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The effects of a relaxation intervention on nurses' psychological and physiological stress indicators: A pilot study

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ABSTRACT

The present pilot study was designed to examine the feasibility and the effects of a psychomotor relaxation program on nurses' psychological (burnout symptoms, affective states) and physiological stress indicators (salivary cortisol). Fifteen nurses engaged in an 8-week psychomotor relaxation program (two 20-min sessions per week) and 15 maintained their usual activities. The current study showed that the psychomotor relaxation program was feasible and well tolerated by the participants. Compared to the control group, the relaxation group showed a decrease in their levels of emotional exhaustion, depression and salivary cortisol. In the fifteenth session, salivary cortisol concentrations significantly decreased from pre-session to post-session. These results provide preliminary evidence that relaxation interventions are effective strategies for reducing the usual stress experienced by nurses, and demonstrate that a psychomotor relaxation program might be an important occupational stress-management tool for healthcare professionals.

1. Introduction

Hospitals are frequently identified as exceptionally stressful work environments [1], where healthcare workers are routinely exposed to stressor agents such as physical and cognitive workload, personal responsibility, time pressure, and inadequate resources [2,3]. Although the stress response is normally considered adaptive, the repeated experience of stressors has a detrimental impact on physical and mental health. The prolonged activation of physiological systems such as the hypothalamic-pituitary-adrenal (HPA) axis and the autonomic nervous system result in chronic exposure to heightened concentrations of stress hormones, such as cortisol, harming the immune system [4,5]. Chronic states of stress are associated with negative affective states such as anxiety and depression [6].

Research shows that healthcare professionals, nurses in particular, have a higher risk of experiencing physical and mental stress-related problems [7], including severe chronic fatigue, anxiety and depression [8–10]. Nurses are also known to report high rates of occupational burnout [11,12], due to chronic stress at work, long-term physical and emotional exhaustion, and reduced interest and motivation on the job [13].

Relaxation techniques such as progressive relaxation, autogenic training, meditation, stretching, or breathing exercises, have been argued as valuable approaches to manage the stress response [14–16]. Either through attention regulation (e.g., meditation, autogenic training), or muscle tone regulation (e.g., muscle stretching, progressive relaxation), relaxation techniques can improve the regulation of the HPA axis activity, resulting in decreased concentrations stress hormones [17,18], lower levels of negative affective states (e.g. Refs. [17–19], and decreased rates of occupational burnout [20]). There is also research indicating that after a learning period, individuals can independently transfer some of the acquired skills into their everyday lives, and use them wherever and whenever they feel the need to regulate stress [21].

Given the prevalence of stress-related problems among nurses [2,22], relaxation techniques have been increasingly applied to promote stress-management [14,16,23]. Some studies have shown to be especially effective in improving psychophysiological stress indicators, such as depression, anxiety, and burnout [20,21,24,25]. One five-week mindfulness program (one session of 2 h per week, with practice in between), showed to significantly reduce self-perceived stress, anxiety, and depression levels of nurses [24].

