

Integrating a Portable Biofeedback Device into Call Centre Environments to Reduce Employee Stress: Results from Two Pilot Studies

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SUMMARY. Due to the nature of the work, customer call centres are noted high-stress environments when compared to other subsets of the same business and to other industries. Two studies in two separate call centres were performed to assess the impact of a portable heart rate variability (HRV) biofeedback device on employee performance ratings and stress-related complaints. Results from the first study indicated a significant improvement in call scores (objective third-party call ratings about quality of service) in the intervention group compared to the control, whereas results from the second study

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These studies were conducted at Discovery Health Insurance and at ICAS (Independent Counseling and Advisory Services) in Cape Town and Johannesburg, South Africa. The devices were supported by Helicor, Inc., the makers of the StressEraser portable biofeedback device. The investigator is a reseller of the StressEraser device. The authors would like to acknowledge Frederick Muench for his involvement with the study and preparation of this manuscript.

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revealed a significant reduction in subjective stress-related complaints. Implications for employee health and performance are discussed.

KEYWORDS. Biofeedback, employee health, intervention, occupational stress, performance

INTRODUCTION

There is now ample evidence that work-related stress is a pervasive problem. A 2004 poll by the American Psychological Association found that 62% of respondents said that work has a significant impact on their stress level. The 2000 annual "Attitudes in the American Workplace VI" Gallup Poll sponsored by the Marlin Company found that 82% of workers feel stress on the job, with 35% reporting job stress harming their physical and emotional health. There have also been reports that occupational stress appears to be increasing. For example, the Occupational Health & Safety Act in the U.K. report (Occupation Safety & Health Service [OSH], 2003) found that workplace stress increased in the United Kingdom by 13% in 2002. This resulted in a reduction of job satisfaction by 64%, productivity dropped by 36%, and damage to health increased by 29%.

The impact of work-related stress can be seen on the organizational and individual level. From a public health perspective, occupational stress can have serious health consequences including sleep problems, headaches, pain, depression, anxiety, substance use, cardiovascular disease, depersonalization, decreased self-efficacy, and anger (cf. Gates, 2001; National Institute for Occupational Safety and Health [NIOSH], 1999; Schnall et al., 2000). Interestingly, work stress may affect the individual more than other types of stressors. The St. Paul Fire and Marine Insurance Company (1992) reported a stronger relationship between work stressors and health concerns than personal stressors such as family problems.

Although the figures vary widely, conservative estimates suggest that workplace stress and its consequences cost companies tens of billions of dollars each year. These costs are typically a result of increased health care needs from stress-related disorders and lost productivity due to absenteeism and impaired performance. In the

2004 poll by the American Psychological Association, 25% of workers has called in sick or taken a “mental health day” as a result of stress from work. The Integra Realty Resources study (2001) reported that 1 in 10 had taken a sick day due to workplace stress. One in five had quit a job because of workplace stress. High stress levels are also associated with decreased cognitive and behavioral performance (Staal, 2004), and job stress is no exception (Beehr, 1995; Shanafelt et al., 2002; Van Dyne et al., 2001).

Due to the nature of the work, customer call centres are noted high-stress environments with high staff turnover compared to other parts of the same business and to other industries (Australian Communications Association [ACA], 1998; Hannif & Lamm, 2005). Hester (2003) conducted a comprehensive survey of the call centre industry in association with the Australian Services Union (ASU). Results indicated that call centre workplace cultures are dominated by excessive monitoring and stress. The survey assessed workers in 658 call centres. Over half of agents reported high stress levels. Nearly, one third took 10 or more days off each year due to work-related stress. Eighty-seven percent said stress was a significant workplace issue, and 40% said they suffered from work-related health problems such as headaches and eyestrain. There are several reasons that call centre employees are at increased risk for stress-related problems and emotional exhaustion. These include the pressure to handle calls quickly while following scripts and expressing emotion to create a positive customer experience, dealing with rejection, abuse and harassment by customers with little time to recuperate between calls, being monitored and penalized for lost calls by management, and unrealistic productivity targets (ACA, 1998; Deery & Kinnie, 2002; Hannif & Lamm, 2005). In particular employees in the health sector may experience significantly more burnout than other professions (cf. Jain, Lall, McLaughlin, & Johnson, 1996; Shapiro, Austin, Bishop, & Cordova, 2005) and thus working in a health-care-related call centre may exacerbate stress-related problems.

