Quantitative Study on the Impact of Parent Education on Shaken Baby Syndrome (SBS)

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**Introduction**

A newborn’s cry can be highly stressful to caregivers resulting in frustration and aggression towards the child. Therefore, it is important to provide educational materials that will help caregivers understand how to interpret and address the infant’s needs during inconsolable crying. The focus of this research review is to investigate whether parent education programs are effective in increasing mother's knowledge about shaken baby syndrome (SBS). The research article selected is relevant to this question in that it compares the Period of PURPLE Crying program to an injury control program in increasing the knowledge and changing mothers’ responses to their baby's cry (Barr et al., 2009).

SBS is a form of traumatic brain injury that is caused by violent shaking of the baby. The child’s head does not necessarily need to hit a hard surface in order for damage to occur. It is estimated that there are 30 cases of SBS per 100,000 children under the age of one, each year. Since caregivers are most likely to injure a child and there is little awareness about the dangers of shaking a baby, education programs designed for caregivers might be effective in preventing SBS. Additionally, since SBS can happen as early as the first two weeks of life, prevention programs should be offered soon after birth. Programs should also provide ideas on healthy coping mechanisms such as walking away when the caregiver feels that he or she cannot self-regulate to handle the situation (Barr et al., 2009).

**Purpose of the Study**

The authors predicted that using the Period of PURPLE Crying program would increase maternal awareness and prevent aggressive infant handling behaviors, particularly shaking. The authors hope that these changes would in turn result in a decline of SBS cases. Since shaken baby syndrome is more likely to happen during the early months of life, presenting this material to the parents soon after birth is the best approach to prepare and educate them on this topic. Additionally, periods of inconsolable crying, the most common precipitator of violent shaking of the baby, have been shown to increase during the first month of life, reach its peak in the second month, and finally decline by the fourth month. This program should not only reach new parents but it should also reach out to caregivers such as babysitters and daycare workers. Results of this study supported the hypothesis that maternal knowledge with regards to the dangers of infant handling would increase. The study also showed that understanding and responding appropriately to the baby’s cry improved after the program. Mothers also increased their sharing of the information learned with care caregivers and reported more incidences of walking away when too frustrated by their infant’s cry (Barr et al., 2009).

**Participant Selection and Sample Characteristics**

Between May 2005 and November 2006, mothers were recruited from hospitals in the Greater Vancouver Area, British Columbia. Mothers from six hospitals in the area, provided verbal consent to participate on the study. Only mothers who had uncomplicated pregnancies and gave birth to singleton healthy infants born no earlier than 37 weeks gestation qualified to participate on the program. Additional requirements included: having access to a DVD player and being fluent in English. Out of the 3,240 mothers who were approached and 2,331 who were invited, 1,833 consented to participate. Those who did not receive a follow-up visit from a nurse or lost contact with the hospital were excluded from the study. The resulting sample included 1,279 mothers ranging from 25 to 35 years of age with similar educational backgrounds, from four different health regions (Barr et al., 2009).

**Methods**

This study was a level 1 quantitative randomized control trial. The sample was divided into an experimental group, consisting of 649 mothers, and a control group of 630 mothers. Participants were randomly assigned to the groups by using permuted blocks of 2 to 4. The two groups were similar in order to avoid selection bias. The experimental group received the Period of PURPLE Crying package consisting of a Baby’s Day Diary with instructions, a sealed envelope with an 11 page booklet, a DVD, and a teddy bear. On the other side, the control group received the control injury prevention materials consisting of two brochures and a DVD about infant safety. Both groups received the materials during a nurse home visit that took place two weeks after the babies’ birth. Since materials were placed in sealed envelopes, nurses were blind as to whom was given which program (Barr et al., 2009).