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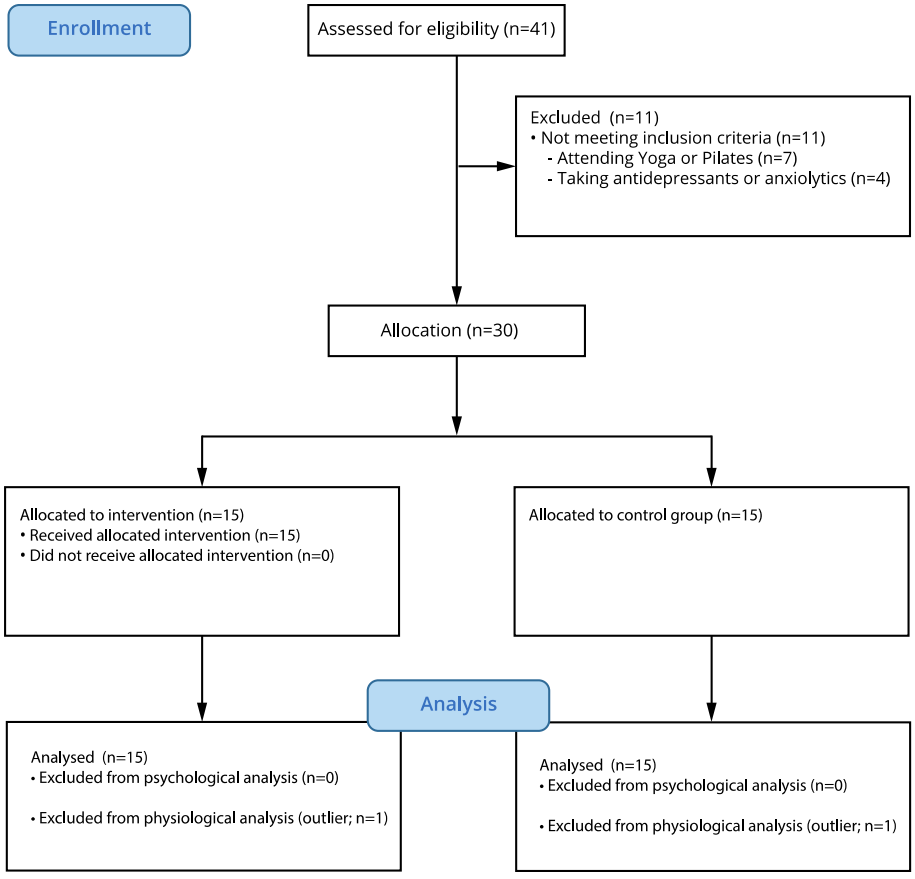

Fig. 1. Participants flow diagram.

Despite the negative impact of burnout on nurses' physical health and work performance, the systematic review of Guillaumie and colleagues [23] shows a lack of studies documenting the effects of relaxation techniques on symptoms of occupational burnout. While some previous studies [26,27] failed to find statistically significant effects of a mindfulness-based intervention on burnout symptoms of healthcare personnel, others [20] showed significant improvements in nurses' symptoms after participating in an eight-week mindfulness based stress reduction program (one session of 2.5 h per week, a 6-h daylong retreat and daily practice). Nurses also reported lack of time to participate in sessions, as well as discomfort during mindfulness activities and difficulties in maintaining a daily practice [20]. Hence, shorter sessions might be important to increase nurses' attendance of relaxation programs. In fact, Yung and colleagues [21] showed that two relaxation techniques (stretch-release relaxation and guided imagination) with shorter sessions (20-min) both effectively enhanced nurses' mental health status, particularly their anxiety levels.

Considering the discomfort during mental relaxation [20,23,27], it has been also suggested that stressed populations could better benefit from a holist approach, combining attention regulation exercises and muscle tone regulation exercises [27], such as psychomotor relaxation. Therefore, the aim of the current study is to examine the feasibility and impact of a psychomotor relaxation program, combining both attention and muscle tone regulation in short sessions implemented in the subject's workplace. Although such integrative approach is commonly used across Europe and South America, to date no previous research has yet focused psychomotor relaxation.

Most existing stress measurement instruments rely on the retrospective assessment of perceived stress, which can be influenced by memory capacity [28], interpersonal characteristics such as verbal ability, interoceptive awareness, or personality traits [29,30]. Hence, the present study aims to combine psychological symptoms of stress with a physiological parameter, i.e., cortisol. Cortisol is a well-established hormonal mediator of the stress response, relatively accessible to researchers, and does not require invasive (and often stressful) collection methods (e.g., plasma, urine) [17]. Although some studies have shown decreased cortisol levels following participation in relaxation programs (e.g. Refs. [17,31–34], for the general population, others failed to detect these changes [35–37]). Given the lack of consistent evidence on the effects of relaxation on cortisol levels, Miller and Cohen [29] suggest examining the acute effects of relaxation sessions to increase the chance of detecting changes in the stress response processes promoted by relaxation techniques. However, to the best of our knowledge, no study has yet tested both the acute and chronic adaptations to stress at multiple stages throughout a relaxation program.

