Interventions for Grandmothers: Comparative Effectiveness of Resourcefulness Training, HRV Biofeedback, and Journaling

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In the United States, more than one million grandmothers are raising their grandchildren, and this can be stressful, produce depressive symptoms, and adversely affect their quality of life. The pilot trial of 60 grandmothers reported here examined the effects of a cognitive behavioral intervention (resourcefulness training), biofeedback control training (focused on heart rate variability), and journaling on measures of perceived stress, depressive symptoms, and quality of life. Comparative analysis revealed a decrease in stress with all three conditions; a decrease in depressive symptoms in the resourcefulness training group; and improved quality of life in the resourcefulness training and biofeedback groups.

In the United States, grandparents with grandchildren under the age of 18 years living with them number seven million, and more than one third provide direct care to meet the children’s personal needs (U.S. Census Bureau, 2012). According to the 2012 American Community Survey, approximately 1.7 million grandmothers are responsible for the basic needs of their grandchildren, and about 40% of these grandmothers are doing so without the help of a spouse (U.S. Census Bureau, 2012). Thus, grandmothers functioning in the role of primary caregiver outnumber grandfathers by a ratio of nearly 2:1 (Kreider & Ellis, 2011; U.S Census Bureau, 2012). Numerous studies have shown that grandmothers who raise grandchildren are at risk for overwhelming stress, depressive symptoms, and poorer quality of life (Musil et al., 2011; Musil, Warner, Zauszniewski, Wykle, & Standing, 2009; Zauszniewski, Musil, Burant, & Au, 2014). Yet interventions for grandmothers raising grandchildren have not been aimed at reducing stress or depressive symptoms or enhancing the grandmothers’ quality of life. Rather, interventions have focused primarily on educational programs related to child behavior/development, parenting skills training, and support groups (e.g., Brown et al., 2000; Collins, 2011; Cox, 2002; Kelley, Whitley, & Campos, 2010; Kelley, Whitley, & Sipe, 2007).

It is vitally important for a grandmother who is raising her grandchild(ren) to stay healthy so that she can continue in that role. Otherwise, the child(ren), who may have no other place to go, may be forced to enter institutions or foster care. This would be an unfortunate consequence for all concerned, including the grandmother, the child(ren)’s parents, the grandchild(ren), and society at large. Therefore, promoting the health, particularly the mental health, of grandmothers raising grandchildren is an important goal and interventions to attain that goal need to be identified.

Meeting Grandmothers’ Mental Health Needs

Recent research has begun to examine the use of cognitive-behavioral interventions such as resourcefulness training for family caregivers (e.g., Rossuwrm, Larrabee, & Zhang, 2002), including grandmothers raising grandchildren. Resourcefulness training is a cognitive-behavioral intervention that consists of teaching personal (self-help) and social (help-seeking) skills and discussion regarding the use of those skills during a single 40-minute session followed by reinforcement and practice of those skills for next four weeks.

Studies have demonstrated grandmothers’ need for resourcefulness training (Zauszniewski, Au, & Musil, 2012), as well as its feasibility, fidelity (i.e. assurance of intervention delivery according to the defined protocol), and substantial effect sizes on measures of stress, depressive symptoms, and quality of life (Zauszniewski, Musil, & Au, 2013; Zauszniewski, Musil, Au, Burant, & Standing, 2014; Zauszniewski, Musil, Burant, & Au, 2014). However, the effectiveness of resourcefulness training has not been
compared with other interventions that may be equally beneficial to grandmothers, such as biofeedback.

