. Pregnant Low SES mothers receiving Medicaid were randomized to either participate in the 15 hour (6-week) Birth Your Way treatment as a component of their WIC program, or to participate in the standard WIC program only (no Birth Your Way). We examined the effects of the Birth Your Way treatment on shaping pregnant Medicaid clients' psychological flexibility, the hypothesized psychological mechanism

underlying ACT-based treatments (Assaz et al., 2018). ACT-based treatments have been shown to motivate and sustain healthy behavior change via improvements in psychological flexibility, or the degree to which an individual's behaviors are aligned with their core, personal values (Borgogna et al., 2020).

We hypothesized that pregnant mothers who participated in the ACT-based Birth Your Way treatment would experience greater increases in psychological flexibility than mothers receiving WIC only (H1). Given the robust evidence for ACT's effectiveness in improving health behavior engagement (including dietary behaviors) across a variety of populations, we examined the effects of the Birth Your Way treatment on bolstering prenatal engagement in the WIC nutrition protocol (Karekla et al., 2020). We hypothesized that greater dietary improvements would be observed for pregnant mothers who received the Birth Your Way treatment than for mothers who received WIC only (H2).

The WIC supplemental nutrition program has been shown to buffer infant mortality risk by reducing NICU admissions, low birthweight and preterm deliveries via improvements in prenatal nutrition (Carlson & Neuberger, 2021). Therefore, we also examined the effects of the Birth Your Way treatment on amplifying the WIC program's impact on infant birth outcomes, hypothesizing that mothers who participated in the Birth Your Way treatment would deliver fewer NICU-admitted, low birthweight, and preterm infants than mothers receiving WIC only (H3).

Finally, we examined the effects of the Birth Your Way treatment on the primary maternal mortality risk factor, cesarean surgery, a key birth outcome of interest for Medicaid distributors that is not targeted by the WIC program (Medicaid and CHIP

Payment and Access Commission, 2019). In our ACT conceptualization, we proposed that increases in psychological flexibility would enable birthing mothers to engage in labor strategies shown to decrease Cesarean surgery risk by reducing slow or stalled labor (failure to progress). We hypothesized that mothers participating in the Birth Your Way treatment would undergo fewer Cesarean surgeries than mothers receiving WIC only (H4).

CHAPTER V

METHOD

Participants

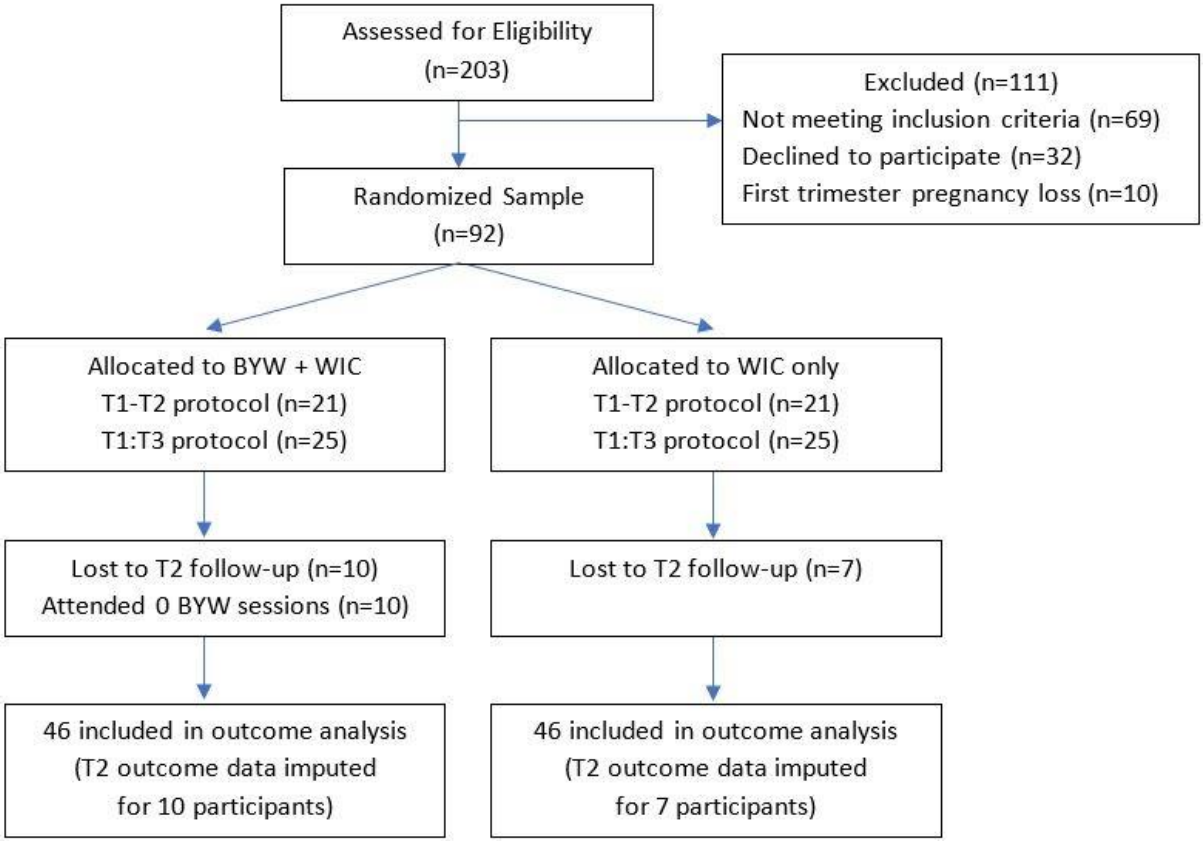
Our community sample included 92 low income primiparous pregnant people, self-identified as women, who enrolled in Medicaid and WIC prenatal services prior to their 2nd trimester of pregnancy. Women ranged in age from 18 to 40 with a mean sample age of 25 years (*SD* = 5.15). Representative of the local community, the majority of our sample identified as white (80.2%), with remaining participants identifying as Hispanic/Latinx (10.4%), Black/African American (5.2%), Asian/Pacific Islander (3.1%), and Native American (1%). Only 20.1 percent of study participants were married or living in a domestic legal partnership, while nearly half (44.8%) reported their relationship status as separated, single or dating and 34.4% reported living with a romantic partner. Over two-thirds of women described their pregnancy as unexpected (68.7%). A minority of the study sample had earned at least a four year college degree (13.6%), and 8.3% of participants reported having not completed high school. Again, representative of the local community distribution, the majority of participants (75.5%) had earned a high school diploma or equivalent and/or had participated in some college or vocational school. All study participants met income guidelines for WIC eligibility, with household incomes falling below 185% of the federal poverty line. One-third of pregnant mothers in our sample reported household incomes less than $5000 annually, another third reported household incomes between $5000 and $20,000 annually, and the majority of the remaining third reported household incomes between $20,000 and

$40,000 annually (28.3%). Only 4.4% of study participants reported household incomes greater than $40,000 annually.

Procedure

Maternal child health caseworkers from our partner Medicaid distributor site referred 203 pregnant members upon Medicaid enrollment to also enroll in Birth Your Way's childbirth preparation program offered at their local WIC site. A majority (66%) of the pregnant women eligible to participate in the Birth Your Way randomized efficacy trial enrolled in the study. A research assistant screened potential participants for study eligibility: 1) Medicaid-enrolled, 2) WIC-enrolled, 3) primiparous, 4) age 18 or older, and 5) less than 20 weeks gestation, and pregnant mothers who met enrollment criteria completed informed consent and HIPAA release authorization procedures. Approximately one third (34%) of pregnant referrals did not meet study eligibility requirements, and 5% of referrals became ineligible due to first trimester normal pregnancy loss (see Figure 7). A research assistant met in-person with each pregnant referral at baseline to obtain informed consent and administer the on-line pre-assessment battery of questionnaires (T1). Participants were notified by a research assistant that they would be randomized to either receive the 6-week ACT-based Birth Your Way childbirth group series held at WIC, or they would receive an ACT-based parenting series held at WIC upon study completion. All study participants signed up for WIC services and received didactic lessons in prenatal nutrition from a WIC educator prior to completing baseline measures. After participants completed their pre-assessment in their second trimester of pregnancy, they were randomized to one of two study conditions: 1) WIC

plus Birth Your Way 6-week group series (15 intervention hours) treatment condition or 2) WIC only control condition.

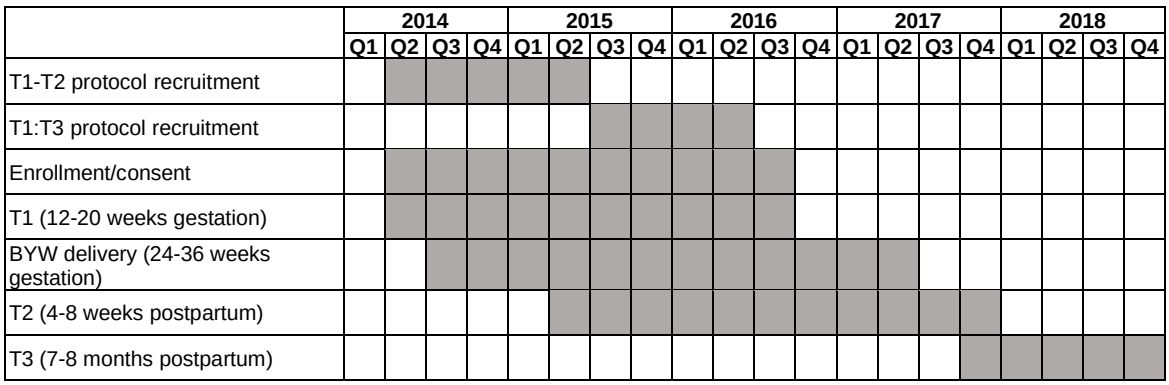


*Current analysis excludes T3 outcome data. Lost to T3 follow-up (n=7).
WIC = Women Infants and Children. BYW = Birth Your Way.

