Natural Reduction of Pain During Childbirth Through the Use of Behavioral Interventions

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High rates of cesarean, epidural, and spinal anesthesia procedures during childbirth in the United States have been termed as an epidemic by those attempting to understand this phenomenon. In 2013, 31% of women delivered their children via cesarean (Boyle, et al., 2013). However, the World Health Organization (1985) advocates that 5-15% is an ideal range for medically necessary cesarean procedures (Boyle & Reddy, 2013; Ishag, 2014). Non-medically necessary procedures refer to treatment that is prescribed to alleviate pain or discomfort, but is not necessary for saving the life of the patient in that specific circumstance. Additionally, the United States has some of the highest rates of maternal mortality among industrialized countries, which is contrary to global trends in both industrialized and developing nations (Sifferlin, 2016; Tavernise, 2016). Maternal mortality in the United States has increased from 23 deaths per 100,000 births in 2005 to 28 per 100,000 births in 2013 (Tavernise, 2016). Placing the rates of maternal mortality, due to complications during pregnancy and childbirth, higher in the United States than other less industrialized countries such as: Iran, Vietnam, Libya, Turkey, and Romania (Taversine, 2016). There are a number of suggested reasons for this recent increase in maternal mortality rates in the United States including: racial discrepancies, increases in obesity related illness during pregnancy, inconsistencies in access to healthcare, older gestational ages, and lastly, the recent rise in cesarean births (Sifferlin, 2016). Furthermore, research has demonstrated that women who receive epidurals are more likely to receive instrumental assistance (e.g. forceps or vacuum aided delivery) during the second stage of labor (Anim-Somuah, Smyth, & Howell, 2005). Epidural anesthesia cause muscle weakening which impedes the woman’s ability to push, therefore instrumental assistance is required (Anim-Somuah, et al., 2005). In 2011 60% of women that had a spontaneous vaginal delivery (i.e. gave birth without
the aid of forceps or vacuum delivery) received epidurals “compared to 83.8% of women who required forceps delivery and 77.3 % who required vacuum extraction” (Anim-Somuah, et al., 2005, p. 4). While modern medicine has, numerous lifesaving benefits, it can have collateral adverse effects as well. The aforementioned collateral adverse effects include increased risk of forceps and vacuum delivery and mortality rates (Anim-Somuah, et al., 2005; CDC, 2011). However, behavioral interventions have been suggested as an alternative to non-medically necessary procedures during childbirth.

Research suggests that natural pain reduction and principals for prenatal care are behavioral. Previous research on behavioral interventions found that psychoprophylactic preparation (i.e. Lamaze classes) lead to more enjoyment and less anesthesia during childbirth (Charles, Norr, Block, Meyering, Meyers, 1977). This was evaluated in 95 laboring women who received psychoprophylactic intervention prior to childbirth. Those that received the intervention were compared to 195 women that did not receive prior coaching. The procedure involved personal interviews conducted 1-3 days postpartum on the childbirth experience. Questions involved in the interview included pain during the childbirth process and enjoyment of the overall experience (Charles et al., 1977). This study also obtained medical records to evaluate the frequency of medical intervention utilized by the participants during childbirth (Charles et al., 1977). Results indicated that those who received psychoprophylactic intervention received less anesthesia, reported overall higher levels of enjoyment during childbirth, and experienced less pain than participants that did not receive psychoprophylactic intervention. Psychoprophylactic intervention focuses on an enjoyable birthing process for the mother. This is attempted by encouraging others close to the mother to offer support during the childbirth process (Charles et al., 1977). Also, it teaches behavioral based birth practices to the mother that focus on breathing
techniques and body positioning used to effectively decrease pain and control anxiety during childbirth (Charles et al., 1977).