Only one pilot study has examined the effects of heart rate variability (HRV) biofeedback on grandmothers’ stress, emotions, and cognitions (Zauszniewski, Au, & Musil, 2013). However, a randomized controlled trial of physicians using HRV biofeedback reported significant declines in their stress scores over time (Lemaire, Wallace, Lewin, de Grood, & Schaefer, 2011). Both stress and emotions have been linked with HRV, the naturally occurring beat-to-beat changes in heart rate that reflect the interaction between the sympathetic and parasympathetic nervous systems (Prinsloo et al., 2011; Siepmann, Aykac, Unterdorfer, Petrowski, & Mueck-Weymann, 2008). Thus, HRV may reflect salutary adjustments to changing internal and external stimuli/environments. With chronic stress or depression, there is a decrease in HRV (Karavidas, 2005; Nolan et al., 2005). However, with HRV biofeedback an individual can be trained to increase HRV to facilitate autonomic regulation. Training in paced breathing is a primary tool in the HRV biofeedback training (Gevirtz, 2011). As a result of the synchronization of the respiratory and cardiac systems, stress and depressive symptoms should be reduced (Hallman, Olsson, von Scheele, Melin, & Lysov, 2011; Nolan et al., 2005). Thus, biofeedback training may be an effective alternative to cognitive-behavioral interventions such as resourcefulness training for grandmothers raising grandchildren. To determine their comparative effectiveness, this analysis examined the effects of resourcefulness training, biofeedback training, and a comparison condition, journaling, in grandmothers raising grandchildren.

Methods

Design and Sample

Data for this analysis were obtained from two studies of grandmothers raising grandchildren. The first study examined the necessity, feasibility, fidelity, and effectiveness of resourcefulness training in comparison to methods of expressive disclosure (Zauszniewski et al., 2012; Zauszniewski, Musil, & Au, 2013; Zauszniewski, Musil, Au, Burant, & Standing, 2014; Zauszniewski, Musil, Burant, & Au, 2014). The second study focused on the effects of biofeedback training in grandmothers (Zauszniewski, Au, & Musil, 2013). Random assignment to interventions was done in the first study, but not in the second study. For the analysis reported here, data from the two studies were merged.

Following approval by the University Institutional Review Board, in both studies grandmothers were recruited from the community in Northeast Ohio through posted advertisements in health centers, churches, and local businesses (e.g., grocery stores, department stores, restaurants, coffee houses, bookstores, libraries, etc.) or flyers distributed to support groups for grandmothers raising grandchildren. Grandmothers had to have been raising grandchildren younger than 18 years of age in their household for at least six months.

Resourcefulness Training

In Study 1, the resourcefulness training intervention was provided for 20 grandmothers by a trained interventionist during a single 40-minute session. During the session, the eight personal and social resourcefulness skills were explained, and potential situations in which the grandmother might use each skill in daily activities and in her relationship with her grandchild were discussed. Also, a laminated 3 × 5 card listing the resourcefulness skills was given to each grandmother. The interventionist then explained the importance of daily reflection for mental practice and reinforcement of the resourcefulness skills through the use of a written journal. Writing 3–5 pages per day was recommended. Before journaling each day, grandmothers were asked to review the laminated card listing the eight resourcefulness skills, and then to describe in the journal their use of each of the skills, for the next 4 weeks. Reminder phone calls were made weekly by the interventionist. Data were collected in four face-to-face interviews: one week before (T1) and one week after (T2) the resourcefulness training intervention; T3 and T4 data collections followed at 6-week intervals afterwards.

Biofeedback

In Study 2, a trained interventionist taught 20 grandmothers the breathing protocol for using the StressEraser® as described in the owner’s manual by Helicor, Inc. (2007). Each grandmother was taught to (a) insert her left index finger into the sensor clip on the top of the device that senses the pulse; (b) take a slow, deep breath while watching the waves that appeared on the device’s screen; (c) exhale slowly while counting from one to five when a new triangle appeared above the wave on the screen; and (d) begin to take another slow, deep breath as the next wave began to ascend. The grandmothers practiced with the device while the interventionist was present until they felt confident in using it. Grandmothers were each given a StressEraser® to use for 4 weeks. They were also given a journal in which they were to record the daily points for each biofeedback
session shown on the device. The points reflected how well the grandmothers coordinated their breathing with their heart rate. Reminder phone calls were made weekly by the interventionist. Data were collected the week before (T1) and the week after (T2) the biofeedback intervention; the StressEraser® was retrieved before the T2 data collection; T3 and T4 data collections took place at 6-week intervals afterwards.