Figure 7. Intent to Treat Study Flowchart

Ethics approval for this study was obtained from the University of Oregon institutional review board (Protocols 09122014.016 and 04012014.001). A research assistant met with participants at one month postpartum (T2) to conduct the post-assessment, administering the same battery of online questionnaires with additional measures of birth and postpartum outcomes. A subset of participants (the final 50 study participants enrolled under protocol 04012014.001) completed the same follow-up

assessment again at 7 months postpartum (T3) to assess durability of intervention effects on values-directed behavioral engagement and maternal adherence to the WIC nutritional guidelines. Additionally, the T3 assessment was conducted to enable post-hoc exploration of potential postpartum intervention targets: quality of the parent infant relationship, breastfeeding practices and support, and safe infant sleep practices. Participants completed questionnaires using the on-line Qualtrics software (Qualtrics, Copyright 2015). Research assistants were blind to participants' randomly assigned study condition. Participants received $10 at T1, $20 at T2 and $30 at T3 as incentive for their voluntary participation. All study participants were at least 18 years of age, provided informed consent, and could refuse to participate at any time.



*First 42 participants recruited under T1-T2 protocol 09122014.016. Final 50 participants recruited under T1:T3 protocol 04012014.001. Birth Your Way = BYW

Figure 8. Birth Your Way Pragmatic Clinical Trial Study Timeline

Conditions

Prior to completing the T1 assessment, participants signed up for the WIC program and received the mandatory prenatal WIC nutrition lesson delivered didactically by a trained WIC certifier. Control group participants received WIC services only

without the Birth Your Way prenatal intervention. Upon study completion, control group participants were offered an ACT-based parenting class held with caregivers and their infants in the WIC classroom. Treatment participants were offered the 6 week group-based Birth Your Way childbirth preparation series held in the WIC classroom, implemented by the study's principal investigator while serving in her role as a WIC volunteer employee. Each 2.5 hour childbirth class session provides didactic instruction on a particular phase or stage of childbirth, beginning with cervical dilation (sessions 1-3), fetal and placental ejection (session 4), breastfeeding initiation, postpartum care (session 5) and newborn parenting (session 6). Values-based birth planning activities are conducted in sessions 5 and 6 and include didactic lessons on labor management strategies that reduce risk of preventable Cesarean surgery. Tailored to fit the pregnancy and childbirth context, embedded in each session are experiential ACT-based psychoeducational activities that target the 6 core processes that make up the hexaflex: present moment awareness, acceptance, defusion, self as context, contact with values, and committed action. The ACT psychoeducational activities contained in each Birth Your Way class session are experiential (rather than didactic), and participants commit to practice ACT-based skills between sessions (see Figure 6).

Fidelity

A senior research assistant with extensive training in ACT-based intervention approaches monitored fidelity of intervention implementation. The fidelity monitor observed each Birth Your Way class session and compared live intervention delivery against the protocol outline for each session, assuring that intervention components were delivered according to protocols. In each class session, the fidelity monitor also tracked

unique content generated in group discussions that fell outside session protocols (e.g., recommendations for baby shower gift registries). All Birth Your Way sessions were delivered by the study's principal investigator in her capacity as a WIC volunteer employee.

Measures

Unhealthy Diet. Participants completed the Health Behavior Questionnaire at baseline and follow-up. The HBQ measures health behavior engagement for four domains: diet, physical activity, alcohol consumption, and tobacco use. The 8-item dietary portion of the HBQ aligns with the prescribed WIC prenatal nutrition regimen and assesses quality of nutritional intake over the past month (Paxton, Strycker, Toobert, Ammerman, & Glasgow, 2011). Assessing the frequency of intake of fast-food meals, fruits and vegetables, regular soda or sweet tea, beans, chicken or fish, chips or crackers, desserts or other sweets, and margarine, butter or meat fat, each response is scored from 0 - 2 and sum scores range from 0-16. Higher sum scores on the HBQ reflect a less nutritious perinatal diet and lower scores reflect a more nutritious perinatal diet. The validated HBQ measure has demonstrated good test-retest reliability and is the primary recommended instrument for use in public health settings (Glasgow et al., 2005). Internal reliability was adequate in the present sample (α=.64).

Experiential Avoidance (Values-directed actions). The Acceptance and Action Questionnaire (AAQ-II; Bond et al., 2011) is a single-factor 7-item self report questionnaire that measures experiential avoidance, the theoretical opposite of psychological flexibility, (e.g., "My painful experiences...make it difficult for me to live a life that I would value"). Psychological flexibility is described as the degree to which an

individual's behavioral repertoire is in alignment with their core personal values. Rated on a 7-point Likert scale from 1 (never true) to 7 (always true), higher total sum scores reflect greater experiential avoidance, whereas, lower total sum scores reflect greater engagement in values-directed behavior (psychological flexibility). The AAQ-II has demonstrated satisfactory discriminant and structure validity. Internal consistency and test–retest reliability of the AAQ-II have been found acceptable (Bond et al., 2011). Participants completed the AAQ-II at baseline and follow-up (α=.93).

Participants completed the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987) at baseline and follow-up since the measure is validated for prenatal and postpartum use. The EPDS consists of ten questions rated on a five point Likert scale, and it has been determined to be a valid and reliable measure of prenatal and postpartum depressive and anxiety symptoms in clinical and research settings. This measure showed good internal consistency in the present sample (α=.69).

Birth Outcomes. In the postpartum period, mothers reported on their birth outcomes: (a) infant's birthweight, (b) infant's gestational age at birth, (c) incidence of NICU admission, and (d) method of delivery (Cesarean or vaginal). Continuous measures (birthweight and gestational age) were transformed into dichotomous (yes/no) outcome variables and then combined with the other measures to yield a count variable reflecting how many of the poor birth outcomes of interest had occurred at the time of delivery: low birthweight < 1500 grams, gestational age < 37 weeks; presence of NICU stay, and Cesarean birth.

Birth Complications. At follow-up, participants also reported on the occurrence of medical complications and interventions that occurred at the time of delivery: including whether the infant required (a) oxygen or (b) incubation, underwent (c) breech delivery, (d) forcep delivery, or (e) vacuum delivery, or the infant demonstrated (f) slow heartbeat, (g) difficulty breathing and/or (h) convulsions upon delivery.

Labor interventions. Participants at follow-up reported on the incidence of medical interventions that occurred during labor that are associated with poorer birth outcomes. These include: (a) administration of constant heartbeat monitoring, (b) epidural, (c) other anesthesia, (d) narcotics, (e) pitocin, (f) other labor induction and/or augmentation methods, (g) confinement to bed, (h) confinement to intravenous fluids, and (i) frequent cervical checks.

Birth Setting and Provider. Mothers reported their prenatal provider type for prenatal care and childbirth delivery. At post-assessment, mothers also reported their birth setting, indicating whether they delivered their infant in a hospital, at home, free-standing birth center, or another location.

Birth Satisfaction. The Childbirth Experience Questionnaire (CEQ) is a valid and reliable measure of childbirth experience (Dencker, Taft, Bergqvist, Lilja, & Berg, 2010). The 22 item scale is divided into four childbirth experience domains: 1) own capacity, 2) professional support, 3) perceived safety, and 4) participation. The measure uses a 4-point Likert scale ranging from totally agree to totally disagree, with higher sum scores reflecting more positive birth experiences. Designed to be implemented in medical

settings with postpartum women, the CEQ demonstrated good construct validity and test-retest reliability. Participants completed the assessment at follow-up (α=.70).

Prenatal risk factors. At baseline and again at post-assessment, women reported on the incidence of risk factors that occurred during pregnancy: (a) bleeding or spotting, (b) pre-eclampsia, (c) premature contractions, (d) high blood pressure, (e) toxemia, (f) Rh incompatibility, (g) anemia, (h) gestational diabetes, (i) infectious disease, (j) number of doctor visits for pregnancy complications, and (k) fetal exposure to tobacco or alcohol.

Postpartum outcomes. At baseline, mothers reported their plans for breastfeeding postpartum. At post-assessments, mothers reported on their current breastfeeding behaviors: (a) percentage of infant's food that comes from breast milk, (b) breastfeeding social support, (c) maternal perception of breastfeeding's effect on parent infant relationship, and when applicable (c) reasons for choosing not to breastfeed. At post-assessment, mothers also reported on their co-sleeping parenting behaviors, indicating whether or not their infants slept in the same room, and when applicable, the percentage of time their infant slept in the same bed.

Mindful parenting was assessed in the postpartum period using the Interpersonal Mindfulness in Parenting, Infant Version (IM-PI) questionnaire (Duncan & Bardacke, 2010). Participants responded to the 27-item questionnaire using a five point Likert scale. The IM-PI contains five subscales that measure facets of mindful parenting: 1) attention, 2) emotional awareness, 3) self-regulation, 4) non-judgmental acceptance, and 5) compassion in the infant child relationship. This measure showed good internal consistency in the present sample (α=.64).

