

# Impact of a Feeding Log on Breastfeeding Duration and Exclusivity

Deborah L. Pollard

Published online: 23 February 2010  
© Springer Science+Business Media, LLC 2010

**Abstract** Even with the gradual upward trends in breastfeeding initiation and duration, breastfeeding rates at 6 months continue to lag well behind the 50% target set for any breastfeeding and the 25% target set for exclusive breastfeeding by the Healthy People 2010 initiatives. Overall evidence is limited in identifying effective interventions that promote breastfeeding duration and more research needs to be focused on specific nursing strategies and their effect on breastfeeding outcomes. The aim of this study was to test the efficacy of a daily feeding log, guided by Bandura's social cognitive learning theory, on breastfeeding duration and exclusivity in primiparous mothers. The study used a randomized, controlled, two-group experimental design with a sample of 86 primiparous mothers. The experimental group completed a daily breastfeeding log for a minimum of 3 weeks and breastfeeding outcomes were examined over 6 months. The breastfeeding outcome variable was analyzed using survival analysis and Cox proportional hazards regression procedures. Subjects in the experimental group did not breastfeed significantly longer than the control group, however, a larger proportion of subjects in the experimental group reported full breastfeeding at 6 months as compared with subjects in the control group. Additional predictor variables were WIC enrollment, planned duration of breastfeeding, feeding frequency and feeding length at 1 week. The findings from the study suggest that the breastfeeding log may be a valuable tool in self-regulating breastfeeding and promoting a longer duration of full

breastfeeding, but its acceptability may be impacted by socio-demographic variables.

**Keywords** Breastfeeding · Breastfeeding duration · Exclusive breastfeeding · Intervention

## Introduction

Breastfeeding rates at 6 months have increased over the past 20 years from approximately 22.4% during 1988–1994 to 42.1% in 2004 [1–3] as a result of a focus on promoting education and evidence based interventions, however, the rate of breastfeeding exclusivity at 6 months still remains relatively low at 13.6% [3]. Even with these upward trends breastfeeding rates at 6 months lag well behind the 50% target set for any breastfeeding and the 25% target set for exclusive breastfeeding by the Healthy People 2010 initiatives [4].

The challenge for health care providers is to determine the most effective interventions to foster support for the breastfeeding family. Most intervention research has examined the impact of education, professional support, and/or peer support on breastfeeding outcomes. This evidence indicates that education alone [5] may not influence breastfeeding outcomes as compared with nursing strategies that incorporate a combination of education and support or interventions that promote self-efficacy [6–9]. Overall evidence is limited in identifying effective interventions that promote breastfeeding duration and more research needs to be focused on specific nursing strategies and their effect on breastfeeding outcomes. A breastfeeding feeding log is often used in practice settings to monitor feeding patterns in the newborn, however, a review of the literature did not reveal any research that examined the

D. L. Pollard (✉)  
School of Nursing, University of North Carolina Wilmington,  
601 S. College Road, Wilmington, NC 28403, USA  
e-mail: pollardd@uncw.edu

impact of this strategy on breastfeeding duration or exclusivity.

## Methods

The purpose of the research study was to evaluate an intervention that may influence self-efficacy or confidence in breastfeeding. The intervention involving a breastfeeding log was guided by social cognitive learning theory [10–12], specifically the self-regulation process that involves self-observation, judgmental processes, and self-reaction. The self-observation aspect of self-regulation was operationalized in this research study by self-monitoring via the completion of the Daily Breastfeeding Log. Subjects then compared their completed breastfeeding logs with expected breastfeeding behaviors such as frequency of feedings and infant outcomes related to output.

The study evaluated the effect of a self-monitoring intervention, the Daily Breastfeeding Log, on breastfeeding duration in primiparous mothers over 6 months postpartum. Specifically, the aim of this study was to test the efficacy of the self-monitoring intervention guided by social cognitive learning theory on breastfeeding duration and exclusivity in primiparous mothers. It was hypothesized that primiparous mothers in the intervention group would breastfeed longer than the mothers in the control group.