The only study to date examining the effects of relaxation techniques on nurses' cortisol levels only included nurses who scored positively for post-traumatic stress disorder, and collected cortisol through blood sampling [38]. Furthermore, Duchemin and colleagues [26] reported decreased levels of a physiological stress indicator (i.e., salivary α-amylase) on surgical intensive care personnel (69% were nurses) after participating in an 8 week mindfulness-based intervention. Hence, there is a need of research focused on the implementation of relaxation programs addressing nurses' physiological stress indicators, such as cortisol.

1.1. The current study

The main purpose of this pilot study was to examine the feasibility and the effects of a psychomotor relaxation program in nurses' psychological and physiological stress indicators. More specifically, it was hypothesized that burnout symptoms, affective states, and salivary cortisol would benefit from an 8-week (16 sessions) relaxation program combining body awareness, muscle tone regulation, and breathing

Table 1
Participants characteristics.

	Psychomotor Relaxation Group	Control Group	Total
Age (years)	38.60 ± 7.5	42.87 ± 6.7	40.73 ± 7.3
Nursing practice (years)	15.73 ± 8.0	20.53 ± 7.3	18.13 ± 7.9
Gender (% women)	86.7	86.7	86.7

exercises. In particular, salivary cortisol changes were investigated not only from the baseline to the end of the intervention, but also from the beginning to the end of the second and the fifteenth sessions.

2. Method

2.1. Participants

Nurses were recruited through advertisements in their hospital. As shown in Fig. 1, Forty-one registered nurses (four male, all Portuguese natives) voluntarily agreed to participate in the study. Exclusion criteria were (a) being a nurse for less than 6 months; (b) participating in a similar intervention program within the last 12 months; (c) having a physical condition that can affect the participation in the program and (d) taking medication that can influence stress-management. Eleven nurses were excluded for having regular classes of Yoga or Pilates (7 nurses) and for taking antidepressants or anxiolytics (4 nurses).

The main descriptive characteristics of the participants are shown in Table 1. Participants' ages ranged from 26 to 49 years old (M_{age} = 40.73 ± 7.3 years) and the participants' years of nursing practice ranged from 3 to 31 years ($M_{practice}$ = 18.13 ± 7.9 years). The majority of the participants were women (87%). Participants belonged to the emergency (n = 24), mental health (n = 4), orthopedics (n = 1), and surgery (n = 1) units. Participants were allocated by convenience (i.e., schedule) to the Psychomotor Relaxation Group (PRG, n = 15) and to the Control Group (CG, n = 15). There were no significant differences between groups, regarding age, gender, years of nursing practice, or unit.

2.2. Procedures

The study was approved by the Ethics Committee of the University of Évora and by the Hospital Institutional Review Board and was carried out under the standards set by the Declaration of Helsinki. The collected data was fully encrypted to ensure the privacy of the participants.

All instruments (questionnaires and salivary cortisol) were collected by the same researcher, throughout the different stages of testing. To examine the chronic effects of the intervention program, instruments were collected at enrolment (baseline) and at the end of the 8-week period (post-intervention). To measure the acute effects of the relaxation program, salivary cortisol was also measured at the beginning and end of the 2nd and the 15th sessions. Although the program consisted of 16 sessions, the 2nd and the 15th sessions were chosen to examine the acute changes on salivary cortisol concentrations, considering that (1) in the 1st session, participants would be focused on adapting to the session (e.g., time, therapist, exercises, etc.) and not necessarily on the relaxation and (2) previous research showed that the idea of coming to the end of an intervention might have a negative impact on affective states and other indicators [39]. Subjects were asked to restrict potential cortisol-altering substances before the testing sessions, such as smoking, strenuous physical exercise, food, and caffeine for at least 1 h.