Parenting stress was assessed at 1 month and 7 months postpartum with the Parental Stress Scale (PSS; Berry & Jones, 1995). The PSS consists of 18 questions rated on a five point Likert scale, (e.g., "I am satisfied as a parent."). The scale is deemed appropriate for assessing parenting stress in parents of children and infants with and without developmental and behavioral problems and showed good reliability in this sample (α=.65).

Sociodemographic variables. Pregnant mothers reported on sociodemographic variables at baseline: (a) maternal age, (b) maternal education, (c) relationship status, (d) household income, and (e) race/ethnicity.

Consumer Satisfaction. Pregnant mothers who participated in one or more Birth Your Way sessions provided quantitative and qualitative satisfaction and use ratings of the Birth Your Way session at one month postpartum using an unvalidated internal program measure of consumer satisfaction.

Statistical Analyses

Power estimates for birth outcomes at post-assessment (T2) assume an intent-to treat model making use of all available data. Assuming a two-tailed alpha set to .05, we estimated sufficient power (>.80) to detect medium (d= 0.5) effects for within- and between-group effects of Birth Your Way condition on birth outcomes at T2 with a minimum sample size of 90 participants (Faul, Erdfelder, Lang, & Buchner, 2007).

Ninety-two pregnant mothers completed baseline T1 assessments. We conducted statistical analyses in SPSS Statistics for Windows, Version 27.0 using a rigorous intent-to-treat design with the 92 participant sample. ANOVA tests were conducted for continuous variables and chi-square tests were conducted for categorical variables to

assess baseline differences between randomized treatment and control groups (see Table 3).

After running a diagnostic assessment that determined outcome data were missing at random, we used Multiple Imputations (MI) to obtain a complete data set for all time points by imputing missing values for outcome variables. The MI was implemented in SPSS using the Monte Carlo Markov Chain (MCMR) imputation method, pooling statistics from 5 iterations with 50 maximum case draws and 2 maximum parameter draws (Huque, Carlin, Simpson, & Lee, 2018; Pedersen et al., 2017)

CHAPTER VI

RESULTS

We used chi-square tests for categorical variables and ANOVA tests for continuous variables and detected no significant differences on baseline measures and sociodemographic variables between randomized conditions at pre-assessment ($p>.05$), except for a significant difference between the groups in values-directed actions ($F(1,90)=4.93$, $p=.029$). Mean scores at baseline were significantly higher for the treatment group ($M=18.39$, $SD=7.597$) than for the control group ($M=14.87$, $SD=7.623$), thus the values-directed actions variable was entered as a covariate in outcome analyses. Table 3 contains descriptive baseline data from measures collected at pre-assessment (T1) in the 2nd trimester of pregnancy.

We performed two planned comparisons for each of our outcome variables of interest: first, to evaluate intervention effects in a real world public health context (intent-to-treat); and then to examine potential treatment effects under optimal conditions (per-protocol). In our intent-to-treat model, we used the full analysis set that included all participants randomized to treatment, even if they received no Birth Your Way doses. We then performed a per-protocol analysis to examine the effects of minimum dose on our outcomes of interest, excluding treatment participants for whom no Birth Your Way treatment was applied (Gupta S. K., 2011; Ten Have et al., 2008).

We tested intervention effects using ANCOVA for continuous outcome variables and binary logistic regression for binary categorical outcome variables. The values-directed action variable was included as a covariate in all outcome analyses to account for significant baseline differences between the groups in that variable.

Table 3. Baseline (T1) Characteristics of Pregnant Mothers by Randomized Condition

	Total Sample (*n*=92)		Treatment (*n*=46)		Control (*n*=46)	
Sample characteristics	*n* or *M*	(% or *SD*)	*n* or *M*	(% or *SD*)	*n* or *M*	(% or *SD*)
Age (years)	25.03	(5.15)	25.39	(5.46)	24.67	(4.86)
Education Completed						
Less than High School	8	(8.7%)	5	(10.9%)	3	(6.5%)
High School or equivalent	19	(20.7%)	9	(19.6%)	10	(21.7%)
2 year degree (Vocational/Technical)	2	(2.2%)	2	(4.3%)	0	(0.0%)
Some college	50	(54.3%)	23	(50%)	27	(58.7%)
4 year degree (Bachelor)	11	(12%)	6	(13%)	5	(10.9%)
Masters degree	2	(2.2%)	1	(2.2%)	1	(2.2%)
Income						
Under $5000	31	(33.7%)	14	(30.4%)	17	(37%)
$5000 - $9,999	11	(12%)	9	(19.6%)	2	(4.3%)
$10,000 - $19,999	20	(21.7%)	9	(19.6%)	11	(23.9%)
$20,000 - $29,999	15	(16.3%)	7	(15.2%)	8	(17.4%)
$30,000 - $39,999	11	(12%)	5	(10.9%)	6	(13%)
$40,000 - $49,999	3	(3.3%)	2	(4.3%)	1	(2.2%)
$50,000 - $74,999	1	(1.1%)	0	(0.0%)	1	(2.2%)
Race/ethnicity						
Latina	10	(10.9%)	6	(6.5%)	4	(4.3%)
African American	5	(5.4%)	4	(4.3%)	1	(1.1%)
Asian American	3	(3.3%)	2	(2.2%)	1	(1.1%)
Native American	1	(1.1%)	0	(0.0%)	1	(1.1%)
white	73	(79.3%)	34	(37%)	39	(42.4%)

Table 3. (continued). Baseline (T1) Characteristics of Pregnant Mothers by Randomized Condition

Relationship status						
Single	14	(15.2%)	7	(15.2%)	7	(15.2%)
Dating	25	(27.2%)	12	(26.1%)	13	(28.3%)
Living with someone	31	(33.7%)	12	(26.1%)	19	(41.3%)
Married	17	(18.5%)	11	(23.9%)	6	(13%)
Separated	2	(2.2%)	2	(4.3%)	0	(0.0%)
Legal Registered Domestic Partnership	3	(3.3%)	2	(4.3%)	1	(2.2%)
Relationship length						
Not applicable	14	(15.2%)	7	(15.2%)	7	(15.2%)
<1 year	20	(21.7%)	10	(21.7%)	10	(21.7%)
1-2 years	17	(18.5%)	11	(23.9%)	6	(13%)
2-5 years	28	(30.4%)	11	(23.9%)	17	(37%)
5-10 years	10	(10.9%)	5	(10.9%)	5	(10.9%)
>10 years	3	(3.3%)	2	(4.3%)	1	(2.2%)
Relationship is with biological father	75	(81.5%)	37	(80.4%)	38	(82.6%)
Contact biological father has with mother						
None	9	(9.8%)	5	(10.9%)	4	(8.7%)
Once per month or less	4	(4.3%)	4	(8.7%)	0	(0.0%)
2-3 times per month	1	(1.1%)	1	(2.2%)	0	(0.0%)
Once per week	2	(2.2%)	1	(2.2%)	1	(2.2%)
2-3 times per week	5	(5.4%)	1	(2.2%)	4	(8.7%)
Daily	71	(77.2%)	34	(73.9%)	37	(80.4%)

Table 3. (continued). Baseline (T1) Characteristics of Pregnant Mothers by Randomized Condition

Non-biological children living in the home						
None	74	(80.4%)	35	(76.1%)	39	(84.8%)
1	11	(12.0%)	6	(13.0%)	5	(10.9%)
2	6	(6.5%)	4	(8.7%)	2	(4.3%)
3	1	(1.1%)	1	(2.2%)	0	(0.0%)
Prenatal Risk Factors						
Bleeding or spotting	15	(23.9%)	4	(8.7%)	11	(23.9%)
Pre-Eclampsia	7	(7.6%)	3	(6.5%)	4	(8.7%)
Premature contractions	10	(10.9%)	3	(6.5%)	7	(15.2%)
High blood pressure	13	(14.1%)	7	(15.2%)	6	(13.0%)
Gestational diabetes	7	(7.6%)	4	(8.7%)	3	(6.5%)
Pregnancy Unexpected	63	(68.5%)	29	(63%)	34	(73.9%)
Gestational age pregnancy discovered (weeks)	6.9	(5.37)	6.8	(5.76)	7.0	(5.02)
Prenatal tobacco use						
Yes, both before and after pregnancy discovered	11	(12.0%)	5	(10.9%)	6	(13.0%)
Yes, but stopped when pregnancy discovered	22	(23.9%)	12	(26.1%)	10	(21.7%)
No, never any tobacco use during pregnancy	59	(64.1%)	29	(63.0%)	30	(65.2%)
Average prenatal daily tobacco use (times used)						
Before pregnancy discovered	2.59	(5.47)	2.78	(5.73)	2.39	.(5.25)
After pregnancy discovered	.38	(1.11)	.37	(1.10)	.39	(1.13)

Table 3. (continued). Baseline (T1) Characteristics of Pregnant Mothers by Randomized Condition