Behavioral based procedures are suggested to reduce pain naturally and lead to more enjoyment, however, literature in this area has generated contradictory findings. Earlier studies suggested that women who received preparatory behavior based training prior to childbirth did not differ in regards to pain or level of anesthesia from those that did (Davis & Curi, 1968; Scott & Rose, 1976). Davis et al. (1976) determined that the reason the two experimental groups differed was likely due to personality characteristics of the women in the sample. An alternative explanation could be that type and quality of training played a role in this conclusion. Psychoprophylactic training quality likely contributes to its utilization during labor and therefore has an impact on experienced pain. Current psychoprophylactic training can involve one full day class, weekly classes starting at the 28th week of pregnancy, full weekend sessions, or could be offered completely online. Across these options Lamaze classes typically involve 12 hours of total instruction. (Pregnancy Corner, 2017). These classes focus on breathing, movement, and how partners can provide support (Murray, 2016). These components are essential for preparation, but it is likely that the overall short duration of typical Lamaze classes prevent the in-depth understanding and generalization of the skills; therefore, the quality is diminished. If the training provided in these psychoprophylactic classes emphasized understanding, preparedness, retention, and generalization of the content then the training is more likely to be applied during childbirth; And contrary to what was concluded by Davis et al. (1976) could be more effective for pain and anxiety reduction.

Despite these conflicting findings, Lamaze class is a behavioral intervention commonly recommended by doctors. Behavioral interventions such as these preparatory classes are
suggested to have inherent benefits. Minimally these classes provide an initial understanding of what to expect during labor and childbirth and are intended to help the woman prepare for and make informed decisions about her experience (DiFlippo, 2008). However, previous research that evaluated the suggested widespread effects (e.g., pain reduction, mitigating undesirable birthing interventions like forceps, and decreased maternal mortality rates) of this training have yet to be empirically evaluated. Additionally, investigation into how quality of Lamaze instruction impacts skill acquisition and utilization of the behavioral techniques taught to reduce pain is limited.

Type and quality of instruction likely influences the adherence, maintenance and generalization of the skills taught in psychoprophylactic classes. Research suggests that lecture style teaching and delayed assessment of skills, as Lamaze classes are typically structured, do not promote comprehension or competency of content (Knight & Wood, 2005). Behavior analytic research has empirically evaluated a teaching strategy called Behavioral Skills Training (BST) that has been used effectively to teach skill acquisition with a wide variety of individuals and skills (Miltenberger, 2011). Some of which include teaching parents to accurately implement functional assessments of problem behavior in their children, to teach functional communicative responses to decrease aggression with adults with intellectual disabilities, and to teach gun safety to children (Himle & Miltenberger, 2004; Shayne & Miltenberger, 2013; Travis & Sturmey, 2013). The BST approach involves first providing verbal instructions of skills, then modeling of the skill, after that BST allows the individual to practice while the instructor provides corrective feedback and praise. The use of BST has demonstrated skill acquisition across behaviors and when previous training using different teaching techniques have generated ineffective results (Himle & Miltenberger, 2004).
The premise of the current study will be to utilize knowledge on behavior analytic principals to teach expectant women natural pain reducing behaviors using similar practices taught in Lamaze classes. More specifically, this study will teach pregnant women laboring and birthing body positions, breathing techniques, and precise movements that are suggested to decrease anxiety and pain naturally during childbirth using the four components approach of BST. This study aims to extend the research conducted by Charles and colleagues (1977). Methodological improvements will be made to empirically evaluate the suggested benefits of behavioral interventions prior to and during childbirth. Additionally, this study will attempt to speak to the effect of training quality of such interventions. The purpose of the current study is to evaluate the effectiveness of behavioral interventions taught during pregnancy. It is hypothesized that behavior interventions taught prior to childbirth will increase utilization of the practices and will decrease pain, non-medically necessary interventions, and increase overall enjoyment of the childbirth process compared to those that do not receive such training. This study predicts that more intensive and extensive training during pregnancy through BST of laboring and birthing positions, breathing techniques, and movement will increase its utilization during labor and childbirth. The utilization of these skills will lead to decreased pain during childbirth and will increase enjoyment when compared to typical Lamaze or no Lamaze training. Additionally, it is predicted that the training that utilizes BST will be more effective than the typical Lamaze class instruction.