2.3. Outcome measures

Occupational burnout was measured through the Portuguese version of the Maslach Burnout Inventory [40], a self-report questionnaire which measures three indicators of occupational burnout: emotional exhaustion, depersonalization, and reduced sense of personal accomplishment. The questionnaire consists of 22 items rated on a six-point scale (0 = never; 6 = every day). Emotional exhaustion is measured by the average of ten items (e.g., I feel emotionally drained by my work; Working with people directly puts too much stress on me), depersonalization by the average of five items (e.g., I feel burned out from my work; I feel recipients blame me for some of their problems) and reduced personal accomplishment by the average of seven items (e.g., Working with people all day is really a strain for me; I feel I'm working too hard on my job). Higher scores point at higher levels of burnout indicators. The Portuguese version of the Maslach Burnout Inventory showed good reliability [41].

Affective states were obtained through the Portuguese short version of the Profile of Mood States [42]. This self-report questionnaire is comprised of 36 items and measures on a five-point scale (0 = not at all; 5 = extremely) the extent to which six affective states have been felt during the past week: Tension-anxiety (e.g., tense; restless), depression (e.g., unhappy; hopeless), anger-hostility (e.g., annoyed; bad-tempered), vigor (e.g., active; lively), fatigue (e.g., exhausted; worn out) and confusion (e.g., mixed-up; unable to concentrate). Each scale is obtained by the average of the respective six items. The Portuguese short version of the Profile of Mood States showed good reliability [43].

Cortisol (mcg/dL) was quantified in saliva samples collected at the same time (around 4:30 p.m.) and in the same room where the intervention occurred. Samples were collected directly from each participant's mouth, without stimulation, by passive droll to a polyethylene tube maintained on ice and further maintained at −20 °C, until laboratory analysis. After thawing, samples were centrifuged for 20 min at 13000 *g*, at 4 °C, for removal of mucins, cells and food debris. Cortisol determination was performed in the supernatant using the Salimetrics® Cortisol Enzyme Immunoassay (EIA) Kit, following manufacturer instructions and absorbance reading was carried out at 450 nm, in a microplate reader (Glomax, Promega). Determinations were performed in the six testing moments: baseline/post-intervention; 2nd session: pre-/post-session; 15th session: pre-/post-session.

2.4. Intervention

The Psychomotor Relaxation Program was implemented in a hospital's room and combined body awareness, muscle tone regulation, and breathing exercises. The program was comprised of two 20-min sessions per week for 8 weeks, and occurred after work, around 4:30 p.m. Relaxation sessions began with an initial dialogue (3 min), a main section combining the relaxation exercises (15 min), and a final ritual (2 min). During the main section, participants were laid down on mattresses, listening to and observing a therapist, who described and demonstrated the exercises. The main section included first a body awareness exercise focusing participants' attention on their own bodies' interoceptive and proprioceptive sensations (e.g., *with your eyes closed, bring your attention to your left hand and notice the sensations that are present*), a tonic regulation exercise guiding participants to relax different muscle groups (e.g., *focus on your right knee … Lift your right knee … feel the tension … and relax …*), and finally, a breathing exercise focusing awareness to, and control of breath (e.g., *breathe in deeply and feel your stomach expand and then your chest; hold your breath for a moment and then breathe out slowly and smoothly through your mouth*). As the

program progressed, exercises' difficulty, as well as participants' autonomy and relaxation skills were increased. Exercises' difficulty, participants' relaxation capacity, and tolerability were supervised and evaluated by means of a systematic observation, with emphasis on participants' response to the therapist's instructions, as well as on non-verbal communication (e.g., facial expressions, diaphragmatic amplitude, muscle tension). When the exercise complexity was perceived as not well tolerable by the participants, the difficulty was adjusted until it was perceived as comfortable. The sessions were planned and conducted by a psychomotor therapist. A university professor with a degree in psychomotor therapy, specialized in relaxation, supervised the intervention program. The CG participants maintained their usual daily lives and work activities during the intervention period.