Prenatal alcohol use before pregnancy discovered						
Not at all	26	(28.3%)	10	(21.7%)	16	(34.8%)
Less than once per month	29	(31.5%)	17	(37%)	12	(26.1%)
Once or twice per month	17	(18.5%)	11	(23.9%)	6	(13.0%)
Once or twice per week	15	(16.3%)	4	(8.7%)	11	(23.9%)
Most days or every day	4	(4.3%)	3	(6.5%)	1	(2.2%)
Other	1	(1.1%)	1	(1.1%)	0	(0.0%)
Prenatal alcohol use after pregnancy discovered						
Not at all	86	(93.5%)	42	(91.3%)	44	(95.7%)
Less than once per month	6	(6.5%)	4	(8.7%)	2	(4.3%)
Prenatal care provider						
Obstetrician	70	(76.1%)	35	(76.1%)	35	(76.1%)
Certified nurse midwife	19	(20.7%)	9	(19.6%)	10	(21.7%)
Homebirth midwife	3	(3.3%)	2	(4.3%)	1	(2.2%)
Planned provider for delivery						
Obstetrician	68	(73.9%)	34	(73.9%)	34	(73.9%)
Certified nurse midwife	19	(20.7%)	9	(19.6%)	10	(21.7%)
Homebirth midwife	3	(3.3%)	2	(4.3%)	1	(2.2%)
Family practice doctor	1	(1.1%)	0	(0.0%)	1	(2.2%)
Undecided	1	(1.1%)	1	(1.1%)	0	(0.0%)
Planned birth setting						
Hospital	79	(85.9%)	41	(89.1%)	38	(82.6%)
Home	3	(3.3%)	2	(4.3%)	1	(2.2%)
Free-standing birth center	10	(10.9%)	3	(6.5%)	7	(15.2%)

Table 3. (continued). Baseline (T1) Characteristics of Pregnant Mothers by Randomized Condition

Planned delivery support persons						
Friend	27	(29.3%)	15	(32.6%)	12	(26.1%)
Doula	9	(9.8%)	4	(8.7%)	5	(10.9%)
Romantic partner	16	(17.4%)	9	(19.6%)	7	(15.2%)
Baby's biological father	68	(73.9%)	31	(67.4%)	37	(80.4%)
Mother	58	(63.0%)	32	(69.6%)	26	(56.5%)
Father	16	(17.4%)	9	(19.6%)	7	(15.2%)
Other relative	37	(40.2%)	13	(28.3%)	24	(52.2%)
Plan to breastfeed baby (yes)	89	(96.7%)	44	(95.7%)	45	(97.8%)
Other prenatal classes currently taking						
None	75	(81.5%)	37	(80.4%)	38	(82.6%)
WIC office	4	(4.3%)	3	(6.5%)	1	(2.2%)
OB/Gyn office	6	(6.5%)	2	(4.3%)	4	(8.7%)
Community-based agency	1	(1.1%)	1	(2.2%)	0	(0.0%)
Nurse office	1	(1.1%)	1	(2.2%)	0	(0.0%)
Other agency	3	(3.3%)	2	(4.3%)	1	(2.2%)
Multiple agencies	2	(2.2%)	0	(0.0%)	2	(4.3%)
Other prenatal classes currently planned						
None	42	(45.7%)	21	(45.7%)	21	(45.7%)
WIC office	4	(4.3%)	1	(2.2%)	3	(6.5%)
OB/Gyn office	14	(15.2%)	5	(10.9%)	9	(19.6%)
Community-based agency	10	(10.9%)	6	(13.0%)	4	(8.7%)
Other agency	16	(17.4%)	10	(21.7%)	6	(13.0%)
Multiple agencies	6	(6.5%)	3	(6.5%)	3	(6.5%)

Table 3. (continued). Baseline (T1) Characteristics of Pregnant Mothers by Randomized Condition

Values-directed behaviors						
Experiential Avoidance (AAQ-II)	16.63	(7.77)	18.39	(7.60)	14.87	(7.62)
Depressive symptoms (EPDS)	11.32	(4.78)	12.50	(5.21)	10.13	(4.01)
Prenatal Health Behaviors (HBQ1)						
Unhealthy Diet	5.92	(2.35)	6.35	(2.29)	5.50	(2.35)
Aerobic exercise	5.07	(1.69)	5.20	(1.64)	4.94	(1.74)
Strength and flexibility exercise						
Both	10	(10.9%)	8	(17.4%)	2	(4.3%)
Strength only	2	(2.2%)	1	(2.2%)	1	(2.2%)
Flexibility only	43	(46.7%)	18	(39.1%)	25	(54.3%)
None	37	(40.2%)	19	(41.3%)	18	(39.1%)
Number of alcoholic drinks consumed last 30 days	0.08	(0.46)	0.13	(0.62)	0.04	(0.21)
Tobacco lifetime use > 100 times (yes)	43	(46.7%)	21	(45.7%)	22	(47.8%)
Any tobacco prior 7 days (yes)	13	(14.1%)	6	(13.0%)	7	(15.2%)

Experiential Avoidance (Values-Directed Actions)

Using an intent-to-treat design that includes treatment group participants who did not receive the Birth Your Way intervention, there was no main effect of condition on prenatal to postpartum changes in experiential avoidance, controlling for baseline levels, $F(1,89)=1.27$, $p=.30$. Decreases in experiential avoidance represent increases in values-directed actions. In our per-protocol analysis, there was a main effect of minimum dose (1 or more Birth Your Way sessions) on changes in values-directed actions from baseline to 1 month postpartum; with significantly greater decreases in experiential

avoidance observed for participants who received a minimum dose (*n*=36, *Madj*=-4.55, *SE*=.87), compared to participants who received WIC services only (*n*=56, *Madj*=-1.08, *SE*=.76), accounting for baseline levels, *F*(1,89)=9.52, *p*=.003, partial *n2*=.10 (see Figure 9). Within the treatment condition, there was a significant effect of minimum dose (1 or more Birth Your Way sessions) on prenatal to postpartum changes in values directed actions, with greater decreases in experiential avoidance observed for treatment group participants who received a minimum dose than for treatment group participants who received no Birth Your Way sessions, *F*(1,44)=15.11, *p*=.004, partial *n2*=.25.

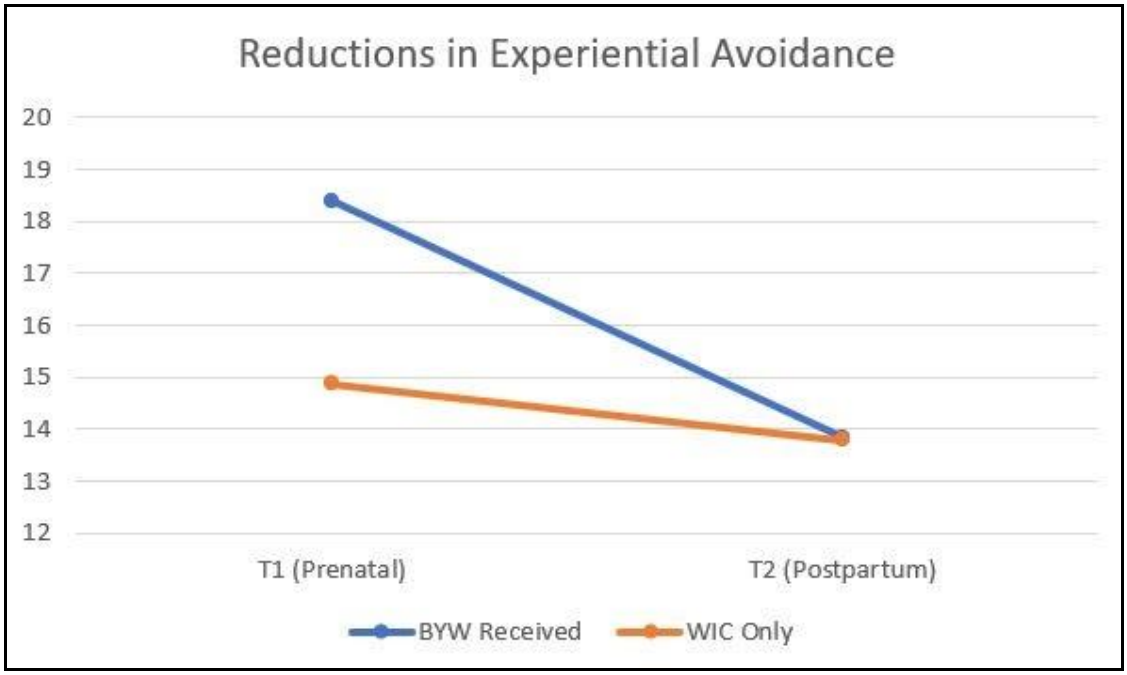


Figure 9. Perinatal Reductions in Experiential Avoidance by Treatment Received.

Perinatal Diet (Unhealthy Diet)

Accounting for baseline values-directed actions and prenatal diet, there was not a significant association between prenatal to postpartum changes in values-directed actions and changes in perinatal diet, *F*(1,88)=.77, *p*=.45. When participants randomized to

treatment who did not receive the Birth Your Way treatment were included in the intent-to-treat model, there was no effect of randomized condition on changes in perinatal diet, controlling for baseline diet and values-directed actions, $F(1,88)=4.43$, $p=.05$. In our per-protocol analysis, there was a significant effect of minimum dose (1 or more Birth Your Way sessions) on changes in perinatal diet; such that, greater decreases in unhealthy dietary behaviors were observed for participants who received a minimum dose ($n=36$, $Madj=-.42$, $SE=.32$), than for participants who received WIC only ($n=56$, $Madj=.58$, $SE=.38$), accounting for baseline diet and values-directed actions, $F(1,88)=6.58$, $p=.041$, partial $n2=.07$ (see Figure 10).