**Journaling**

Because journaling was a part of the biofeedback and resourcefulness training interventions and it is known that journaling helps to reduce stress and improve health and well-being (Ullrich & Lutgendorf, 2002; Smyth & Helm, 2003; Pantchenko, Lawson, & Joyce, 2003), it was essential to measure its effects without biofeedback or resourcefulness training. Therefore, we used data from Study 1 in which grandmothers were randomly assigned to complete a daily written journal. Instructions for completing the journal were provided by a trained interventionist. The pages recommended for journaling were the same as for the other two treatment conditions. However, the grandmothers in this condition were asked to write about daily events and thoughts and feelings about their day with their grandchild for 4 weeks. Consistent with the other treatment conditions, weekly reminder phone calls were made to these grandmothers by an interventionist. Data collection took place before (T1) and after (T2) the 4 weeks of journaling; T3 and T4 data collections followed at 6-week intervals afterwards.

**Variables and Measures**

Data were collected during face-to-face interviews at baseline (pre-intervention) and then at 2, 8, and 14 weeks postintervention to evaluate lagged and extended effects. At baseline, grandmothers completed a demographic questionnaire on their age, race/ethnicity, marital status, education, annual income, and number of health problems, selected from a list of 10 common health problems found in women: cancer, diabetes, HIV/AIDS, heart disease, hypertension, kidney disorders, mental disorders, osteoporosis, respiratory disease, and stroke (U.S. Department of Health & Human Services, Health Resources & Services Administration, Maternal & Child Health Bureau, 2003). Grandmothers also completed measures of perceived stress, depressive symptoms, and quality of life.

Perceived stress was measured by the 14-item Perceived Stress Scale (PSS; Cohen, Kamarck, & Merremstein, 1983) on which items are rated on a 5-point Likert scale from “never” to “very often.” Seven items are phrased in the opposite direction and are reverse scored. Higher scores indicate greater perceived stress. The PSS has acceptable internal consistency with Cronbach’s alphas ranging from .84 to .87 (Cohen et al., 1983; Cohen & Williamson, 1988). In this sample, Cronbach’s α was somewhat lower (.76) yet acceptable. Correlations with theoretically related constructs, including self-assessed health, health service use, health behaviors, help-seeking behavior, and salivary cortisol support the scale’s construct validity (Schwartz & Dunphy, 2003; Wright et al., 2004).

Depressive symptoms were measured by the 20-item Center for Epidemiological Studies–Depression Scale (CES-D; Radloff, 1977). Items on this scale are rated on a 5-point scale from “rarely” to “always,” and total scores may range from 0 to 80. Four items are phrased in a positive direction and are reverse coded. Higher scores are indicative of more depressive symptoms (Radloff, 1977). The CES-D scale has shown acceptable internal consistency in studies of grandmothers, with Cronbach’s α ranging from .88 to .91 (Blustein, Chan, & Guainais, 2004; Caputo, 2001; Ruiz, Zhu, & Crowther, 2003). In this sample, Cronbach’s α was .88. The CES-D has widely reported validity and has been standardized among populations of various ages and races/ethnicities (Radloff, 1977).

Quality of life was measured by the Short Form-12 (SF-12; Ware, Kosinski, & Keller, 1996). Although the SF-12 contains two subscales—physical and mental health—the composite score was used in this study. In addition, a simplified scoring method in which the total score is the sum of the scores on the 12 items was used (Resnick & Parker, 2001). Four negatively phrased items are reverse scored, and higher scores indicate better quality of life. Using the simplified scoring method, the SF-12 was found to be internally consistent in two studies, with Cronbach’s α ranging from .72 to .87 (Resnick & Parker, 2001). In this study, Cronbach’s α was .88. Test-retest reliability has also been reported, with correlations ranging between .73 and .86 after 2–4 weeks, indicating stability of the measure over time (Resnick & Parker, 2001). Construct validity has been supported by confirmatory factor analysis, the use of contrasted groups, and hypothesis testing (Resnick & Parker, 2001).