2.5. Statistical analyses

The Shapiro–Wilk test showed that the scores on the Maslach Burnout Inventory and Profile of Mood States questionnaire variables had a normal distribution in both groups. Therefore, intervention effects were first examined using repeated-measures analysis of variances (ANOVAs) with 'group' (PRG and CG) as a between-subject factor and 'time' (pre, post) as a within-subject factor; baseline scores were entered as covariates. An independent-sample *t*-test was used to study differences at baseline between the PRG and the CG and paired-sample *t*-test was used to compare data within each group at baseline and after 8 weeks. Effect sizes are reported as partial eta-squared (η_p^2), with cut-off values of 0.01, 0.06, and 0.14 for small, medium, and large effects, respectively [44]. For Cortisol measures, much of the data were not normally distributed. Therefore, the non-parametric Mann–Whitney test was used to compare results between the PRG and the CG and the Wilcoxon Signed-Rank test was used to study changes from baseline to post-intervention within each group. Effect sizes for Cortisol are reported as eta-squared (η^2), according to the instructions for non-parametric tests provided by Fritz, Morris, and Richler [45]. Cut-off values for effect sizes were 0.01, 0.06, and 0.14 for small, medium, and large effects, respectively [44].

The results are expressed as mean and standard deviation for the Maslach Burnout Inventory and the Profile of Mood States questionnaire and in median and interquartile range (IQR) for salivary cortisol concentration. The proportional change (Δ%) between post-intervention and baseline results was calculated using the formula: Δ% = [(post-test – pretest/pretest)] × 100.

Salivary cortisol data were examined for outliers, defined as three SD above the mean. Significance was set at $p \leq .05$ for all tests. Data were analyzed using SPSS 21.0 (SPSS, Chicago, IL).

3. Results

Attendance in the Psychomotor Relaxation sessions was very good, exceeding 87.5% (14 in 16 sessions) for all participants. Throughout the program, all participants independently performed all the proposed exercises, demonstrating active engagement. As the sessions progressed, participants became increasingly capable to focus their attention on their bodies and regulate their indices of arousal.

In the evaluation of the chronic effects of the intervention in salivary cortisol, data from one participant of the CG was not considered since its baseline values were > 3 SD above the mean.

As shown in Table 2, at baseline, the PRG and CG did not show statistical differences in the majority of the dependent variables. The exceptions were the variable 'depersonalization' of the Maslach Burnout Inventory, in which the CG had 1.04 more points than the PRG; and 'personal accomplishment' from the same inventory, in which the PRG had 0.63 more points than the CG. Several within- and between-groups differences were found after 8 weeks (Table 2).

Significant improvements were found in the PRG in 'emotional exhaustion' (−18.2%, $p = .03$). Repeated-measures ANOVA yielded a significant time × group interaction for 'emotional exhaustion' (−18.2% for the PRG and −6.6% for the CG): $F(1, 28) = 5.1, p < .01$, $\eta p^2 = 0.159$. The PGR significantly reduced its scores in 'personal accomplishment' (−8.2%, $p = .01$), although there was no significant time × group interaction effect.

Table 3 shows the scores on the Profile of Mood States questionnaire. Significant improvements were found in the PRG in 'depression' (−63.7%, $p = .01$), 'hostility' (−41.1%, $p = .05$) and 'fatigue' (−34.6%, $p = .05$). Repeated-measures ANOVA showed a significant time × group interaction for 'depression' (−63.7% for the PGR and 7.4% for the CG): $F(1, 27) = 10.91$, $p = .003$, $\eta p^2 = 0.288$.