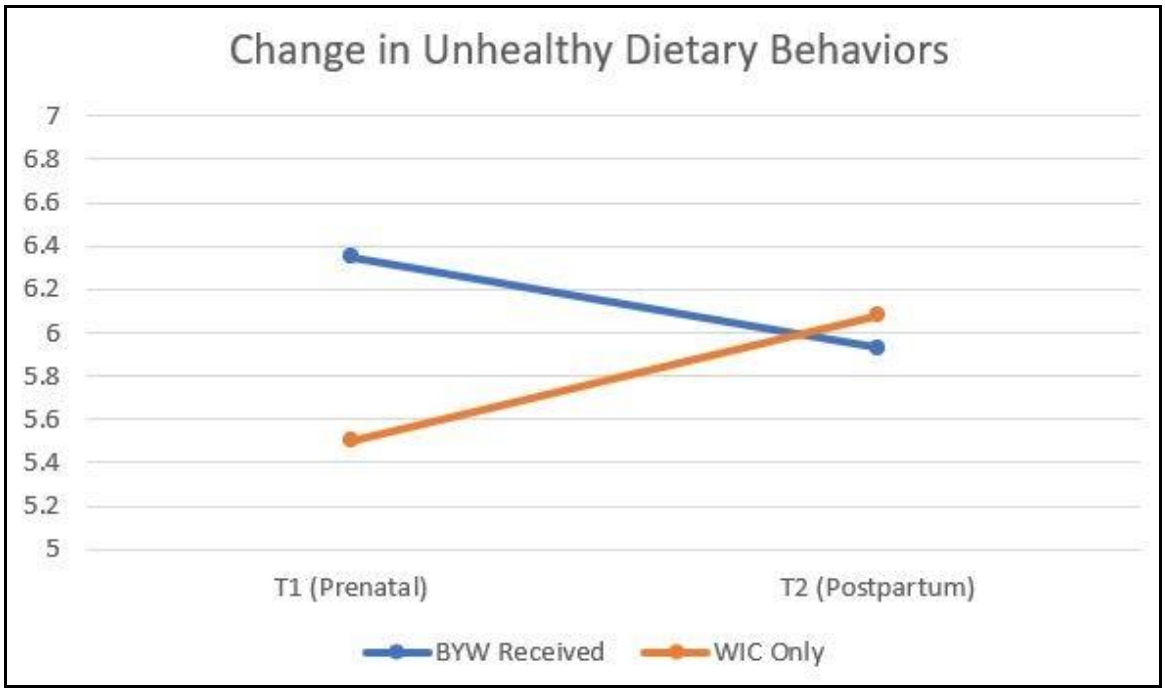


Figure 10. Perinatal Change in Unhealthy Dietary Behaviors.

Within the treatment condition, there was a significant effect of minimum dose (1 or more Birth Your Way sessions) on changes in perinatal diet, with greater decreases in unhealthy dietary behaviors observed for treatment group participants who received a

minimum dose than for treatment group participants who received no Birth Your Way sessions, accounting for baseline levels, $F(1,43)=6.14$, $p=.020$, partial $n2=.07$.

Other Health Behaviors

Controlling for baseline aerobic activity and values-directed actions, there was a significant positive association between prenatal to postpartum changes in values-directed actions and aerobic activity $F(1,88)=9.86$, $p=.006$, partial $n2=.08$. Neither randomized condition ($p=.282$), nor minimum dose ($p=.05$) predicted significant differences in aerobic activity when controlling for baseline diet and values-directed actions. There was not a significant association between changes in values directed actions and daily prenatal tobacco use ($p=.853$), controlling for baseline tobacco use and values-directed actions. Again, accounting for baseline tobacco use and values-directed actions, neither randomized condition ($p=.565$), nor minimum dose ($p=.551$) predicted significant differences in daily prenatal tobacco use.

Infant Birth Outcomes

A series of binary logistic regression analyses were performed to examine whether receiving WIC only (no Birth Your Way treatment) increased the likelihood of delivering a low birthweight, preterm or NICU-admitted infant, while accounting for significant baseline differences in values-directed actions (experiential avoidance). First, in our intent-to-treat model (see Table 4), which included treatment participants who received WIC only (no Birth Your Way sessions), there was no main effect of randomized condition on likelihood of delivering a low birthweight infant (Analysis 1) or a preterm infant (Analysis 2). There was a significant main effect of randomized condition on NICU admissions (Analysis 3). The model for Analysis 3 was significant,

($X2$(2)=6.32, p=.040) and explained 11.0% (Nagelkerke $R2$) of the variance in NICU admissions. In this model, mothers who were randomized to the WIC only control condition were 4.33 times more likely to have delivered a NICU-admitted infant than mothers who were randomized to the treatment group condition.

Table 4. Intent-To-Treat Summary: Binary Logistic Regression Analyses of WIC Only Randomized Condition on Predicting Likelihood of Poor Infant Birth Outcome

	Analysis 1: Low Birthweight Delivery				Analysis 2: Preterm Delivery				Analysis 3: NICU Admission			
			95% CI				95% CI				95% CI	
Predictor variables	OR	*p*	Lower	Upper	OR	*p*	Lower	Upper	OR	*p*	Lower	Upper
WIC Condition (Ref=BYW)	5.063	0.156	.050	50.949	3.058	0.095	0.821	11.389	4.325	**0.044**	1.042	17.962
Experiential Avoidance	0.971	0.493	0.891	1.057	0.997	0.945	0.925	1.076	0.998	0.969	0.914	1.091
Model Statistics												
Chi square	8.063				3.927				6.322			
Df	2				2				2			
Model significance	0.044				0.165				0.040			
-2 Log Likelihood	77.317				81.171				77.962			
Nagelkerke R^2	0.142				0.069				0.110			

*OR=odds ratio. CI=confidence interval. WIC=Women Infants and Children. BYW=Birth Your Way.

In our per-protocol design (see Table 5), having received WIC only (no Birth Your Way treatment) significantly increased the likelihood of delivering a low birthweight, preterm or NICU-admitted infant. The model for Analysis 1 was significant, ($X2$(2)=11.915, p=.007) and explained 19.80% (Nagelkerke $R2$) of the variance in low birthweight outcomes. According to this model, mothers who received WIC only (no

Birth Your Way sessions) were 11.93 times more likely to have delivered a low birthweight infant than mothers who received 1 or more Birth Your Way sessions.

Table 5. Per-Protocol Summary: Binary Logistic Regression Analyses of WIC Only (No Birth Your Way doses) on Predicting Likelihood of Poor Infant Birth Outcome

	Analysis 1: Low Birthweight Delivery				Analysis 2: Preterm Delivery				Analysis 3: NICU Admission			
			95% CI				95% CI				95% CI	
Predictor variables	OR	*p*	Lower	Upper	OR	*p*	Lower	Upper	OR	*p*	Lower	Upper
WIC only (Ref=1+ BYW doses)	11.93	**0.032**	1.242	114.50	5.738	**0.041**	1.070	30.77	12.823	**0.018**	1.542	106.62
Experiential Avoidance	0.974	0.571	0.891	1.066	1.002	0.954	0.930	1.080	1.004	0.924	.915	1.103
Model Statistics												
Chi square	11.915				6.927				10.892			
Df	2				2				2			
Model significance	0.007				0.035				0.005			
-2 Log Likelihood	73.465				78.170				73.392			
Nagelkerke R^2	0.198				0.118				0.186			

*OR=odds ratio. CI=confidence interval. WIC=Women Infants and Children. BYW=Birth Your Way.

The model for Analysis 2 was also significant, ($X2(2)=6.927$, $p<.035$), explaining 11.8% (Nagelkerke *R2*) of the variance in preterm birth outcomes, with mothers who only received WIC 5.74 times more likely to deliver a preterm infant than mothers who received 1 or more Birth Your Way sessions. The model for Analysis 3 was also significant, ($X2(2)=10.892$, $p<.005$) and explained 18.6% (Nagelkerke *R2*) of the variance in NICU admissions. In this model, mothers who received WIC only (no Birth

Your Way doses) were 12.82 times more likely to have delivered a NICU-admitted infant than mothers who received 1 or more Birth Your Way doses.

Maternal Birth Outcomes

We performed binary logistic regression analyses to examine whether receiving WIC only (no Birth Your Way treatment) increased the likelihood of Cesarean surgery, while accounting for significant baseline differences in values-directed actions (experiential avoidance). Using an intent-to-treat design that included treatment participants who received WIC only (no Birth Your Way sessions), there was no main effect of randomized condition on likelihood of Cesarean surgery (see Table 6).

Table 6. Intent-To-Treat Model Summary: Binary Logistic Regression Analysis of WIC Randomized Condition on Predicting Likelihood of Cesarean Surgery

			95% CI	
Predictor variables	OR	*p*	Lower	Upper
WIC Condition (Ref=BYW)	1.958	0.312	0.514	7.466
Experiential Avoidance	0.934	0.111	0.859	1.016
Model Statistics				
Chi square	7.642			
Df	2			
Model significance	0.044			
-2 Log Likelihood	99.545			
Nagelkerke R^2	0.115			

*OR=odds ratio. CI=confidence interval. WIC=Women Infants and Children. BYW=Birth Your Way.