**Results**

Ages of the grandmothers ranged from 40 to 82 years with an average of 57 years. The grandmothers reported having an average of one health problem (range 0 to 4) among the 10 listed by the U.S. Department of Health and Human Services (2003). One third of the grandmothers were married while the other two thirds were single, divorced,
separated, or widowed. More than half (54%) were African American; 38% were Caucasian; and 8% were Asian American, Hispanic/Latino, or American Indian. Over one third (34%) reported having less than a high school education; 51% had completed high school and/or some college; and 15% had a college degree. Almost half reported an annual income less than $10,000; 38% reported incomes between $10,000 and $50,000; and 13% reported an income exceeding $50,000.

To examine the effects of resourcefulness training, HRV biofeedback, and journaling on stress, depressive symptoms, and quality of life over time in grandmothers raising grandchildren, we employed repeated measures analysis of variance and posthoc examination and plotting of mean scores for each of the three study outcomes. Thus, we were able to determine effects within and between the three treatment conditions, the presence of interactive effects (time by group), and descriptive trends on mean scores of stress, depressive symptoms, and quality of life. Mean scores on perceived stress, depressive symptoms, and quality of life over time by treatment condition are displayed in Table 1.

Effects on Perceived Stress

Mean scores on perceived stress varied significantly over the four time points, $F(3, 171) = 17.45, p < .001$. The test of within-subjects contrasts indicated the presence of a significant downward linear trend across the four measurement points, $F(1, 57) = 37.16, p < .001$, and no interaction between group and time. The test of between-subjects effects was not significant, $F(2, 57) = 0.81, p > .05$. Posthoc analysis revealed that grandmothers in all three treatment conditions reported less perceived stress over time, and the effects of the three conditions did not differ substantially. Mean scores on perceived stress for the three treatment conditions over the four measurement points are plotted in Figure 1.

As shown in Figure 1, the greatest drop from baseline to T2 (2 weeks postintervention) was observed for the HRV biofeedback. However, there was also a substantial drop for

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<th>Table 1. Mean scores on perceived stress, depressive symptoms, and quality of life over time by treatment condition</th>
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Note. $N = 20$ grandmothers per treatment condition.
the resourcefulness training condition and a smaller drop for the journaling condition. Interestingly, mean scores on stress in the biofeedback group appear to plateau after the grandmothers no longer had access to the device (i.e., T3). However, there was a continued downward trend in perceived stress in the resourcefulness training group. The journaling group had higher scores on perceived stress over time than the other two treatment conditions; however, the group’s mean score was 5 points lower than the baseline (T1) score and was the same as the biofeedback group’s T4 mean score.

Effects on Depressive Symptoms
Mean scores on depressive symptoms also varied significantly over the four time points, $F(3, 171) = 2.998, p = .032$. The test of within-subjects contrasts indicated a significant downward linear trend across the four measurement points, $F(1, 57) = 8.60, p < .005$, and no interaction between group and time. The test of between-subjects effects was not significant, $F(2, 57) = 0.86, p > .05$. Posthoc analysis revealed that grandmothers in all three treatment conditions had lower depressive symptom scores over time and the treatment effects did not differ substantially. Mean scores on depressive symptoms for the three treatment conditions over the four measurement points are plotted in Figure 2.

Figure 2 shows drops from baseline to T2 (2 weeks postintervention) for both the HRV biofeedback and the resourcefulness training groups, while the journaling group showed a slight increase at T2. Mean scores on depressive symptoms showed a steady downward trend over time in the HRV biofeedback group, while the RT group showed a large immediate decline of 3.5 points, followed by a more tapered slope. The journaling condition had higher scores on depressive symptoms over time than the other two treatment conditions; however, the group’s mean score on depressive symptoms was still lower than at baseline.