### Research Design

A randomized, controlled, two-group experimental design was used to examine the association between the independent variable, the breastfeeding log, and the dependent variable, breastfeeding duration. Sealed envelopes were used to randomize subjects to their protocol assignment using a permuted block within strata randomization using mode of delivery and return to work/school as stratifying factors to control for these variables since there is some research indicating a relationship with breastfeeding. Randomization to groups was done after all subjects received a videotaped educational session. The 35 min educational session was produced by the investigator specifically for the research study and was not a standard of practice at the hospital. The videotaped educational session included content on effective latch and positioning strategies, milk production and transfer, signs of adequate intake, infant feeding patterns, average length and frequency of feedings, use of breast massage/compression, management of sore nipples and engorgement, recognizing and managing plugged ducts and mastitis, manual expression, indications and use of manual and electric pump, sources of support and resources, and maternal nutrition. Subjects

assigned to the control group received a standardized educational session on breastfeeding via videotape and usual care. Subjects assigned to the experimental group received the same standardized educational session via videotape, instructions on use of the Daily Breastfeeding Log for 6 weeks, and weekly phone calls by the investigator at 1, 2 and 3 weeks following delivery. The weekly calls to the experimental group were completed by the primary investigator and were aimed at providing a reminder to return any logs to the researcher in the provided stamped, return envelope.

### Sample

After obtaining Institutional Review Board approval from the university and the community hospital, a convenience sample of 86 primiparous mothers was recruited from the obstetrical department of a community hospital in the mid-Atlantic region over a 6 month recruitment period. Post-partum mothers were invited to participate in the study if they: (a) were primiparous; (b) between the ages of 18 and 40; (c) planned to breastfeed; (d) were able to read, write, and speak English; (e) attended prepared childbirth classes; (f) delivered a healthy infant greater than 37 weeks gestation; and (g) initiated breastfeeding within 24 h of delivery. Mothers were excluded from the study if the infant was unable to breastfeed due to a medical condition. The research subjects did not receive any incentives or monetary stipends for participation.

Several techniques were used in determining the sample size for this study. A power analysis procedure using a .95 effect size in a pilot study [13] and an over-sampling of 15% due to the risk of attrition in a longitudinal study were used to ascertain the calculated sample of 86 subjects. The power analysis procedure used a .95 effect size from the pilot study, alpha of .05, power of .80 and a beta of .20. The power analysis procedure estimated a total sample of 32 subjects, however, based on the number of study variables and the risk of attrition, a final sample of 86 subjects was selected, 43 subjects in the control group and 43 subjects in the experimental group.

### Data Collection Instruments

Data collection for the study began within the first 12–48 h following delivery and extended to 6 months. The Personal Data Form (PDF), Breastfeeding Experience Instrument (BEI) and the Hughes Breastfeeding Support Scale (HBSS) [14] were instruments completed at the first data point in the hospital and the BEI and HBSS were repeated at the 6 month data collection point. An additional instrument used at 6 months was the Feeding and Weight Pattern Instrument (FWPI).

The Personal Data Form (PDF) and The Breastfeeding Experience (BEI), adapted with permission from Rentschler [15], were used to collect demographic data and information specific to breastfeeding, respectively. The BEI collected data regarding the use of supplementation with formula and/or solids. Breastfeeding experiences were categorized into full, partial, or token breastfeeding. The FWPI was an investigator-designed questionnaire used to measure feeding and weight patterns for the first 6 months following birth and completed by the primary care provider for the infant. The FWPI addressed five time periods over the first 6 months following birth when routine visits are scheduled and feeding and weight patterns are assessed and the information provided was used to assess consistency with the mother's self-report of breastfeeding duration. The FWPI was returned for 88% of the subjects and was consistent in all cases with the mother's self report of breastfeeding duration. Moderately strong reliability is reported for the HBSS which was used to measure emotional, instrumental, and information support for breastfeeding mothers [14].