The mothers were contacted by telephone one day before and one day after they were expected to start recording diary entries in order to ensure that they understood how to complete their diary. Mothers started recording diary entries about their behavior as well as their baby’s, five weeks after giving birth. By eight weeks postpartum, the mothers received a telephone call from an independent researcher who was blind to the hypothesis, the test materials, and groups. The 20-minute telephone interview tested the mother’s recall of the program’s materials. A $25 dollar check was given as incentive to participate. All questions with regards to SBS were created specifically for this study as there was no previous research on issues involving crying, shaking, and risky infant handling behaviors. The study was reviewed and approved by the behavioral ethics review board of the University of British Columbia (Barr et al., 2009).

**Intervention**

The Period of PURPLE Crying program is an educational resource used to increase parental awareness of the dangers of abusive behaviors. This program, developed by the National Center on Shaken Baby Syndrome, presents information that helps parents better identify their babies’ needs based on crying patterns. Each of the letters in the word “PURPLE” represents a domain of crying that has been shown to frustrate parents and caregivers. The letter “P” stands for “peak pattern”, a time period during the child’s second month of life when crying is at its highest. The letter “U” stands for “unexpected timing” of prolonged crying bouts, and “R” stands for “resistance to soothing”. “P” stands for “pain facial expression”, “L” is for “long crying bouts”, and finally “E” stands for “evening crying bouts” (Barr et al., 2009).

The program provides insight to help parents understand why a baby’s cry can be so emotionally distressing to caregivers. Although the PURPLE program provides three guidelines to soothe a crying baby, it also acknowledges that soothing doesn’t always work. The first guideline states that parents should address crying with typical responses first, such as holding, talking to, and comforting the infant. If the crying does not subside and the parent starts to become frustrated, it is recommended that the parent set the child down on a safe place, walk away until calm, and finally return later to check on the child. The last guideline is to never shake a baby (Barr et al., 2009).

On the other side, the control group received the Canadian Pediatric Society’s brochure titled “Safety Tips for Parents”, providing information on safe sleep positions and Sudden Infant Death Syndrome along with an instructive DVD with clips from the “back to sleep” campaign (Barr et al., 2009).

**Outcome Measures**

There was a total of eight outcome measures identified. The first five measures were concerned with knowledge about crying, knowledge about shaking, responses to crying in general, responses to inconsolable crying, and self-talk responses. These outcomes were transformed into a scale with scores ranging from 0-100, with higher scores indicating better knowledge. The remaining three outcomes included sharing information with others in three different domains: crying, shaking, and walking away. These latter outcomes were measured in terms of percentage of mothers who shared information with at least one caregiver in the three domains previously mentioned (Barr et al., 2009).

Additionally, there were four secondary outcome measures that were taken from the mothers’ diary entries. The first three corresponded to caregiver’s responses to infant distress. Distress was defined as external manifestations of discomfort such as fussing, crying, or inconsolable crying. These measures included: minutes per day of caregiver contact with infant, number of pick up events per day, and number of walk away events per day. The fourth and last outcome measured the level of caregiver’s frustration by using a 6-point Likert scale (Barr et al., 2009).

Data from the diaries was coded into a numerical system. Kappa scores from a 7% sample for mean interrater reliability were 0.99 for behaviors and 0.75 for events. These values show that these measures are very high in reliability. The authors of these articles vaguely discuss the validity of the study, but because these outcome measures have been widely utilized in other studies, it is assumed that the level of validity is acceptable (Barr et al., 2009).

**Statistical Analyses**

Statistical analyzes revealed that in order to achieve a 90% power that allows researchers to detect a mean difference of 10% between the experimental and control groups, the sample needed to include between 1,052 and 4,058 participants. Therefore, researchers aimed to recruit at least 1,200 mothers. A α = 0.05 two-sided test was used with equal numbers in each group. Primary analyses were derived from known data whereas parallel sensitivity was obtained from multiple imputation, based on the method of chained equations. Imputed values were randomly sampled from the posterior predictive distribution of the missing data. In general, results from both, the known data and multiple imputation analyses were the same (Barr et al., 2009).