Twenty-six percent of the overall sample underwent Cesarean surgery (n=24), with 33% of WIC only mothers (no Birth Your Way treatment) delivering via Cesarean surgery (*n*=19); compared to 13.89% of mothers who received at least one Birth Your

Way session (*n*=5). In our per-protocol analysis, having received WIC only (no Birth Your Way treatment) did not predict increased likelihood of Cesarean surgery (see Table 7).

Table 7. Per-Protocol Model Summary: Binary Logistic Regression Analysis of WIC Only (No Birth Your Way doses) Predicting Likelihood of Cesarean Surgery

			95% CI	
Predictor variables	OR	*p*	Lower	Upper
WIC only (Ref=1+ BYW doses)	2.792	0.080	0.886	8.804
Experiential Avoidance	0.938	0.137	0.862	1.021
Model Statistics				
Chi square	9.074			
Df	2			
Model significance	0.015			
-2 Log Likelihood	98.113			
Nagelkerke R^2	0.136			

*OR=odds ratio. CI=confidence interval. WIC=Women Infants and Children. BYW=Birth Your Way.

Summary of Results

In summary, analyses from our intent-to-treat design which included treatment group participants who received no Birth Your Way treatment, revealed no main effect of randomized condition on values-directed actions, perinatal diet, postpartum aerobic activity, tobacco use, low birthweight deliveries, preterm deliveries or Cesarean surgeries. We did observe a main effect of randomized condition on NICU admissions, with the WIC only condition predicting increased likelihood of delivering a NICU-admitted infant. Analyses from our per-protocol design did not reveal an effect of

minimum dose (1 or more Birth Your Way sessions) on postpartum aerobic activity, tobacco use or Cesarean surgery. Receiving a minimum dose (1 or more Birth Your Way sessions) was associated with significant reductions in unhealthy dietary behaviors and experiential avoidance, representing increases in healthy perinatal diet and values-directed actions respectively. Having received WIC only (no Birth Your Way doses) predicted increased likelihood of low birthweight delivery, preterm delivery and NICU admission (see Table 8).

Table 8. Summary of Results and Effect Sizes by Per-Protocol and Intent-To-Treat Designs

	Per-Protocol (*d*)	Intent-To-Treat (*d*)
Values-directed actions (Experiential Avoidance)	**.61***	.11
Perinatal Diet	**.50***	.39
Low birthweight	**1.37***	.89
Preterm birth	**.96***	.62
NICU admissions	**1.41***	**.81***
Cesarean surgeries	.57	.37

*significant effect ($p<.05$) of Condition (ITT) or minimum dose (Per-Protocol).
d = Cohen's d.

Attrition and Consumer Satisfaction Ratings

The thirty-six treatment group participants who participated in at least one Birth Your Way session held at the county WIC site completed consumer satisfaction ratings at one month postpartum. A majority of these participants (58%) attended at least five of the six Birth Your Way sessions, and only two participants attrited after attending the first session (see Table 9).

Table 9. Birth Your Way Sessions Attended

Sessions Attended	%	Count
1 session	5.56	2
2 sessions	5.56	2
3 sessions	25.00	9
4 sessions	5.56	2
5 sessions	38.89	14
6 sessions	19.44	7
Total	100	36

Treatment group participants who did not attend at least one Birth Your Way session (*n*=10) identified work conflicts (30%), rural location (20%) and lack of transportation (50%) as their primary reasons for not attending. Participants who attended at least one session (*n*=36), reported work conflicts (29%) and sickness (29%) as their primary reasons for not attending, with only three participants reporting rural location and lack of transportation as reasons for not attending Birth Your Way sessions (see Table 10).

At one month postpartum, treatment group participants who attended one or more Birth Your Way sessions (*n*=36) were prompted to reflect on their birth experience and rate their satisfaction with the Birth Your Way series using a 5 point likert scale with responses ranging from "not at all helpful" to "extremely helpful" (see Table 11). A majority of participants (72%) reported that the information and resources received in the Birth Your Way class series were "extremely helpful" (*n*=26), while the remaining 10 participants reported that information and resources received were "very helpful." No participants rated the information and resources received as "somewhat helpful", "not

very helpful", or "not at all helpful". Addressing the childbirth context specifically, a majority of participants (55%) reported that the ideas learned in class were "extremely helpful" during childbirth, 15 participants (42%) reported that the ideas learned in class were "very helpful" during childbirth, and 1 participant rated the ideas learned in class as "somewhat helpful" during childbirth. No participants rated the Birth Your Way series as "not very helpful" or "not at all helpful".

Table 10. Reasons Given for Not Attending Birth Your Way Sessions

Reasons Given	%	Count
Work Conflict	28.57	6
Sickness	28.57	6
Out of town/traveling	19.05	4
Medical appointment	9.52	2
Lack of transportation	9.52	2
Rural location	4.76	1
Total	100	21

These same participants were also prompted to rate their future likelihood of using strategies from the Birth Your Way series, and recommending the Birth Your Way series to others, using a 5 point likert scale with responses ranging from "not at all likely" to "will definitely use/recommend" (see Table 11). Half of participants (50%) reported they "will probably" continue using the strategies learned in the Birth Your Way class series (n=18), while 15 participants (42%) reported they "will definitely" continue using strategies learned, and 3 participants (8%) reported they "might" continue using strategies learned. No participants rated the likeliness of continued strategy-use as "not very likely",

or “not at all likely”. Addressing the likelihood participants will recommend the Birth Your Way series to others, a majority of participants (75%) reported they “will definitely” recommend the Birth Your Way series to others, and the remaining 9 participants (25%) reported they “will probably” recommend the Birth Your Way series to others. No participants reported their likelihood of recommending the Birth Your Way series to others as “not very likely” or “not at all likely”.

Table 11. Satisfaction and Usage Ratings of the Birth Your Way Series

How helpful were the information and resources you received in the Birth Your Way class series?		
	%	Count
Not at all helpful	0.00	0
Not very helpful	0.00	0
Somewhat helpful	0.00	0
Very helpful	27.78	10
Extremely helpful	72.22	26
Total	100	36
How helpful were the ideas you learned in this class during your childbirth experience?		
	%	Count
Not at all helpful	0.00	0
Not very helpful	0.00	0
Somewhat helpful	2.78	1
Very helpful	41.67	15
Extremely helpful	55.56	20
Total	100	36
How likely are you to continue using some of the strategies you learned in class?		
	%	Count
Not at all likely	0.00	0
Not very likely	0.00	0
Might use	8.33	3
Will probably use	50.00	18

Table 11. (continued.) Satisfaction and Usage Ratings of the Birth Your Way Series

Will definitely use	41.67	15
Total	100	36
Would you recommend this class to other pregnant women?		
	%	Count
Not at all likely	0.00	0
Not very likely	0.00	0
Might recommend	0.00	0
Will probably recommend	25.00	9
Will definitely recommend	75.00	27
Total	100	36

In response to a series of open-ended prompts, the 36 attending participants reported on what they liked about the Birth Your Way class series, what they found to be the most important thing learned, and what they would change about the Birth Your Way series (see Table 12). Open-ended responses were organized into categories based on qualitative themes drawn from participants' responses. The 36 participants who attended one or more sessions provided 55 things they liked about the Birth Your Way series, and their responses were categorized into 9 qualitative themes. Nearly half of the responses for this item (47%) indicated participants liked receiving general information about labor and specific strategies and techniques for labor. Another quarter of responses (26%) indicated participants liked the friendly, relaxed and supportive class atmosphere and spending time with other pregnant women.

These 36 participants also reported the most important thing they learned from the Birth Your Way series, and their 36 responses were organized into 10 qualitative themes. Over one-third of participants (36%) indicated that gaining skills in mindful acceptance

(*n*=8) or effective problem-solving (*n*=5) was the most important thing they learned in the Birth Your Way series. Finally, 17 of these 36 participants provided their recommendations for improving the Birth Your Way series. The primary recommendations given (41%) were to provide more available time-slots to attend the Birth Your Way series (*n*=4) or to lengthen each class session or the series as a whole (*n*=3).