Worksite stress management programs have proven to be effective in reducing health problems such as hypertension and depression, decreasing absenteeism and accidents, and increasing job performance and job satisfaction (cf. Shapiro et al., 2005; Van der Hek & Plomp, 1997). Workplace stress programs typically target environmental stressors, teach coping skills, and teach employees relaxation skills to reduce stress. Relaxation training can be particularly useful

in reducing autonomic arousal associated with the stress response. This is manifested by increased sympathetic (fight-or-flight) activity and reduced parasympathetic (rest-and-renew) activity. Unlike a top-down model that focuses on environmental engineering by reducing the likelihood of stressors occurring, relaxation programs attempt to reduce an individual's reactivity to stressors and help him or her recuperate from an overstimulated stress response.

There are several barriers to teaching relaxation effectively, such as not knowing whether one is engaging the relaxation system in the body, no objective measurement of compliance, and limited time to practice techniques that generally require 20-minute segments. Relaxation programs in call centres may be particularly difficult to implement given the industry's emphasis on speed and quality and the limited opportunity to take time out. A review of the literature indicates that there are no empirical call centre interventions that agents can employ when under attack from stress. Because the nature of call centre employment is stressful, interventions that target the stress response directly appear particularly important.

Two studies were performed in two separate call centres to assess the impact of a portable heart rate variability (HRV) biofeedback device, called the StressEraser, on performance and stress-related complaints. HRV is a window into the autonomic nervous system. Studies designed to induce stress reactions have found that the introduction of a stressor will reduce HRV (Berntson & Cacioppo, 1994; Delaney & Brodie, 2000). There is an emerging literature citing the efficacy of computerized HRV biofeedback to treat a variety of stress related disorders (Lehrer, 2007; Nolan et al., 2005). The device guides users to maximize their HRV by finding their unique breathing pattern via their heart rate wave so that respiration and heart rate (HR) covary in a synchronous phase relationship. This usually involves breathing somewhere between 4.5 and 7.5 breaths per minute but varies from person to person. Each time users meet a certain threshold, they receive points. Points are awarded for smooth waves when HRV is increased but not awarded when disruptions in the wave occur through improper breathing or excessive limbic activity. Breathing at this frequency and maintaining a cognitive focus has been shown to shift the body into a balanced autonomic state and increase HRV. Results from pilot study with the device used as an adjunct to psychotherapy (Reiner, *in press*), revealed that over a 3 week period it significantly reduced anxiety and anger and improved sleep

parameters. Moreover, there was a dose response in that increased use yielded greater symptom improvement.

STUDY 1

Method

Twenty participants (12 female; 8 male) in a call centre of a health maintenance organization (HMO) in Cape Town, South Africa, were given a StressEraser biofeedback device for 45 days and compared to other 318 agents at a different site on improvement/change in call scores (interaction and helpfulness with customers) from the previous 2 months. The 20 agents volunteered to participate in the study. The control comparison was a call centre of the same HMO in another city, so as not to contaminate results.

All participants attended a 30-minute training which involved discussing: (1) the body's reaction to stress; (2) the relationship between deep, rhythmic, paced breathing, and cognitive focus on relaxation; and (3) introducing the StressEraser biofeedback device. Following a demonstration, users were instructed to experiment with different exhale counts until they could find the slowed respiration pattern that awarded them with continuous points. Users were also given an overview of the general device specifications (on-off button, setting the date and time, backlighting, sound, finger sensor, etc.). Participants were instructed to achieve 100 points a day (required on weekdays only) which takes about 20 minutes but could be used in 5-minute intervals. All agents were able to contact the trainer with questions about the device once the study had begun. The device houses a history feature that stores each session so adherence could be tracked objectively during the study.

The primary outcome measure was call score ratings, which are ratings by a third party who calls back customers to ask about their experience and service with the agent during a call. Scores range from 0 (*worst service*) to 10 (*best service*) and are generally static with a mean about 8.5. Raters were unaware that the study was taking place, and the agents did not know call scores were being evaluated. Agents were informed that the device was being tested to see if it helped them relax. In addition to call scores, qualitative information was gathered from the participants at the conclusion of the study.