The type of analysis for this study was selected independently from the study’s results. For continuous measures, a t-test was used to measure the mean difference between the experimental group, receiving the Period of PURPLE crying program, and the control group, receiving injury prevention material. The incidence of rate ratios for the number of diary events was estimated by using a negative binomial regression. Interactions of the variables of education, mode of learning the program (reading the booklet or watching the DVD), parity of infants, and inconsolable crying, was examined through the use of statistical tests of interactions along with main effect terms. If measures were not normally distributed, nonparametric comparisons were used to confirm significance (Barr et al., 2009).

**Findings**

There was missing data about age, education, and marital status for 3%, family income for 9%, and outcomes for knowledge and behavior for 4% of the sample. All four of the diary measures were missing for 17% of the participants. When comparing women who were missing data for four primary scales to those missing data for all five scales, the latter group had lower incomes and were more predominant in the experimental group. (Barr et al., 2009).

The mothers who learned about the PURPLE program obtained greater scores in knowledge about infant crying than those who received the control material. On a score scale ranging from 0 to 100, the test group obtained scores of 63.8 whereas those who received control materials had scores of 58.4, which was a significant difference. The confidence interval was 95%. Those in the experimental group also scored higher in response to crying, inconsolable crying, and self-talk response, but these differences were not statistically significant. Although there were discrepancies, both groups showed shaking score similarities (Barr et al., 2009).

However, mothers who received training in the PURPLE program reported more incidences of sharing information about walking away when frustrated, the dangers of shaking a baby, and infant crying. When performing analysis taking known data into consideration only, mothers in the experimental group were more likely to walk away when infants cried inconsolably. According to multiple imputed data analysis, walking away was 1.5 times more common among mothers in the PURPLE experimental group. There was no difference between the experimental and the control group in the frequency of picking up behaviors, and the length of time of contact between mother and baby during times of distress (Barr et al., 2009).

Differences in level of frustration between the two groups was not statistically significant. The duration and frequency of distress, fussing, crying, and inconsolable crying were similar between the two groups as well. Women in the PURPLE group with higher education level had more knowledge about shaking but were similar in knowledge on all the other domains (Barr et al., 2009).

**Interpretation**

 Knowledge about crying was 5 % greater among mothers exposed to the PURPLE program. Mothers in this group were also more likely to share information with others in regards to descriptions of crying, walking away when frustrated, and the dangers of shaking a baby. Although awareness of the dangers of shaking was high in both groups, the main difference was in the increase of knowledge about crying in the experimental group. This change was twice the average of short and long term effects of 108 interventions used to change parental knowledge and attitudes. Participants sharing the knowledge that they learned with caregivers and others promotes awareness among those who are most commonly involved in child caregiving (Barr et al., 2009).

**Limitations**

Some of the limitations identified by the author include the scarcity of male participants. This may considerably reduce the effectiveness of the program as statistics have consistently identified the father, stepfather, or the mother’s boyfriend as the most common perpetrators in cases of infant head injury. Instead, this study included only mothers, the next most likely perpetrator. Mothers have been acknowledged as the primary caregiver for infants and are also viewed as being more likely to talk to other mothers and caregivers about infant care, including educational information about SBS. Another limitation of the study is that outcome measures were based on self-reports rather than direct observation (Barr et al., 2009).

Entries in the Babies’ Day Diary were less subject to memory biases but data from only four days of behavior were analyzed. Another limitation was the self-selection factor that resulted from missing data from participants that lost contact with the research study. Additionally, the authors did not adjust for multiple outcomes, which may have affected the results (Barr et al., 2009).