The Daily Breastfeeding Log was an investigator-generated form to record the mother's experiences during breastfeeding. Subjects in the experimental group were directed to complete the daily log for 6 weeks. For data analysis, subjects who completed the log for 3 or more weeks was considered to meet the protocol for the intervention. There were nine columns in the log that addressed key aspects of monitoring the breastfeeding experience and included listing each breastfeeding session for the day, length of feeding, urine and stool output, use of supplement or pumping, and three open ended questions for subjects to respond to their feelings for the day.

## Data Analysis

Descriptive statistics were computed for the demographic variables and nonparametric inferential statistics were used for the hypothesis testing procedures, specifically survival analyses techniques that included logrank test, Cox proportional hazards regression, and Kaplan-Meier estimation. For categorical variables, the chi-square test ( $\chi^2$ ) or the Fisher's Exact (FE) test was used to conduct two-tailed testing of the differences in the proportions between the groups. The data analysis is based on 84 subjects (97.7% of the recruited sample) who finished the study, 43 in the control group and 41 in the experimental group. Two subjects (2.3%) in the experimental group were lost to attrition.

A life table was created to compare the experimental and control groups on breastfeeding rates over the 6 months following delivery. The life table graphically

displays the cumulative percentage still breastfeeding at each week. The logrank test was then used to assess for overall difference in breastfeeding patterns between the experimental and control groups. Cox proportional hazards regression procedures were used to determine if the dependent variable, breastfeeding percents at specific postpartum time points, could be predicted by variables such as return to work/school, how soon the initial feeding occurred following delivery, social support scores and demographic variables. A hazard ratio was generated in these procedures to estimate the relative risk of the explanatory variable on the dependent variable. For all analyses, a two-tailed  $P$ -value of less than .05 was set as statistical significance. Data were analyzed utilizing the statistical software package, SPSS for Windows.

## Results

### Sample Characteristics

There were no significant differences in the demographic and biomedical characteristics between the experimental and control groups (Table 1), except for employment status. A higher percentage of subjects were presently employed in the experimental group, compared to controls (74.4 and 44.25%), respectively;  $P = 0.008$ . However, there were no significant differences between intervention and control participants in the percent planning to return to work ( $P = 0.08$ ) or in the number of weeks planned to be home before returning to work. The sample was

**Table 1** Characteristics of the sample

Variables	E experimental group (n = 43)	Control group (n = 43)	P value
<i>Age (years)</i>			
Mean	26.7 (SD = 4.7)	25.2 (SD = 4.7)	.134
<i>Race</i>			
White	41 (95.3%)	42 (97.7%)	.390
Other	2 (4.7%)	1 (2.3%)	
<i>Marital status</i>			
Married	38 (88.4%)	31 (72.1%)	.10
Single	5 (11.6%)	12 (27.9%)	
<i>Presently employed</i>			
Yes	32 (74.4%)	19 (44.2%)	.008
<i>Mode of delivery</i>			
Vaginal	31 (72.1%)	33 (76.7%)	.62
Cesarean	12 (27.9%)	10 (23.3%)	
<i>WIC enrollment</i>	15 (34.9%)	20 (46.5%)	.38

Unless otherwise noted, quantities in cells denote frequency count and overall and overall or group percentage

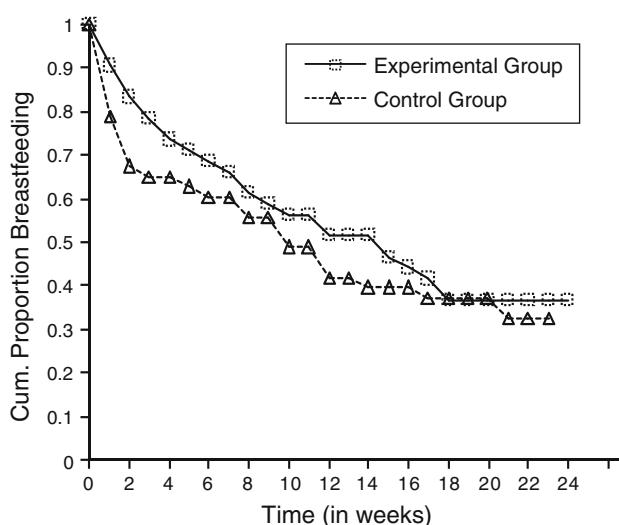
predominantly white (96.5%) which paralleled the ethnicity of the region.