**Method**

**Overview**

The present study will examine how training of behavioral labor interventions during pregnancy effect women’s pain experience and enjoyment during labor and childbirth. This
study will also examine how having a partner (e.g. spouse, mother, doula, sister, or friend) that provides support during childbirth influences the overall experience. Pain will be defined as physical suffering or discomfort categorized by type of pain (e.g. sharp, dull, deep, and surface) and intensity rated on a 10-point Likert scale. Enjoyment will be defined as a sense of pleasure, contentment, or feeling as though the participant personally benefitted from the childbirth process. Partner support is defined as individuals with whom the expectant women chose to participate in her childbirth experience that provided a certain level of investment in the emotional, physical, and psychological well-being of the women. Pain experience and overall enjoyment will be assessed using self-report measures. Presence of a partner will not directly be manipulated, but is categorized by the prior planned attendance of another person by the expectant women.

**Participants**

Participants for inclusion in this study are women that are in the final trimester of their pregnancy and are patients of Carmellia Women’s Health OBGYN services. Three hundred first time mothers with varied demographic characteristics will be recruited for the study, see Appendix A for recruitment flyer. The participants included in the study will be women that planned prior to inclusion in the study to have a natural childbirth. Participants were cleared by their physician as low risk and healthy enough to only receive medically necessary interventions during the childbirth process. It is important to note that participants are given no direction about whether they should or shouldn't follow their birth plan throughout the birthing process. Therefore, should the participants deviate from their natural birth plan any time during pregnancy or childbirth there will be no perceived penalty. Only first time mothers will be included in the sample to prevent any potential differences in pain during childbirth based on
previous childbirth experiences. Demographic information on age and ethnicity will be collected, no other identifiable information will be obtained from these participants in order to protect their confidentiality. Prior to data collection all procedures will be approved by the Sacramento State Internal Review Board (IRB) due to the possibility of risk to the participant; informed consent will be obtained from the participant prior to the study and a debriefing will take place after the measures are taken. Specific information regarding IRB, consent, and debriefing forms can be found in Appendix A.

**Materials**

The materials that will be used for this study include surveys on the experience of pain and enjoyment during labor and childbirth that are given to participants between 24-48 hours after childbirth. Surveys that rate experienced pain and overall enjoyment are derived from relevant items on The National Initiative on Pain Control Scale (Galer, Jensen, & Gammaitoni, 2003). The revised questionnaire asks 14 questions that assessed pain type and intensity during labor and childbirth, each of which are rated with a 10-point Likert scale. In addition, the questionnaire will address if and at what point pain mediation was administered after labor started for each participant across the groups. One question on enjoyment or pleasantness of the overall experience of childbirth is assessed on the same questionnaire using a 10-point Likert scale. On the 10-point Likert 0 is “No pain”, 5 is “moderate pain”, and 10 is “worst possible pain” of that type. Each question on pain type is explained using examples in an effort to decrease ambiguity and the subjective nature of the self-report measures on pain. Validity of the pain and experienced enjoyment inventory has been assessed with a reliability analysis of the scales in previous studies. Additional reliability analyses will be conduct in order to ensure that
the derived questions are measuring what they are intended to. For specific survey information see Appendix A.

**Procedure**

The experimental phase will begin at the 28th week of gestation and will last until the participant goes into labor after reaching a full-term pregnancy, approximately 38-40 weeks. The participants will be interviewed during intake. During the intake interview the participants will indicate if they plan to have a natural childbirth or if they plan on using pain management during childbirth. Individuals that indicate a natural childbirth preference will be asked to participant in the study. Participants will then be asked if they are interested in attending a Typical Lamaze class, an Intensive Lamaze class, or if they intend on not attending a psychoprophylactic preparation class prior to childbirth. The participants will then be categorized into different groups based on their pregnancy and childbirth plan. The groups will be formed based on what the participants indicate is their preference, but will be free to deviate from their plan at any point during pregnancy and childbirth without any actual or perceived penalty. The survey that will be administered will indicate if and at what point they deviated from their plan and that information will be used to compare the rates of pain management utilized across the groups.