**Implications for Future Research**

According to the authors, future research should investigate the Period of PURPLE Crying program more in depth in order to allow more definite conclusions about its effectiveness. Other forms of infant trauma should also be addressed by future research in order to evaluate the impact of hospital based prevention programs in comparison to community based programs. Additionally, future research should attempt to measure not only change in knowledge, but changes in the incidence of SBS before and after the administration of preventive hospital based educational programs. According to the authors, the implication of this study suggested that exposing individuals to knowledge that is relevant to what they are experiencing at that particular moment of their lives, such as having a child, may have a greater impact in changing both knowledge and behaviors related to their life circumstances. Therefore, implementing more educational programs in hospitals that address the dangers of violent physical handling might make a difference by preventing or decreasing the incidence of physical abuse among infants (Barr et al., 2009).

**Study Critique**

This quantitative study used a large sample size of over 1000 participants, which was adequate to limit the probability of failure. Further research needs to be conducted in order to obtain stronger support for the effectiveness of education prevention programs in decreasing the likelihood of SBS in young infants (Barr et al., 2009).

The PURPLE materials have been studied in a similar randomized controlled trial in Seattle. Research assistants delivered the materials to mothers in prenatal classes, maternity wards, and within pediatric offices. Higher scores were found for crying knowledge in the experimental group of mothers who read or viewed the information. The findings showed a 6.2% increase in crying knowledge, a 6.5% increase in sharing information about walking away, and a 5.6% increase in sharing information of shaking dangers. Unlike the current study reviewed, this research found a significant 1.3 point increase in shaking knowledge, but found no differences in sharing knowledge about crying and walking away from crying (Barr et al., 2009).

**Strengths**

The three major strengths of this study were that it was a randomized control trial, administrators were blind to the groups, and a large sample was used. On the other side, although blinding nurses minimized researcher bias, if the nurses had been aware of what program they were delivering, they may have been more likely to emphasize key points of the program, and possibly enhance its effectiveness. Another strength of the study was that intention-to treat analyses were only conducted using known data. Furthermore, parallel sensitivity analyses were performed using multiple imputation methods in order to minimize the biasing effects of missing data (Barr et al., 2009).

**Weaknesses**

The three major weaknesses of the study include the lack of males in the sample as well as the fact that it relied mainly on self-reports rather than direct observation. Additionally, missing data from participants who dropped out of the study may have affected the results significantly. Furthermore, the Period of PURPLE Crying program was compared to a child safety program that does not address SBS. Further research and development of other educational programs to address SBS need to be conducted to compare equivalent programs (Barr et al., 2009).

**Variables**

The control program materials used for this study were not identified and described in as much depth as the PURPLE materials used for the experimental group. The two groups were comparable in results, although the PURPLE materials used in the experimental group had slightly greater knowledge than the control group in some areas. However, an assessment of the mothers’ knowledge of shaken baby syndrome and injury prevention was not conducted prior to the study. Accounting for these variables may have yielded different results (Barr et al., 2009).

**Implications and Significance for Occupational Therapy**

These findings are relevant to the practice of occupational therapy due to its focus on prevention programs that aim to facilitate optimal performance in the occupation of parenting. Providing education and information to help parents manage their baby’s crying the adequate way, might not only prevent infant injuries, but enhance parenting skills and the enjoyment of this occupation. Since the PURPLE Crying Program has shown to enhance awareness and knowledge in new mothers, occupational therapists employed in hospitals that do not offer the program could advocate and educate hospital administrators to implement the program. Additionally, testing the use of these programs will enable further research and add to the body of knowledge about prevention programs (Barr et al., 2009).

By taking on the responsibility of promoting evidence based programs that result in positive outcomes, occupational therapists can contribute to the improvement of preventative healthcare and help reduce the incidence of disability, injury and even child mortality.

**References**

Barr, R. G., Barr, M., Fujiwara, T., Conway, J., Catherine, N., & Brant, R. (2009). Do educational materials change knowledge and behaviour about crying and shaken baby syndrome? A randomized controlled trial. *CMAJ: Canadian Medical Association Journal*, *180*(7), 727-733.