Table 12. Qualitative themes from participant satisfaction reports of the Birth Your Way series

What did you like about the Birth Your Way class series?		
	%	Count
Learning general information about labor	23.64	13
Learning specific strategies and techniques for labor	23.64	13
Class atmosphere was friendly, relaxed, and supportive	14.55	8
Spending time with other pregnant people	10.91	6
Learning mindfulness/breathing practices	10.91	6
Instructor was warm and caring	5.45	3
Learning communication strategies	3.64	2
Class boosted confidence	3.64	2
Class lessons were interactive	3.64	2
Total	100	55
What was the most important thing you learned in the Birth Your Way class series?		
	%	Count
Acceptance skills	22.22	8
Problem-solving skills	13.89	5
Learning about choice in birthing options	13.89	5
Learning to get calm and centered	13.89	5
Mindful awareness	8.33	3
Effective communication strategies	8.33	3

Table 12. (continued). Qualitative themes from participant satisfaction reports of the Birth Your Way series

Birth planning according to values	5.56	2
Relaxation and stress reduction techniques	5.56	2
Mindful breathing techniques	5.56	2
Strategies for early labor	2.78	1
Total	100	36
What changes would you recommend to improve the Birth Your Way class series?		
	%	Count
More time-slots offered	23.53	4
Longer class sessions and/or group series	17.65	3
Fewer mindfulness activities	5.88	1
Smaller class size	5.88	1
More inclusive for partners	5.88	1
More information on anatomy	5.88	1
More practical application	5.88	1
Nothing or n/a	29.41	5
Total	100	17

CHAPTER VII

DISCUSSION

The Birth Your Way program was developed to address the alarming infant and maternal mortality crises in the United States (Organization for Economic Cooperation and Development, 2019). We used an implementation science approach to develop and evaluate the Birth Your Way program within the public health apparati (Medicaid and WIC) that target the structural determinants of infant and maternal mortality risk (Esmail et al., 2020; Glasgow et al., 2020). The federal Medicaid and WIC maternal child health programs are available in every county or parish in the United States and share the aim of promoting healthy and less costly birth outcomes (Bitler & Currie, 2005; Markus et al., 2017) The Birth Your Way program was designed to capitalize on the Medicaid program's excellent reach while preventing costly birth outcomes via increased adherence to the WIC prenatal nutrition protocol. The intervention utilizes an ACT-based approach to bolster the WIC supplemental nutrition program's effects on poor birth outcomes known to increase infant mortality risk, e.g., NICU admissions, low birthweight and preterm deliveries (Fingar et al., 2016).

In our model test site, maternal child health caseworkers from our partner Medicaid distributor promote the Birth Your Way program to pregnant Medicaid enrollees as an incentive to sign up for WIC services, typically in their first trimester of pregnancy. Pregnant Medicaid enrollees then sign up for WIC services and receive didactic lessons in healthy prenatal nutrition as well as vouchers to purchase nutritious foods. Then, in their second trimester of pregnancy, mothers choose between Birth Your

Way options: 1) original 6-week, group-based series, 2) 90-minute individual session, or 3) self-guided digital version of the individual session. The 90-minute individual session has been culturally adapted for Latinx and Black birthing families and sessions are available in Spanish and English. In response to challenges presented by the COVID-19 pandemic, the individual session was rapidly adapted for remote delivery and enjoys an engagement rate of greater than 90%. The group-based series is on hold while community based participatory research efforts are underway within our model test site to adapt the series for remote delivery. The implementation pipeline we established with our Medicaid and WIC public health partners at our model test site has enabled rapid adaptation, field testing and dissemination of services to meet clients' changing needs throughout the COVID-19 public health crisis.

Pragmatic Randomized Clinical Trial

Utilizing the RE-AIM framework, formative development of the Birth Your Way program included several rounds of needs assessments, focus groups and pilot testing with public health agency staff and their pregnant clients to establish program feasibility and acceptability prior to launching formal evaluation in 2014 (Gaglio et al., 2014; Glasgow et al., 2020; Russell & Alfred, 2003). The Birth Your Way pragmatic randomized clinical trial was conducted in our model test site from 2014 through 2018 to evaluate the Birth Your Way group-based intervention's promise for buffering infant and maternal mortality risk. We hypothesized that the 15-hour, ACT-based Birth Your Way series would amplify the effects of the WIC supplemental nutrition program on improving prenatal diet and downstream birth outcomes. Additionally, we hypothesized that participation in the 6-week prenatal series would reduce incidence of Cesarean

surgeries. We also predicted that participation in the group-based intervention would increase pregnant mothers' psychological flexibility, the underlying psychological mechanism shown to improve healthy behavior engagement in ACT-based treatments. Psychological flexibility can be characterized as the ability to persist in values-directed actions despite the (at times) adaptive urge to engage in avoidance behaviors that provide temporary relief from uncomfortable thoughts, feelings and physical sensations. The primary focus of the pragmatic clinical trial was to evaluate the ACT-based intervention's potential to mitigate maternal mortality risk factors (Cesarean delivery), and infant mortality risk factors (NICU admissions, low birthweight and preterm deliveries). Additionally, the full study included a third time point (T3) at 7 months postpartum to assess intervention durability, and to enable exploration of targets for future postpartum intervention development.

Summary of Findings

Results from the randomized clinical trial demonstrate the promise of Birth Your Way for increasing prenatal engagement in the WIC nutrition protocol and for improving key infant health outcomes. As hypothesized, pregnant mothers who received a minimum dose (one or more sessions) of the Birth Your Way intervention made greater dietary improvements than mothers who received the WIC supplemental nutrition program only, accounting for group differences at baseline. These results suggest the Birth Your Way series can be efficacious for high risk pregnant mothers when it is received as part of the WIC supplemental nutrition program.

The results among participants who received a minimal dose are promising when considered in the abstract, independent of the real world public health context. However,

our aim is to impact infant mortality risk within existing public health apparati where program attrition commonly impedes health promotion program effects (Gupta S. K., 2011; Ten Have et al., 2008). Therefore, we also conducted parallel analyses using an intent-to-treat approach that includes all cases in the group to which they were randomized regardless of actual delivery. In this case, the "treatment" group includes participants (n = 10) who were randomized to treatment but received no treatment, citing lack of transportation (n=5), rural location (n=2), and/or work conflicts (n=3) as reasons for not attending at least one Birth Your Way session at the county WIC site. There were no significant differences in prenatal risk factors between the treatment group participants who attended at least one Birth Your Way session and those who did not attend any sessions.

The intent-to-treat model detected no main effect of condition on improvements in perinatal diet. Within the treatment group, mothers who received a minimum Birth Your Way dose made greater dietary improvements than treatment group mothers who did not attend at least one session. It could be the case that treatment group mothers who failed to attend at least one session would not have responded to treatment despite having received a minimum dose. However, the lack of differences in prenatal risk factors between treatment group participants who received a minimum dose and those who did not is evidence against this possibility.

Preterm birth and low birthweight deliveries were also reduced for pregnant mothers who received a minimum dose of the Birth Your Way intervention compared to mothers who received WIC services only. This demonstrates the Birth Your Way intervention's promise for improving health outcomes in controlled settings. However,

there was not a significant result of randomized condition in our intent-to-treat analysis, whereby treatment group mothers who received no Birth Your Way sessions were included in the analysis. Treatment group participants who did not receive Birth Your Way delivered more preterm and low birthweight newborns than treatment group mothers who received at least a minimum Birth Your Way dose, despite no significant differences in prenatal risk factors. Treatment group mothers who did not attend the Birth Your Way intervention reported lack of transportation, rural location, and work conflicts as reasons for not attending. Given the current study's high risk sample of low SES mothers receiving Medicaid, lack of ability to attend may reflect increases in risk factors not captured in the baseline prenatal risk factor survey. For example, rural location, lack of transportation and inability to alter work schedules among treatment group mothers who were unable to attend the Birth Your Way series, may have also impeded their ability to participate in preventative medical care (Taylor, Liu, & Howell, 2020). There is evidence that pregnant people residing in rural locations experience increases in prenatal stress that is associated with increased risk of preterm birth (Kozhimannil, Hung, Henning-Smith, Casey, & Prasad, 2018). Finally, there is also evidence that pregnant people who lack flexibility to alter work schedules during pregnancy experience increased work-related stress that is associated with increased risk of preterm birth (Morgan, Christensen, Skedros, Kim, & Schliep, 2020).

In our intent-to-treat analysis, there was a main effect of randomized condition on NICU admissions, with significantly fewer NICU admissions observed for infants born to treatment group mothers than for infants born to control group mothers. The current study provides foundational evidence for the Birth Your Way intervention's efficacy in

mitigating a key cost-saving metric of interest to Medicaid distributors nationwide. There is evidence that availability of NICU beds, rather than infant need, drives the overuse of NICU services for infants weighing over 1500 grams (Haidari et al., 2020; Harrison, Wasserman, & Goodman, 2018). It is unclear the extent to which the Birth Your Way intervention prevents NICU admissions via improvements in fetal health or through a potential behavioral mechanism, such as mothers declining unnecessary NICU services. Unnecessary use of NICU services has been shown to result in iatrogenic effects for families, including increased risk of infant infection, interruptions in breastfeeding, and increased parenting stress (Edwards & Horbar, 2018; K. G. Williams et al., 2018). Future study of the intervention's effects on NICU admissions should examine how increases in values-directed actions relate to maternal decision-making regarding acceptance or decline of NICU services for infants with low illness acuity. Embedded in each Birth Your Way session are didactic lessons on the key maternal postpartum behaviors shown to reduce unnecessary NICU admissions, including minimum 1 hour maternal/infant skin-to-skin contact post-delivery to prevent newborn hypothermia and early initiation of breastfeeding to prevent newborn hypoglycemia (LeBlanc et al., 2018). Buffering NICU admissions via Birth Your Way programming must be replicated across multiple Medicaid distributor sites to establish program effectiveness. However, this initial result is promising as reducing NICU admissions is a top priority for Medicaid distributors (Rudowitz et al., 2019). Birth Your Way's potential for preventing unnecessary NICU admissions could be a boon to Medicaid distributors looking for cost-saving measures (Harrison et al., 2018; Harvey et al., 2020)

The Birth Your Way intervention was designed to target the malleable psychosocial determinants of poor birth outcomes via improvements in healthy prenatal diet. However, the percentage of poor birth outcomes in the US that are attributable to non-malleable genetic factors remains unknown due to complex, interacting etiologies (J. Jain & Gyam, 2016). Accounting for 12% of US births, preterm birth is the largest contributor to infant death, with heritability of preterm birth estimated at 30% (Frey & Klebanoff, 2016). Molecular genetic studies are underway to identify risk biomarkers and to develop novel therapies for prevention and treatment of preterm births (Manuck, 2016). Despite these exciting developments, targeting of prenatal health behaviors remains the most efficacious approach for prevention of preterm births among the majority of people facing increased risk. When combined with medical interventions, improving prenatal health behaviors reduces infant morbidity among highest risk pregnancies (Koullali, Oudijk, Nijman, Mol, & Pajkrt, 2016). Further research is needed to examine the extent to which improvements in prenatal diet explain the Birth Your Way intervention's role in improving infant birth outcomes.