Regarding the chronic effects on salivary cortisol, there was no significant difference between groups at baseline in the salivary cortisol concentrations (baseline *Mdn* 0.188 and 0.151 for the PRG and the CG, respectively), $U = 109.5$, $p = .847$ (see Fig. 1). The comparison between groups of the changes on cortisol concentrations over the 8 weeks (Fig. 2) showed significant differences between the PRG ($\Delta Mdn = -0.069$, IQR = 0.11) and the CG ($\Delta Mdn = 0.047$, IQR = 0.42), $U = 155.0$, $p = .029$, $\eta^2 = 0.164$. Intra-group analysis showed that the cortisol salivary values dropped significantly in the PRG ($\Delta\%Mdn = -54.8$; $Z = 24.0$, $p = .041$) but not in the CG ($\Delta\% Mdn = 6.7$; $Z = 69.5$, $p = .286$).

In what concerns to the acute effects, salivary cortisol concentrations were measured in the PRG before and immediately after the 2nd and 15th sessions. In the 2nd session, there was no significant difference between salivary cortisol concentration at pre-session (*Mdn* = 0.107, IQR = 0.132) and post-session (*Mdn* = 0.130, IQR = 0.132), $Z = 43.5$, $p = .572$. In the 15th session, the salivary cortisol concentration significantly decreased from pre-session (*Mdn* = 0.130, IQR = 0.087) to post-session (*Mdn* = 0.099, IQR = 0.077), $Z = 17.5$, $p = .016$.

4. Discussion

The results of the current pilot study showed that the psychomotor relaxation program was feasible and well tolerated by the participants. The results suggested the potential effectiveness of the program for reducing nurses' emotional exhaustion, lack of personal accomplishment, depression, hostility, fatigue and cortisol levels. The clinical relevance of these results is particularly important, considering the large effect size for emotional exhaustion, depression and salivary cortisol. To the best of our knowledge, this is the first study to examine the effects of a psychomotor relaxation program, as well as both acute and chronic effects on salivary cortisol levels.

Our results indicate that a strictly voluntary approach to a stress reduction intervention results in an acceptable participation by the nurses; all participants performed all proposed baseline and post-intervention assessments, and the compliance rate of attendance was 87.5% (all the participants completed at least 14 out of the 16 sessions). There was also good adherence to the proposed relaxation activities, suggesting that participants were motivated to attend the program, even though they were busy balancing their work schedule and personal lives. Three factors seem to have contributed to the high rate of attendance: the holistic approach of the program, involving both attention and muscle tone regulation; the implementation of the program at the workplace so nurses did not lose significant time traveling to the sessions; and finally, the low time commitment (sessions took 20 min, twice a week, for 8 weeks). In fact, when time commitment is an obstacle to participation, programs of short sessions might be a better option, especially considering previous research [46] showing that interventions demanding less time in session lead to similar psychological outcomes as longer sessions.

In line with previous studies [20,21,25,26,47,48] the present findings showed that the psychomotor relaxation program is an effective method for reducing psychological and physiological indicators of stress. In particular, the program showed large effects concerning the

Table 2
Scores on the Maslach Burnout Inventory at baseline and at 8 weeks.

	Group	Baseline *M* (*SD*)	8 Weeks *M* (*SD*)	Difference between means *M* (95% *CI*)	*p*
Emotional Exhaustion [0–6]	PRG	3.40 (1.71)	2.78 (1.32)	-.61 (−1.17, −.05)[a]	.03
	CG	4.10 (1.15)	3.83 (.94)	-.27 (−.70, .16)	
Depersonalization [0–6]	PRG	1.84 (1.47)[b]	1.76 (1.23)	-.08 (−.56, .40)	.09
	CG	2.88 (1.28)	3.19 (1.50)	.31 (−.36, .97)	
Lack of Personal Accomplishment [0–6]	PRG	4.65 (.59)[b]	4.28 (.70)	-.38 (−.63, −.11)[a]	.80
	CG	4.02 (.77)	3.70 (.85)	-.32 (−.65, .00)	

Note. CI = confidence interval. The *p* values are for repeated-measures analysis of variances.
[a] $p < .05$ changes within the group. Paired-sample *t*-test.
[b] $p < .05$ comparison between groups at baseline. Independent-sample *t*-test. PRG = Psychomotor Relaxation Group; CG = Control Group.