#### Results on the Impact of the Intervention

At 6 months a comparable number of subjects in both groups were still breastfeeding, 37% in the experimental group and 33% in the control group, respectively (Breastfeeding duration curves depicted in Fig. 1). Table 2 depicts the breastfeeding percentages for the two groups at 3, 6, 12, 18, and 24 weeks. Statistical analysis demonstrated no significant differences in percentages of women continuing any breastfeeding at any of the time periods. The median duration of breastfeeding in the experimental group was 13.75 weeks and for the control group was 12.12 weeks.

Further analysis of the data was completed to evaluate the degree of breastfeeding in the two groups at the 6 month time period. The major categories used for this comparison were full, partial, or token breastfeeding as defined by Labbok and Krasovec [16]. A larger proportion of subjects in the experimental group reported full breastfeeding at 6 months as compared with subjects in the control group. Ten of the fourteen women in the experimental group reported full breastfeeding at 6 months, whereas, only three of the thirteen women in the control group reported full breastfeeding,  $\chi^2(1, n = 86) = 39.12, P = 0.000$ . All women ( $n = 10, 100\%$ ) from the experimental group reporting full breastfeeding at 6 months had completed the intervention as per protocol.

There were 10 subjects (23.2%) in the experimental group who did not complete the self-monitoring intervention as outlined in the protocol (3 or more weeks). Subjects



**Fig. 1** Breastfeeding duration curves for subjects in the experimental group and the control group [ $\chi^2_{\text{logrank}}(1, n = 84) = .5, P = .2387$ ]

**Table 2** Breastfeeding percentages for both groups

Weeks postpartum	Experimental group (n = 41)	Control group (n = 43)
3 weeks	32 (78%)	28 (65%)
6 weeks	30 (73%)	26 (60%)
12 weeks	23 (56%)	18 (43%)
18 weeks	17 (41%)	16 (37%)
24 weeks	15 (37%)	14 (33%)

in the experimental group who did not complete the self-monitoring intervention were more likely to be single ( $P = 0.007$ ), tended to be younger ( $P = 0.06$ ), have less income ( $P = 0.06$ ), have less education ( $P = 0.01$ ), and were more likely to be enrolled in WIC ( $P = 0.07$ ) than those completing the logs.

#### Additional Results

Average total feedings and total length of feedings were compiled from the daily breastfeeding logs in the experimental group and compared using Cox proportional hazards regression. Two of the variables were significant predictors of breastfeeding duration. Average number of feedings at 1 week was not correlated with breastfeeding duration ( $P = 0.065$ ), whereas average number of feedings at 3 weeks ( $P = 0.003$ ), and average feeding length at 1 week ( $P = 0.029$ ) were significant predictors of breastfeeding duration at 6 months. Thus, mothers who breastfed for more than 3 weeks of age or had a longer feeding length at 1 week of age tended to breastfeed longer.

#### Limitations of the Study

This study did have limitations related to the sample and methodology that should be taken into account when drawing any conclusions from the results. The first limitation is the homogeneity of the sample in regard to race which is not representative of the general population and thus limits generalizability. The sample selection was from a single site in one geographic area, the racial percentages in the sample paralleled those of the local population but not of the general population. In regard to the research design, the experimental group received weekly phone calls that were intended to remind participants to return their daily feeding logs, however, the calls did provide additional interaction to mothers in the experimental group and may have influenced the findings. In addition, the study examined the feeding log and breastfeeding outcomes, however, the study did not specifically measure breastfeeding efficacy. To address these limitations, further research should include multi-sites with a more diverse

sample, refine the intervention protocol, and incorporate a measurement of breastfeeding self-efficacy.