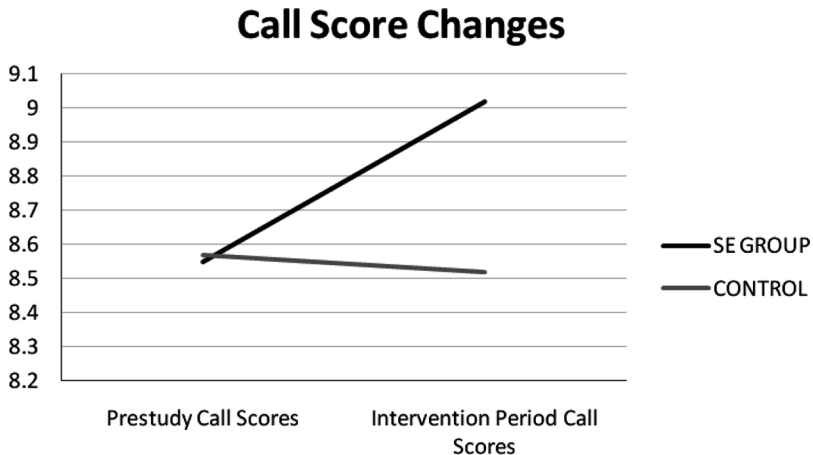
Data Analysis

Univariate ANOVA was used to assess change by including the end-of-treatment score as the dependent variable, baseline score as a covariate, and group assignment as the fixed factor. Adherence was monitored via an objective history feature on the device that includes the date, how long the device was used, and how many points were achieved in each session. Groups were split based on the mean adherence level and an additional univariate ANOVA was performed to examine the dose-response relationship.

Results

The mean points per day was 56.11 (22.46) and the mean number of days used was 23.29 (8.1). As shown in Figure 1, the study participants significantly improved their call scores as compared to the control call agents, $F(334) = 10.85$, $p < .01$. In general, there are not large increases in call scores during any time period, and as such the control group's performance remained nearly static over the 4-month period, 8.57 (.55) to 8.52 (.63). The pilot consultants' performance improved by from 8.55 (.81) to 9.02 (.54). Because there was significant variability in adherence, we examined whether those who adhered more closely to the protocol were more likely to

FIGURE 1. Call Score Improvement



improve call ratings. Results reveal that the top 50% had significantly higher call scores $F(18) = 8.79, p < .01$, than the bottom 50%. Adherence was measured using objective history data from the device.

STUDY 2

Method

Study 2 was performed in a call centre that specializes in external employee assistance and behavioral risk management for mental health and behavioral problems for their corporate clients' staff. All call centre employees were registered mental health practitioners. 23 agents volunteered for the study, and 19 completed pre-intervention assessments (15 women, 4 men). Sixteen completed post-treatment assessment. Additional objective data was collected on all 19 participants. Instructions for use and training were identical to Study 1.

Two questionnaires were given out at baseline and at the end of the study. One assessed the stress-related symptoms such as gastrointestinal (GI) problems, depression, burnout, etc., and the other examined environmental stressors such as a supportive work environment and resource management. The range the personal stressor scale was from 1 = *not at all/rarely* to 4 = *very often* and the range for the environmental stressor scale was from 1 = *very often* to 5 = *not at all/rarely*. Both measures were reliable (BL personal stressors $\alpha = .94$; EOT = .95; BL environmental stressors $\alpha = .69$; EOT = .88). Reductions on personal stressors scale indicate improvement, and increases on environmental stressors scale indicate improvement. We also examined the face-to-face referral rates and red flags. The face-to-face referral rates are an internal centre measurement of how often a clinical call agent needs to have a third party intervene and either assist the caller with a face-to-face visit or send for counseling or medical advice. The red flags are ways to indicate when the caller is in immediate danger and the agent needs to send an emergency service to the scene (i.e., paramedic).

Results

Participants averaged 80.1 ($SD = 44.2$) points per day and used the device for an average of 21 days over the course of the study. Overall, there was a significant decrease in personal stressors over the course

of the study, $F(16) = 6.06$, $p < .001$, but no significant change in environmental stressors, $F(15) = -1.16$, $p > .1$. Overall, the personal stressors were reduced from 2.58 (.55) to 1.87 (.61) whereas the environment stressors improved from 3.63 (.36) to 3.78 (.47). The largest effects on the personal stressors scale were found for reductions in burnout, $t(14) = 4.18$, $p < .001$, fatigue, $t(14) = 4.14$, $p < .001$, GI problems, $t(14) = 4.39$, $p < .001$, and headaches $t(14) = 5.08$, $p < .0001$. A small nonsignificant effect was found for a dose-response relationship $r(14) = .27$, $p < .1$ between points obtained and personal stressors but no dose-response relationship was found for environmental stressors $r(15) = .01$, $p > .1$. When adjusting for differences in call rates from the preintervention to during the intervention, there were no significant differences in the number of red flags or face to face referrals, but there was a trend ($p = .1$) for increased average time on calls which increased from 50.38 to 53.45 minutes and a small nonsignificant dose-response, $r = .33$, $p < .1$. Sick days were reduced from 10 in the month prior to the intervention to 7 during the intervention. Additionally, 16 of the 19 consultants enrolled in the study purchased devices after the study was complete.