Effects on Quality of Life
Mean scores on quality of life varied significantly over the four time points, $F_{\text{Greenhouse-Geisser}}(df = 1.84, 104.87) = 3.66, p = .03$, with an upward linear trend and a significant group $\times$ time interaction effect, $F_{\text{Greenhouse-Geisser}}(df = 3.68, 104.87) = 2.53, p = .05$. The test of within-subjects contrasts showed an upward trend across the four measurement points, $F(1, 57) = 4.93, p = .03$, and a significant interaction between group and time, $F(2, 57) = 3.93, p = .04$. However, the test of between-subjects effects was not significant, $F(2, 57) = 1.97, p > .05$. Posthoc analysis of pairwise comparisons showed that the RT and journaling group’s scores differed by an average of 4.4 points ($p = .052$). Mean scores on quality of life for the three treatment conditions over the four measurement points are plotted in Figure 3.

As Figure 3 indicates, quality of life did not appear to change over time for the grandmothers in the journaling group. There was an initial increase in quality of life from baseline to T2 (2 weeks postintervention) for both the HRV biofeedback and the resourcefulness training conditions, with somewhat greater increases in the resourcefulness training group. However, mean scores on quality of life for the HRV biofeedback group and the resourcefulness training condition appeared to plateau after T2, with...
grandmothers in the resourcefulness condition still reporting somewhat higher quality of life than those in the HRV biofeedback condition.

Discussion

This is the first study to compare biofeedback and resourcefulness training with journaling in grandmothers raising grandchildren. All three interventions were found to reduce stress over time, and both resourcefulness training and HRV biofeedback enhanced quality of life; however, resourcefulness training appeared to be best for decreasing depressive symptoms. Thus, the strongest effects over time were seen for resourcefulness training.

The findings in regard to resourcefulness training are consistent with resourcefulness theory (Zauszniewski, 2012) and with studies of cognitive-behavioral interventions similar to resourcefulness training conducted with dementia caregivers (Kajiyama et al., 2013), nurses (Moeini, Hazavehei, Hosseini, Aghamolaei, & Moghimbeigi, 2011), and faculty physicians (Sood, Prasad, Schroeder, & Varkey, 2011), all of whom found significant downward trends in perceived stress following the intervention. However, these studies did not assess stress over time. In a longitudinal study of women with breast cancer, those who received cognitive-behavioral stress experienced an initial decrease in stress, but the effect was not sustained (Groarke, Curtis, & Kerin, 2013). Their finding differs from our findings; the difference might be explained by the reflection/practice component that is an essential part of resourcefulness training but is not emphasized in other cognitive-behavioral stress management interventions.

Our findings with regard to the biofeedback training are consistent with those of Lemairre and colleagues (2011) who reported that among hospital-based physicians, those who received HRV biofeedback training showed significantly lower stress, which persisted over time. However, while we also found a consistent downward trend in stress for those who learned HRV biofeedback, in their study, participants were allowed to keep the biofeedback device for the duration of the study, while in ours, the device was retrieved after the 4-week intervention period and the stress level plateaued.

For depressive symptoms, the initial drop in scores was greatest (3.8 points) for grandmothers who received resourcefulness training. Those in the RT group dropped an additional point at T4, perhaps related to their continued use of the skills beyond the intervention period. This finding is consistent with other studies of resourcefulness training, which found a substantial drop in depressive symptom scores following intervention (Zauszniewski, Eggenschwiler, Preechawong, Roberts, & Morris, 2006) and consistent downward trends on measures of negative emotions and depressive cognitions (Zauszniewski, Bekhet, Lai, McDonald, & Musil, 2007).