## Discussion

The findings from this study did not support the primary hypothesis that women who completed the intervention would breastfeed longer, however, more women who completed the intervention were exclusively breastfeeding at 6 months. Practitioners realize that the length of time that a woman breastfeeds is influenced by a multitude of intrinsic and extrinsic factors. There is extensive evidence that demonstrates the impact of non-modifiable factors such as maternal age, parity, race/ethnicity, and economic status. [3, 17–21] Consistent with the literature, findings from in this study support the evidence that those mothers who are younger or who are enrolled in the WIC program breastfeed significantly shorter. Even with the tremendous efforts made by the staff in WIC offices, this population is at high risk of early weaning, thus there needs to be continued practice and research focus to identify the most effective strategies. The findings from the study suggest that the breastfeeding log may be a valuable tool for health-care providers who work with breastfeeding mothers, but its acceptability may be impacted by socio-demographic characteristics of mothers enrolled in WIC. Low-income, single mothers who are less certain and indecisive about breastfeeding may benefit from external resources that offer peer education and support rather than a self-monitoring strategy used in this study [22].

The breastfeeding log intervention, guided by social cognitive learning theory, received many positive accolades in the anecdotal responses of the participants and is a more receptive strategy in the breastfeeding mother who is older, higher-educated, and more strongly motivated to succeed. Subjects in the experimental group did not breastfeed longer than subjects in the control group, however, a significant proportion of the subjects in the experimental group were exclusively breastfeeding at 6 months. Limited research has been done that examines the effectiveness of a breastfeeding log. One study explored the effect of a breastfeeding journal introduced at 36 weeks gestation on breastfeeding duration and self-efficacy at 12 weeks postpartum [23]. Findings from Hauck, Hall & Jones (2007) were consistent with the findings in this study in that there was not a significant difference in breastfeeding rates when using a breastfeeding journal or log.

Consistent with the literature, the most common reasons cited for early weaning by mothers in both groups included: baby was not satisfied ( $n = 38$ , 69%) and low milk supply ( $n = 31$ , 56%). Variables that demonstrated a positive correlation with breastfeeding duration were the

number and length of breastfeeding sessions at 1 week following delivery. The timing of the initial breastfeeding session, delivery mode, timing of the return to work, or perceived social support were not significant predictors of breastfeeding duration.

Some evidence exists that intrinsic factors related to maternal attitudes, self confidence and self-efficacy demonstrate a positive relationship to the length of breastfeeding [24–29]. Further research is necessary across diverse groups to explore these variables and the impact that interventions may have on breastfeeding outcomes and perceived self-efficacy.

## References

- Li, R., Odgen, C., Ballew, C., Gillespie, C., & Grummer-Strawn, L. (2002). Prevalence of exclusive breastfeeding among US infants: The third national health and nutrition examination survey (Phase II, 1991–1994). *American Journal of Public Health*, 92, 1107–1110.
- Li, R., Darling, N., Maurice, E., Barker, L., & Grummer-Strawn, L. (2005). Breastfeeding rates in the United States by characteristics of the child, mother, or family: The 2002 national immunization survey. *Pediatrics*, 115, e31–e37.
- Breastfeeding among U.S. children born 1999–2006*. CDC National Immunization Survey. Center for Disease Control. 1/10/2010. <http://www.cdc.gov/breastfeeding/data/NIS%5Fdata/>.
- US Department of Health and Human Services. (2000). *Healthy people 2010: national health promotion and disease prevention objectives* (p. 46). Washington, DC: US Government Printing Office.
- Forster, D., McLachlan, H., Lumley, J., Beanland, C., Waldenström, U., & Amir, L. (2004). Two mid-pregnancy interventions to increase the initiation and duration of breastfeeding: A randomized controlled trial. *Birth*, 31, 176–182.
- Gill, S.I., Reifsneider, E., & Lucke, J. F. (2007). Effects of support on the initiation and duration of breastfeeding. *Western Journal of Nursing Research*, 29, 708–723.
- Murray, E., Ricketts, S., & Dellaport, J. (2007). Hospital practices that increase breastfeeding duration: Results from a population-based study. *Birth*, 34, 202–211.
- Noel-Weiss, J., Rupp, A., Cragg, B., Bassett, V., & Woodend, A. (2006). Randomized controlled trial to determine effect of prenatal breastfeeding workshop on maternal breastfeeding self-efficacy and breastfeeding duration. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, 35, 616–624.
- Porteous, R., Kaufman, K., & Rush, J. (2000). The effect of individualized professional support on duration of breastfeeding: A randomized controlled trial. *Journal of Human Lactation*, 16, 303–308.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84, 191–215.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.
- Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes*, 50, 248–287.
- Pollard, D. (1999). The effect of self-regulation on breastfeeding duration in primiparous mothers. *Dissertational Abstracts International*, 59(9B), 4731.