Table 3
Scores on the short version of the Profile of Mood States at baseline and at 8 weeks.

	Group	Baseline *M* (*SD*)	8 Weeks *M* (*SD*)	Difference between means *M* (95% *CI*)	*p*
Tension [0–5]	PRG	1.47 (.83)	1.09 (.77)	-.38 (−.77, .02)	0.13
	CG	1.48 (.60)	1.43 (.61)	-.04 (−.40, .31)	
Depression [0–5]	PRG	.80 (.76)	.29 (.47)	-.51 (−.88, −.14)[a]	0.01
	CG	.94 (.81)	1.01 (.72)	.07 (−.39, .53)	
Hostility [0–5]	PRG	1.41 (1.07)	.83 (.85)	-.58 (−1.15, .00)[a]	0.57
	CG	1.44 (.88)	1.44 (1.04)	.00 (−.44, .44)	
Fatigue [0–5]	PRG	1.88 (1.28)	1.23 (1.28)	-.64 (−1.29, −.00)[a]	0.10
	CG	2.28 (1.27)	2.10 (1.31)	-.18 (−.51, .15)	
Vigor [0–5]	PRG	1.99 (.84)	2.17 (.80)	.18 (−.06, .41)	0.32
	CG	1.52 (.79)	1.68 (.69)	.15 (−.34, .66)	
Confusion [0–5]	PRG	.77 (.41)	.61 (.36)	-.15 (−.35, .04)	0.13
	CG	.84 (.46)	.89 (.62)	.04 (−.18, .27)	

Note. CI = confidence interval. The *p* values are for repeated-measures analysis of variances. Analysis of covariance.
[a] $p < .05$ changes within the group. PRG = Psychomotor Relaxation Group; CG = Control Group.

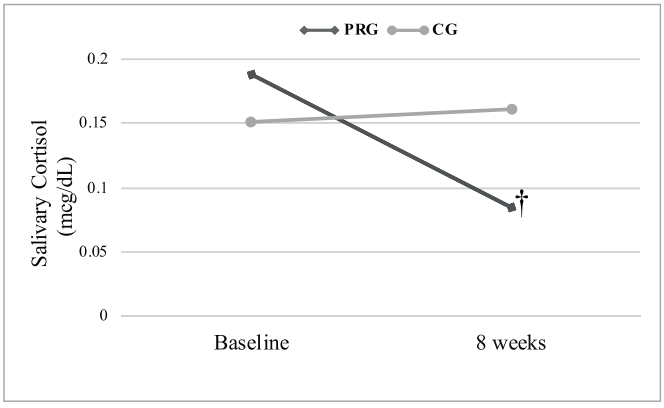

Fig. 2. Salivary cortisol in micrograms per deciliter for the Control Group (CG) and the Psychomotor Relaxation Group (PRG) at baseline and 8-week follow-up. †p < .05 for differences in the 8-week changes between groups (Mann–Whitney test).

decrease of emotional exhaustion, depression and salivary cortisol concentrations.

It should be noted that a previous study [27] examining the effects of an 8-week mindfulness program on burnout symptoms of highly stressed nurses (i.e., from pediatric oncology) showed no significant improvements on burnout, perceived stress, and depression, and that some participants reported to have felt an increase of their stress levels. Hence, researchers suggested that attention regulation methods (e.g., mindfulness) should be combined with muscle tone regulation methods, especially when working with a highly stressed population [27]. The psychomotor relaxation program implemented in the present study involved both attention regulation (by teaching participants to focus their awareness on their body, breath, and movements), and tone regulation (by teaching participants to decrease their tension on specific muscles). Therefore, the present findings suggest that such an integrative approach might be beneficial when addressing a highly stressed population, although more studies are needed to explore such potential.