There was initially a smaller, 1 point drop for those in the biofeedback condition, but after the intervention period (and biofeedback devices were retrieved), depressive symptom scores continued to drop steadily, with T4 scores equivalent to those in the RT group. The drop in depressive symptom scores was similar to that reported in a biofeedback study of persons with fibromyalgia (Hassett et al., 2007). Also, Karavidas and colleagues (2007) reported significant decreases in depressive symptom scores over time following biofeedback for patients with major depression. Although journaling did not appear to be effective initially, over time, depressive symptom scores decreased for those grandmothers. While it is possible that this effect was unrelated to the journaling and might have happened without intervention, others have reported a similar therapeutic effect of journaling one’s thoughts and emotions (Stice, Burton, Bearman, & Rohde, 2007).

In terms of quality of life, there was essentially no change in scores over time for grandmothers in the journaling condition, while there were steady upward trends showing improved quality of life scores in both the biofeedback (2.5 points) and resourcefulness training (6.5 points) conditions. The finding in regard to improved quality of life following resourcefulness training is consistent with the theory of resourcefulness and quality of life (Zauszniewski, 2012) and with a study of elders that showed that teaching resourcefulness skills resulted in better self-assessed health and functioning (Zauszniewski et al., 2006).

Studies that have examined quality of life as an outcome of HRV biofeedback training have yielded mixed results: One study of medically stable patients with a history of heart failure showed no change in quality of life following biofeedback (Swanson et al., 2009), but another study of persons with chronic obstructive pulmonary disease reported significantly better quality of life after biofeedback (Giardino, Chan, & Borson, 2004). Perhaps scores on quality of life have less to do with the biofeedback intervention than with the general health of participants. For example, the grandmothers in this analysis reported on average one health problem and therefore were undoubtedly healthier than those in the study of persons with a history of heart failure (Swanson et al., 2009). Future studies should control for the impact of health on quality of life by capturing participant health problems and their severity.
Study limitations include the modest sample size and convenience sampling. The study also did not determine whether the effects of the interventions on stress, depressive symptoms, or quality of life were associated with characteristics of the grandmothers, such as their age, race/ethnicity, or education, or with characteristics of the child(ren), including their age and gender, or with the length of time the grandmother was the caretaker. Also, those in the biofeedback condition were not randomly assigned, a design issue that should be rectified in future work. In part, because of the restricted geographic from which participants were drawn—Northeast Ohio—and the sample included primarily Caucasian and African American non-Hispanics, reducing the generalizability of the findings. Testing the interventions with other ethnic groups, including Hispanic/Latina, Asian, and Appalachian women would be helpful for understanding the impact of context and culture on intervention preferences and effectiveness.

Despite study limitations, the significant changes over time suggest the utility of all three methods for reducing stress, and to a lesser extent, depressive symptoms. However, while the findings suggest that resourcefulness training and HRV biofeedback are promising interventions in regard to decreasing stress and depressive symptoms and improving quality of life, larger clinical trials with grandmothers raising grandchildren and other family caregivers are needed to obtain more powerful evidence of the beneficial effects of these interventions.

In addition, the mechanism by which the interventions exert effects remain untested. Since both stress and depression include affective, cognitive, behavioral, and physiological components, which are thought to be interrelated, (Gonzalez-Prendes & Resko, 2012), we might speculate that resourcefulness training, a cognitive-behavioral intervention, first targets the cognitive component, which in turn influences the behavioral, affective, and physiological components. In contrast, one might speculate that biofeedback training, which involves teaching paced breathing to enhance HRV, first targets the physiological components of stress or depression, which in turn impact affective, cognitive, and behavioral components.

In conclusion, this study of resourcefulness training and biofeedback for grandmothers raising grandchildren indicates these interventions, taught in a single session and then performed independently by grandmothers, have beneficial effects in reducing their stress and depressive symptoms and enhancing their quality of life. The logical next step would be to extend the testing to a larger national sample with measures of contextual factors and underlying mechanisms, and exploration of the sequenc-

ing of the interventions to address affective, cognitive, behavioral, and physiological aspects of healthy functioning. Once established, such interventions can be used to promote optimal functioning not only among grandmothers but also among other family caregivers providing care on a daily basis.

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References


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