The Birth Your Way intervention aims to improve engagement in healthy prenatal behaviors to improve downstream birth outcomes by targeting the theoretical ACT mechanism, psychological flexibility, or the degree to which one's behavioral repertoire aligns with core, personal values despite the presence of uncomfortable internal stimuli such as psychological stress or anxiety. This study was the first to examine the promise of applying ACT in the prenatal period to improve expecting mothers' psychological flexibility. Accounting for baseline measures, a minimum dose of the Birth Your Way series was associated with decreases in mothers' experiential avoidance (the inverse of

psychological flexibility), compared to mothers who received WIC only. However, results were not significant in our intent-to-treat model that included treatment group mothers for whom the treatment was not applied. Future trials will need to be sufficiently powered to more precisely examine psychological flexibility's potential mediating role in improving perinatal dietary behaviors.

Participation in the Birth Your Way intervention did not significantly reduce Cesarean deliveries compared to receiving WIC only. Although there was no significant difference observed between randomized conditions, the percentage of Cesarean deliveries observed for participants who received at least one Birth Your Way session (13.89%) fell within the 5-15% Cesarean rate recommended by the World Health Organization. Whereas, the percentage of Cesarean deliveries observed for participants who received WIC only (33%) matched the county's prevalence rates. Unlike the didactic lessons on healthy prenatal nutrition provided by WIC educators prior to Birth Your Way delivery, the didactic lessons on Cesarean surgery are embedded within the Birth Your Way intervention itself. The malleable factors occurring in labor that predict increased risk of Cesarean delivery: 1) labor induction, 2) epidural anesthesia, and 3) constant fetal heartbeat monitoring, are addressed in the final two sessions of the Birth Your Way series (Medicaid and CHIP Payment and Access Commission, 2019; Yee et al., 2017). Within the treatment condition, participants who attended 5 or more sessions reported less frequent use of labor induction, epidural anesthesia and constant fetal monitoring than treatment group mothers who did not attend sessions 5 and/or 6. This could be a self-selection effect as treatment group mothers who were able to attend 5 or more sessions may have been less likely to require labor interventions that increase Cesarean risk;

however, there was no difference in prenatal risk factors between treatment group mothers who attended 5 or more sessions and those who did not.

Study Limitations

Limitations of the current study inform directions for future research, particularly with regards to the Birth Your Way intervention's potential for buffering prenatal stress. Although both prenatal stress and prenatal nutrition are primary psychosocial determinants associated with increased risk of poor infant birth outcomes, the current study only examined the Birth Your Way intervention's impact on prenatal nutrition (Environmental Protection Agency, 2013; Kim & Saada, 2013). Although biological links between prenatal stress and fetal stress exposure are well established, the current study did not include a biological stress measure (Christian, 2014; Li, Zhu, Myatt, & Sun, 2014; Peña et al., 2012). Future trials that incorporate precise examination of intervention effects on prenatal stress and fetal glucocorticoid exposure are needed to understand the potential biological mechanism underlying the Birth Your Way intervention (O'Donnell et al., 2012; Seth, Lewis, Saffery, Lappas, & Galbally, 2015). It remains unclear the extent to which mitigation of poor birth outcomes can be attributed to improvements in prenatal diet, reductions in fetal stress exposure, or an interaction between these variables.

In our ACT conceptualization, increases in psychological flexibility enable pregnant mothers to transform the function of subjective stress into the motivation to engage in values-directed actions. Mindful awareness is a key component of psychological flexibility, thus mindfulness activities are embedded in each Birth Your Way session to promote increases in psychological flexibility. However, increases in

mindful awareness alone, apart from increased engagement in values-directed actions, may have impacted participants' subjective stress and downstream health outcomes (Evans, Goodman, Dimidjian, & Gallop, 2019). We hypothesized that increases in psychological flexibility (measured as decreases in experiential avoidance) would improve pregnant mothers' adherence to the WIC prenatal nutrition protocol, but we did not examine the role of subjective stress and mindful awareness in the current study. There is evidence that experiential avoidance, the theoretical opposite of psychological flexibility, contributes to increases in subjective stress, and that mindfulness approaches alone (in the absence of components that target values-directed actions) are less effective at buffering psychological stress (Bonacquisti et al., 2017; Karekla & Panayiotou, 2011). Given the significant between-group differences in psychological flexibility at baseline, and the lack of an active control condition in the current study design, it is unclear the extent to which changes in psychological flexibility explain improvements in nutritional intake and birth outcomes. To elucidate the psychological mechanism underlying the Birth Your Way intervention, subsequent research should include an active control condition whereby mindfulness activities (without emphasis on values-directed behavioral engagement) are compared against a Birth Your Way intervention condition and a WIC treatment-as-usual condition. Finally, future trials should examine the potential interaction between psychological flexibility and subjective stress in improving healthy prenatal behavior engagement and downstream health outcomes.

Another major limitation of the current study is insufficient power to assess racial disparities in program efficacy and birth outcomes. Results may not generalize to non-white racial groups because white participants made up 80% of our sample for the current

study. Future trials should include a racially diverse sample that enables evaluation of intervention efficacy by racial group, including a specific examination of the role discrimination stress plays in exacerbating poor birth outcomes for racially marginalized people (Fox et al., 2015; J. A. Jain et al., 2018). The urgency underlying the need to identify effective methods for improving birth outcomes among Black birthing people cannot be understated. A married, middle class, college-educated Black woman and her infant face greater mortality risk than a single, low income, white woman with less than a high school diploma and her newborn (Moaddab et al., 2018). Since 2018, we have utilized the Hybrid Prevention Program Model to culturally adapt the 90-minute Birth Your Way session for Latinx and Black birthing families (Castro et al., 2004). These culturally adapted programs have demonstrated good acceptability and feasibility in our preliminary implementation trials and are currently delivered in our 2nd model test site, a metropolitan region with a non-white majority population. Future studies should examine the potential efficacy of the culturally adapted interventions at improving prenatal health behaviors and downstream birth outcomes among racially marginalized families.

Future Directions

Our overall study design included a third time point (T3) at 7 months postpartum to assess durability of the intervention's effect on perinatal diet and values-directed actions; and to enable exploration of potential intervention targets for development of an ACT-based postpartum intervention. Both Medicaid distributors and WIC agencies seek to add perinatal "wrap-around" services to reduce client attrition common in the postpartum period (Carlson & Neuberger, 2021; Harvey et al., 2020). We will conduct exploratory analyses of maternal depression, mindful parenting, parenting stress,

breastfeeding and infant sleep at 1 month and 7 months postpartum with the aim of identifying intervention targets for an ACT-based infant parenting series that incentivizes continued participation in WIC services despite barriers related to the postpartum period.

Conclusion

The United States holds alarming records for highest infant and maternal mortality rates in the developed world. Ranking 56th globally, the US infant mortality rate is on par with many low and middle income countries (Organization for Economic Cooperation and Development, 2019). Despite the decline in maternal mortality rates globally, pregnancy-related deaths in the US have trended upwards since 2006 (Moaddab et al., 2018). Birth Your Way perinatal health promotion program was designed to address this alarming US public health crisis by amplifying the proven ability of federal maternal child health programs to mitigate the primary infant mortality risk factors, namely NICU admissions, low birthweight and preterm deliveries, and the key maternal mortality risk factor, Cesarean delivery. The federal Medicaid program buffers mortality risk via increased access to perinatal healthcare services; while the federal WIC program improves health outcomes via improved prenatal nutrition (Bitler & Currie, 2005; Markus et al., 2017). Employing an implementation science approach since 2012, the Birth Your Way intervention has been developed and evaluated in collaboration with Medicaid and WIC partners in a model public health test site. The Birth Your Way intervention is the first to utilize an ACT-based approach to increase pregnant mothers' adherence to the WIC prenatal nutrition protocol. Results from the Birth Your Way pragmatic randomized clinical trial (conducted between 2014-2018) demonstrate the ACT-based intervention's potential to mitigate poor birth outcomes by bolstering WIC program effects. Further

research is needed to assess the Birth Your Way intervention's potential to improve birth outcomes in real-world public health settings. However, the current study documents a promising role for the application of ACT in the prenatal period to increase maternal engagement in values-directed actions and healthy dietary behaviors and to decrease the likelihood of NICU admissions, low birthweight, and preterm deliveries. Expanding the reach of ACT-based prenatal programs across Medicaid distributors to amplify WIC program engagement could prove a critical component in the public health effort to mitigate the US infant and maternal mortality crisis.

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