14. Hughes, R. (1984). The development of an instrument to measure perceived emotional, instrumental, and informational support in breastfeeding mothers. *Issues in Comprehensive Pediatric Nursing*, 7, 357–362.
15. Rentschler, D. (1991). Correlates of successful breastfeeding. *Image: Journal of Nursing Scholarship*, 23, 151–154.
16. Labbok, M., & Krasovec, K. (1990). Toward consistency in breastfeeding definitions. *Studies in Family Planning*, 21, 227.
17. Scott, J., Binns, C., Oddy, W., & Graham, K. (2006). Predictors of breastfeeding duration: Evidence from a cohort study. *Pediatrics*, 117, e646–e655.
18. Gossler, S. M. (2007). *The effect of income level on the relationship between the personal support matrix and sustained breastfeeding*. Doctoral Dissertation, Virginia Commonwealth University.
19. Forste, R., & Hoffman, P. (2008). Are US mothers meeting the Healthy People 2010 breastfeeding targets for initiation, duration, and exclusivity? The 2003 and 2004 National Immunization Surveys. *Journal of Human Lactation*, 24, 278–287.
20. Grummer-Strawn, L., Scanlon, K. S., Darling, N., & Conrey, E. J. (2006). Racial and socioeconomic disparities in breastfeeding—United States, 2004. *Morbidity and Mortality Weekly Report*, 55, 335–339.
21. Ryan, A. S., & Zhou, W. (2006). Lower breastfeeding rates persist among the special supplemental nutrition program for women, infants, and children participants, 1978–2003. *Pediatrics*, 117, 1136–1146.
22. Bolton, T. A., Chow, T., Benton, P. A., Olson, B. H. (2008). Characteristics associated with longer breastfeeding duration: An analysis of a peer counseling support program. *Journal of Human Lactation*, 0: 0890334408325985v1.
23. Hauck, Y., Hall, W., & Jones, C. (2007). Prevalence, self-efficacy and perceptions of conflicting advice and self-management: Effects of a breastfeeding journal. *Journal of Advanced Nursing*, 57, 306–317.
24. Blyth, R., Creedy, D., Dennis, C., Moyle, W., Pratt, J., & De Vries, S. (2002). Effect of maternal confidence on breastfeeding duration: An application of breastfeeding self-efficacy theory. *Birth*, 29, 278–284.
25. Cernadas, J., Noceda, G., Barrera, L., Martinez, A., & Garsd, A. (2003). Maternal and perinatal factors influencing the duration of exclusive breastfeeding during the first 6 months of life. *Journal of human lactation*, 19, 136–144.
26. Chezem, J., Friesen, C., & Boettcher, J. (2003). Breastfeeding knowledge, breastfeeding confidence, and infant feeding plans: Effects on actual feeding practices. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, 32, 40–47.
27. O'Brien, M., Buikstra, E., & Hegney, D. (2008). The influence of psychological factors on breastfeeding duration. *Journal of Advanced Nursing*, 63, 397–408.
28. Taveras, E., Capra, A., Braveman, P., Jensvold, N., Escobar, G., & Lieu, T. (2003). Clinician support and psychosocial risk factors associated with breastfeeding discontinuation. *Pediatrics*, 112, 108–115.
29. Wilhelm, S. L., Rodehorts, T. K., Stepans, M. B., Hertzog, M., & Berens, C. (2008). Influence of intention and self-efficacy levels of duration of breastfeeding for Midwest rural mothers. *Applied Nursing Research*, 21, 123–130.