As expected, the 8-week psychomotor relaxation program had a positive effect on physiological stress indicators, as shown by the decreased levels of salivary cortisol of the nurses who participated in the program. The chronic effects on cortisol levels are in line with previous studies showing the positive effects of relaxation and other body-oriented approaches such as yoga [34] or qi-gong [32] in stress-management of healthy participants. It is important to note the similar approaches of the cited studies and the current study, as all involved muscle contraction and breathing regulation, suggesting that muscle tone regulation might be important to decrease physiological stress response. Despite being the first study to examine the effects of a relaxation program on salivary cortisol concentrations of nurses, the present findings are in line with the study of Duchemin and colleagues [26]; who also showed that a mindfulness based intervention including mindfulness, yoga, and music, effectively decreased a physiological stress indicator, i.e., salivary α-amylase concentrations of healthcare personnel.

The acute effects of the psychomotor relaxation were not significant in the beginning (2nd session) of the 8-week program, contrary to a previous study [18] which showed the immediate effects of an abbreviated progressive relaxation session in salivary cortisol levels of undergraduate students. One should note that there are methodological differences between the studies, namely the participants' age and employment status (students *vs.* nurses) as well as the intervention schedule (7:00 *a.m. vs.* 4:30 *p.m.*), which might explain these different outcomes. For example, it is reasonable to hypothesize that the best time to carry out a relaxation session is early in the day when participants are less tired and more open to the therapist's suggestions.

Despite the non-significant acute effects observed in the 2nd session, in the 15th session, there was a significant decrease of salivary cortisol levels from the beginning to the end of the session. This finding suggests that nurses needed time to improve their ability to reduce objective indices of arousal, supporting the idea that stress-management improves with the practice of psychomotor relaxation. The examination of the acute effects of two sessions of a relaxation program on participants' salivary cortisol seems highly relevant considering the importance of evidence-based health practices [49]. Future studies could analyze the acute effects of each session to determine the optimal duration of a stress-reduction program, especially considering overscheduled populations. Indeed, detailing the characteristics of interventions, such as the duration of the sessions, type of program, and measurements taken is critical to developing effective and replicable stress management tools.

Finally, it is important to note that this pilot study has some limitations, such as small sample size (despite similar to others: [25,26]), overrepresentation of women in the sample, and lack of a placebo intervention in the control group. Moreover, although the psychomotor relaxation group and the control group were similar at most baseline measures (8 out of 10 dependent variables), participants' allocation to the groups was not randomized. The potential confounds of salivary cortisol concentrations were accounted for (e.g., saliva collection was carried out at the same time and place; participants were asked to restrict potential cortisol-altering substances), however, as recommended by Hellhammer and colleagues [50]; future studies should collect repeated measurements of cortisol levels per day over multiple days. Although it was beyond the scope of this pilot study to examine the sustainability of the effects after program's cessation, it would be worthwhile to perform such analysis, especially considering a previous study [21] which showed that the effect of the relaxation programs on nurses' anxiety was only observed one month after the end of the program.

5. Conclusion

The outcomes of this pilot study show that a strictly voluntary psychomotor relaxation program was feasible and well tolerated by nurses. An eight-week program of short sessions combining muscle tone regulation, body awareness and breathing exercises, showed improvements in psychological and physiological stress indicators, particularly emotional exhaustion, depression, and salivary cortisol levels. These results provide preliminary evidence that with appropriate relaxation interventions, it is possible to revert the usual stress experienced by nurses and demonstrate that a psychomotor relaxation program might be an important occupational stress-management tool to implement in healthcare environments.

Declarations of interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ctcp.2019.03.008.

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