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## Dose Effects of Relaxation Practice on Immune Responses in Women Newly Diagnosed With Breast Cancer: An Exploratory Study

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Cancer diagnosis and treatment can cause significant psychological stress (Bleiker, Pouwer, van der Ploeg, Leer, & Adèr, 2000; Epping-Jordan et al., 1999; Yang, Brothers, & Andersen, 2008). Although most patients experience a gradual decline of stress over time, some continue to experience high levels of stress for years, even after the successful completion of cancer treatment (Bleiker et al., 2000). Others experience post-traumatic stress disorder precipitated by a cancer diagnosis (Kangas, Henry, & Bryant, 2002). In addition, in a study by Palmer, Kagee, Coyne, and DeMichele (2004), 41% of women with breast cancer reported significant fear, helplessness, or horror related to their experience with cancer.

Stress can lead to a variety of adverse health outcomes, including greater upper respiratory tract infections and periodontal diseases, accelerated aging, and increased cardiovascular diseases, in diverse populations (Cohen, 1995; Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002a, 2002b). The well-controlled studies of animal models of cancer also showed that stress decreased the efficacy of or resistance to chemotherapeutic agents (Kerr, Hundal, Silva, Emerman, & Weinberg, 2001; Su et al., 2005), and high stress was associated with low physical and psychological quality of life in women with breast cancer (Golden-Kreutz et al., 2005; Härtl et al., 2010; Luecken & Compas, 2002; Yang et al., 2008). In addition, women with metastatic or recurrent breast cancer who had experienced one or more highly stressful or traumatic events in their lives showed a significantly shorter disease-free interval (median = 31 months) compared with women who had not experienced such events (median = 62 months)

**Purpose/Objectives:** To determine the dose effects of relaxation practice on immune responses and describe the types of relaxation techniques preferred and the extent of relaxation practice over 10 months.

**Design:** Descriptive, prospective, repeated measures.

**Setting:** An interdisciplinary breast clinic at a university-affiliated comprehensive cancer center in the United States.

**Sample:** 49 women with newly diagnosed breast cancer and undergoing adjuvant therapy who participated in a stress management intervention.

**Methods:** Relaxation practice was assessed twice a month for 10 months with immune measurements (e.g., natural killer cell activity; lymphocyte proliferation; interferon [IFN]- $\gamma$ ; interleukin [IL]-2, -4, -6, and -10) at the beginning and end of 10-month practice.

**Main Research Variables:** Relaxation practice (representing the concepts of stress and adherence), relaxation technique, and immune response.

**Findings:** After adjusting for covariates, the extent of relaxation practice significantly contributed to the variance of natural killer cell activity, lymphocyte proliferation, IL-4, and IL-10 responses in a positive direction; the higher the relaxation practice, the higher the immune responses. In comparison, IFN- $\gamma$ , IL-2, and IL-6 responses were not affected. The deep-breathing method was most preferred by participants, followed by progressive relaxation and imagination or visualization. The mean weekly frequency of relaxation practice was 5.29 (SD = 3.35), and the mean duration of relaxation practice was 19.16 (SD = 10.81) minutes per session.

**Conclusions:** Persistent relaxation practice may have positive effects on multiple immune responses in a dose-dependent manner.

**Implications for Nursing:** Allowing the choice of preferred techniques and emphasizing the importance of long-term adherence, a relaxation program may need to be routinely offered to women under high stress.