*Intensive Behavioral Intervention Group*

The first group will consist of approximately 100 participants that received an intensive form of a labor behavior training intervention for the duration of the final trimester (From 28th week to the 38th week). To control for durational differences in pregnancy and exposure to the Intensive Lamaze class, this group will only receive training until they reached their 38th week of pregnancy. The training sessions will focus on similar content taught in a typical Lamaze class,
but will be more detailed and will utilize empirically evaluated BST teaching procedures. The duration of the class will be extended for 10 weeks respectively and will involve once a week sessions lasting 3 hours, allowing for extensive understanding and knowledge of the aspects taught to the participants. Each week will cover a different aspect of the behaviors suggested to decrease pain naturally (e.g. breathing, body positioning, stretching, walking, etc.). This training follows the typical BST format and will have four components (Miltenberger, 2012). BST will start first by discussing the behavior with rationale for how it is suggested to decrease pain and other inherent benefits, then the behavior will be taught with verbal instructions, next video and in-vivo modeling will be done for the specific skill, and lastly the participants will practice the skill and receive feedback from the instructor (Miltenberger, 2012). This will be repeated each week on the various skills taught (e.g. breathing, body positioning, stretching, walking, etc.) until the participants reaches their 38th week.

**Typical Lamaze Class Group**

The second group will consist of approximately 100 participants that will receive the typical Lamaze class instruction. Training will occur during one day in the final trimester of pregnancy and last approximately 12 hours. The participants will be taught behaviors suggested to decreased pain naturally (e.g. breathing, body positioning, stretching, and walking) in a lecture style then will have the opportunity to practice each behavior explained by the instructor.

**No Instruction Group**

The no instruction group will consist of approximately 100 participants that did not receive any formal labor and/or childbirth training based on their preferences indicated in the intake assessment.

**Data Collection Procedure**
The presence of a partner will be noted as labor begins. Participants will be asked verbally if they had arranged to have a partner present during childbirth and if that partner was in fact present. Only instances where participants preplanned on having a partner present and that specific individual is actually present will be documented as “partner present”. If no partner is present or if the partner present was not preplanned the instance is documented as “partner not present.”. The survey will be administered between 24 and 48 hours after the infant is born. The duration of labor will differ for each participant; however, the survey will take an average of 10 minutes to complete. The participants will be handed the survey and instructed to answer to the best of their ability the pain they felt during childbirth and the enjoyment they feel with the overall experience by circling the corresponding number on the Likert scale. The participants will also indicate if and at what point they deviated from their natural birth plan and received pain medication by answering a single open ended question. For survey specific information see Appendix A.

Data Analysis

The analysis conducted in this study will be a Factorial Analysis of Variance (ANOVA) with a 3 X 2 design. The primary dependent variable is experienced pain and the secondary dependent variable is enjoyment. However, all survey questions will be analyzed across the two independent variables. The first independent variable is childbirth training and consists of three levels: Intensive Lamaze class (using BST), Typical Lamaze classes, and no prior training. The second independent variable is presence of a partner with two levels: partner present and no partner present during labor and childbirth. This analysis was done to assess any statistically significant differences for the between-subject independent variables. In addition, a chi-square will be used to determine if there is a difference in the frequency of participants that deviated
from their natural childbirth plan among the three childbirth training types. The threshold for significance will be evaluated at a \( p < .05 \). The software used to assess the statistical significance and descriptive statistics will be computed using the Statistical Package for the Social Sciences (SPSS) v. 24 (IMB Armonk, NY). Descriptive statistics will be collected on performance of the participants in the subsequent conditions and demographical information.

**Results**

*Preliminary Analyses*

Descriptive statistics will be calculated for the various measures taken. Demographic information on age and ethnicity will be collected for each participant. Participant’s average pain level on each of the measures and the average level of enjoyment during the childbirth experience will be assessed. As well as average number of participants that have a preplanned partner present during labor and delivery. Standard deviation, 95% confidence interval, median, standard error of mean, skewness, and kurtosis, as well as variance and histograms with a normal curve will be analyzed on the variables discussed above. There will likely not be any significance differences in regard to ethnicity or age of the participants, it is expected that those demographics will not influence pain and enjoyment of childbirth. It is expected that participants that had a partner present during childbirth will experience less pain in the Intensive Lamaze class condition on average, moderate pain for the participants in the Typical Lamaze classes, and on average higher levels of pain for the participants that are in the no instruction group, displayed in Figure 1. The participants that received the Intensive Lamaze class will on average experience the most enjoyment with the childbirth process, the participants in the Typical Lamaze classes will experience moderate levels of enjoyment, and the participants in the no instruction group will experience the least amount of enjoyment, this is displayed in Figure 2. It is also expected
that participants that did not have a partner present will on average experience lower amounts of pain when in the Intensive Lamaze class condition, moderate amounts of pain for those in the Typical Lamaze classes, and the participants that are in the control group will likely experience high amounts of pain, displayed in Figure 1. These results will likely indicate that those that received antecedent interventions prior to the childbirth will experience less pain and more enjoyment compared to the no instruction group both when they do have a partner present and when they do not. The participants that receive the Intensive Lamaze class will likely experience less pain and more enjoyment than those that experience the Typical Lamaze class.