QUALITATIVE FEEDBACK

Although these studies were designed to assess the impact of the relaxation on call scores and objective stress measures, many participants from both studies offered feedback on their experiences using the device. Some of the most interesting remarks that highlight reduced reactivity to stress and feeling rejuvenated are noted below. For example several participants noticed their colleagues and they were less reactive to stress: "I don't feel frustration brewing in me anymore," "I'm calmer and more relaxed and I find that it takes a lot less to phase or upset me nowadays," "It helps to control what my reaction is going to be like," "I realized it really calms me down...even after a heavy traffic." Additionally, participants reported feeling better overall: "I woke up this morning feeling thoroughly exhausted and after our 15-minute stress eraser session I actually felt a bit more rejuvenated," "I do not feel as drained in the evening when I leave work," "I feel that I am more productive at my work than ever before." Although the overall response was positive, several participants had other reactions to the device. Primarily,

some users felt that they did not have enough time or could not remember to use the device: “I find that it takes too much time and stresses me out to remember.” One participant reported that the device added nothing new to their current relaxation strategies: “I meditate daily and this is nothing different.”

DISCUSSION

When taken together, the preliminary results from both studies suggest the device may be an effective intervention strategy for employees in call centres to help combat the intense pressures of call centre environments. The nature of the intervention is itself a unique contribution to the field of occupational health because it requires only brief training to introduce the method, and then users have access to a tangible stress reduction method at their convenience, particularly because employees can use the device effectively at their desks. As noted, stress management programs can have powerful effects on employee health and performance. Traditional relaxation paradigms, though effective, have numerous barriers to proper implementation such as the need to provide ongoing classes for training, not providing objective feedback on the usefulness of the technique, a lack of objective compliance measurement for employers, and limited time to practice techniques that generally require 20-minute segments. Relaxation programs in call centres may be particularly difficult to implement given the industry emphasis on speed and quality and the limited opportunity to take time out. This device appears target some of these barriers while falling victim to the traditional issues associated with relaxation compliance (e.g., time management).

The increase in call scores from Study 1 suggests that there is a tangible difference in how call centre employees interact with clients when they engaged in the relaxation training. Because call raters were unaware of the study and participants were not aware call scores were being evaluated, the reliability of these preliminary findings is enhanced. Call scores clearly reflect not only helpfulness of the agent but also the manner in which agents interact with customers. Taken together with the insignificant findings in Study 2 with regard to referral rates (no change), it suggests that the device may not affect “what the agents do” but rather “how they do it.” Results also

suggest that targeting and reducing the physiological aspects associated with stress can have dramatic increases in work performance, confirming findings from studies on the relationship between relaxation and performance (cf. Davis, Sime & Robertson, 2007). In Study 2, the significant reductions in personal stress-related problems as compared to no significant differences in environmental stress related factors highlights that the device may be a useful means to reduce stress-related complaints. This also suggests that environmental engineering is a separate component to individualized relaxation and suggests that the two should be tackled simultaneously. It is also noteworthy that the call centre in which the study was performed had lower-than-expected environmental stressors, suggesting that the working environment was already well managed. Although the reduction in sick days cannot be clearly attributed to the device, it is worthy of further study due to the substantial lost productivity costs of absenteeism.

A striking feature of these studies is the qualitative remarks from users who subjectively reported significant benefit from using the device. Such feedback is particularly important when studies are done with such small sample sizes. Relaxation programs are only effective when people use them, and adherence to any behavior change regimen remains a significant obstacle to efficacy. Offering participants flexibility in terms of time of may have helped reduce these barriers. The drawbacks noted with regard to time management suggest that even in supportive working environments, employees may need specific times when they can practice relaxation throughout the day.

These studies had several limitations. First is the small samples and limited time duration used in each study. It is possible that adherence may wane with time and the benefits may be less pronounced. Second, because all participants were volunteers it is impossible to rule out the effects of volunteer demand characteristics and the Hawthorne effect. Although the dose-response and objective performance outcome measure in the first study help rule out this confound, the placebo effect can be quite large, and future research should employ randomized controlled trials. Third, the clients were aware the device stored their history and may have been more compliant as a result. Although having an objective electronic compliance measure can also be viewed as a significant benefit, particularly in assessing the dose-response and for monitoring purposes, it is unclear whether compliance would have been as high if participants were not

being monitored. Finally, future studies with the device would benefit from addressing specific stress-related health problems and using validated and objective measures for those diagnoses. Therefore, the findings in this study should be considered preliminary until more research is conducted.

Despite these limitations, and when taken together with previous studies on the benefits of relaxation in corporate settings, and the emerging literature on the efficacy of HRV biofeedback, results suggest that programs may benefit from increased performance and increased employee well-being by integrating a simple biofeedback device into their stress reduction toolbox. Having a wide variety of stress reduction tools is clearly one method to reduce barriers to adherence. It is clear that most relaxation programs work, but that the challenge lies in creating a relaxation protocol that clients actually use.

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