*Chi-Square*

A chi-square analysis will be evaluated to determine the frequency of participant deviation from a natural birth plan across the groups (Typical Lamaze class, Intensive Lamaze class, or no prior instruction). It is expected that frequencies of deviation will significantly differ between the groups with the highest frequency of deviation found in the natural birth plan that selected No Lamaze class followed by those that participated in the Typical Lamaze class, displayed in Figure 4. It is also expected that those that participated in the Intensive Lamaze class will experience the lowest frequency of deviation from their natural birth plan, displayed in Figure 4.

*Main Effects*

Main effects will be analyzed to determine if each of the independent variables have a separate effect on the dependent variables. A significant main effect is expected of the between-subject’s independent variable of antecedent based behavioral interventions (Intensive Lamaze class, Typical Lamaze class, or No prior intervention) and dependent variable of pain experience.
There is likely going to be a significant main effect of the between-subject’s independent variable of partner present (yes, or no) and dependent variable of pain experience.

**Interaction**

Interactions will be analyzed to determine if the dependent variables change based on the respective levels of the independent variables. A significant interaction is expected between the independent variable of antecedent based behavioral interventions (Intensive Lamaze class, Typical Lamaze class, or No Lamaze class), the presence of a partner (yes or no), and the dependent variables (pain and enjoyment). It is expected that participants that had a partner present and were in the Intensive Lamaze class will experience the lowest amount of pain, participants that were in the Typical Lamaze class condition will experience a moderate amount of pain, and participants in the No Lamaze class condition will experience the highest amount of pain possible. It is also expected that participants that do not have a partner present and are in the Intensive Lamaze class will experience the lowest amount of pain, participants in the Typical Lamaze class will experience a moderate amount of pain, and participants in the No Lamaze class will experience the highest amount of pain. Therefore, it can be suggested that the intensive form of Lamaze class is more effective for natural pain reduction than what is typically done or when no intervention is implemented. Also, having a partner present during childbirth mitigates pain. This interaction is displayed in Figure 3.

**Possible Outcomes**

The above section explains what is expected of the results for this study however, being that those results are entirely hypothetical alternative outcomes should be discussed. It is possible that engaging in behavioral based training practices taught during pregnancy do not have an effect on experienced pain or enjoyment during childbirth. Mother’s age, educational
background, cultural influences, or personality characteristics could be additional variables that impact the experienced pain and enjoyment of childbirth. The presence of a partner during childbirth may also not influence pain and enjoyment, but rather the perceived level of expertise of the doctor delivering the infant might have the greatest impact on the experience. The variables assessed in this study represent only a small portion of the variables that could influence experienced pain and enjoyment of the childbirth process for the mother.
References


Figure 1. The graph above displays the average pain rating for the three respective experimental conditions: Intensive Lamaze, Typical Lamaze Class, and No Lamaze Class for participants that had a partner present during labor and childbirth and those that do not partner present. Grey bars present partner present and black bars represent no partner present during childbirth.
Figure 2. The graph above displays the average enjoyment rating for the three respective experimental conditions: Intensive Lamaze Cass, Typical Lamaze Class, and No Lamaze Class.
Figure 3. The graph above displays the interaction effect for experienced pain during labor and childbirth between the three respective conditions (Intensive Lamaze Class, Typical Lamaze Class, and No Lamaze Class) and for participants that had a partner present during labor and childbirth and those that do not partner present. Closed triangles represent partner present and closed circles represent no partner present during childbirth.
Figure 4. The graph above displays the frequency of deviation from natural birthing plan during labor after experiencing Typical Lamaze class (n = 100), Intensive Lamaze class (n = 100), or no class (n = 100).