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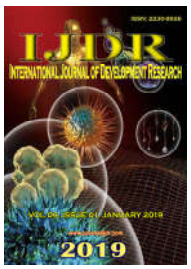

ORIGINAL RESEARCH ARTICLE OPEN ACCESS

EFFECTS OF ELECTROACUPUNCTURE ON BODY MASS INDEX AND QUALITY OF LIFE OF NURSES FROM GAFFRÉE AND GUINLE UNIVERSITY HOSPITAL

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ABSTRACT

Nurses in Brazilian hospitals tend to be overstressed. The aim of this study was to observe the effects of electroacupuncture on the body mass index (BMI) and quality of life (QoL) of nurses from the Gaffrée and Guinle University Hospital (HUGG). Seventy-two female nurses from the HUGG team were randomly assigned to an experimental group (EG; n = 36) and submitted to ten electroacupuncture sessions or to a control group (CG; n = 36). QoL was assessed using the WHOQOL-100 questionnaire. The body measurements analyzed were BMI, Pollock's sum of 7 skinfolds and fat percentage. The quality of life score was 13.69 $p<0.000$; lean body mass 47.15±6.44 $p<0.000$ and BMI 31.85±4.73 $p<0.999$. It can be concluded that electroacupuncture may improve QoL and body composition in the group of nurses assessed.

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INTRODUCTION

Traditional medicine refers to traditional medical (TM) systems, such as traditional Chinese medicine (TCM). In this respect, acupuncture has become one of the most popular therapies in the world (WHO, 2002). The basis of this phenomenon is Qi (also known as chi), usually translated as "vital energy", "life force", or "energy flow". Qi provides continuity between coarse material forms and tenuous non-material energies. It is the basis for the infinite manifestations of life, including minerals, plants, rational and irrational beings (DANTAS, 2001).

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Acupuncture, the technique most advocated by TCM, uses needles that are introduced into specific body points (BORRELLI, 2010)and left for some time before being removed. Thus, a nociceptive stimulus promotes changes by puncturing the skin, superficial fascia and, occasionally, muscle tissue. The perforated points or areas are related to channels that have relationships with organs and other tissues (FINANDO and FINANDO; 2010). Brazilian hospitals are understaffed and the demand for productivity is a source of workplace stress, especially for nurses.Many nurses have an exhausting workload, including being on call, extended working hours, night shifts, and taking on a second job due to low wages, in addition to having significant responsibility, a sedentary lifestyle, being at risk of accidents, and engaging in

non-ergonomic activities. As a result, at the end of their shift, many experience muscle, joint or limb pain related to improper posture (GODIM, GUIMARÃES, D'ALENCAR; 2009). Another factor that interferes in the performance of nurses is working in closed environments, such as operating rooms, hospital wards and laboratories.According to Pereira *et al*. (2009), the high stress levels experienced by nurses who work in confined spaces underscores the need for areas such asbreak and game rooms, where they can interact with other team members (FERST *et al*., 2018; ANWAR *et al*., 2018). Quality of life is a broad and dynamic concept, and a number of definitions can be found in the literature, but all of them consider the cultural, social and environmental individuality of the person.As such, quality of life can be defined as the perception of one's place in the world, expectations, standards and concerns (FLECK *et al*., 1999),or the constant question of human beings, recognized as individual perception in a cultural context andvalue system (FIGUEIRA *et al*., 2010; FIGUEIRA *et al*., 2009). (please check). It is believed that electroacunpuncturewill improve the body composition and quality of life of nurses in this institution. As such, the aim of this study was to assess the effects of electroacupuncture on the body mass index (BMI) and quality of life (QoL) of nurses and nursing assistants at Gaffrée and Guinle University Hospital (HUGG), in the city of Rio de Janeiro, Brazil.

MATERIALS AND METHODS

Participants: This is a randomized clinical trial. The study was conducted at the GaffréeandGuinle University Hospital (HUGG), located in the city of Rio de Janeiro, Brazil. Members of both sexes of the nursing team of HUGG were invited to enroll. The following inclusion criteria were established: a) being a professional at the institutionunder study, performing nursing or nursing assistant activities during the data collection period; b) aged 18 years or older; c) being physically fit to participate in the experimental treatment; d) being at least overweight associated with type II diabetes; e) abdominal circumference above 88 cm for the diagnosis of metabolic syndrome.

The exclusion criteria were: a) the presence of any type of acute or chronic condition, such as heart disease, type I diabetes, hypertension and uncontrolled asthma; b) any musculoskeletal conditions that could interfere with the activity (recent fracture, acute arthralgia, tendonitis and prosthesis use, Paget's disease, sequelae of stroke) or neurological problems; c) use of medications that could cause attention disturbances, interferein the acupuncture treatment and compromise physical performance; d) prolonged use of corticosteroids, anticonvulsants, chemotherapy and beta-blockers; e) ingestion of alcoholic beverages more than twice a week. The Research Ethics Committee of the Federal University of the State of Rio de Janeiro (UNIRIO), Brazil, approved the study, under protocol number 130.994.All the participants gavewritten informed consent in accordance with the human research guidelines established by Resolution 466/2012 of the Brazilian National Health Council.

Procedures

Data collection was performed usinga self-applied questionnaire containing questions prepared by the authors related to health parameters, previous diseases and family health history. If necessary, participants could ask the researchers for help. The study used an intentional non-probabilistic sample, based on the availability and willingness of the professional to participatein the research. After the sampling process, the subjects were randomly selected and assigned in order of arrival to the experimental group (EG),submitted to electroacupuncture sessions, or control group (CG), advised on healthy lifestyle habits and physical conditioning (MEDRONHO, 2004). Although both sexes could participate, only 96 women volunteered to take part in the study.After the interviews, 8 individuals met the exclusion criteria, 4 left the program and 4 were no longer working at the institution.As such72 members (20 nurses and 52 nursing assistants) of the HUGG female nursing staffwere selected.These subjects were randomly assigned to an experimental (EG: n = 36) or control group (CG: n = 36). Figure 1 presents the flowchart of the participants through the study. The individuals underwent anthropometric assessment, including body mass index (BMI), waist-hip ratio (WHR), sum of skinfolds (ΣSF), systolic blood pressure (SBP) and diastolic blood pressure (DBP).The formula BMI = weight/height^2 was used to calculated the subjects'BMI. The result in kg/m^2 is classified as follows: 17 – very low weight; between 17 and 18.49 - underweight**;** between 18.5 and 24.99 – normal weight; between 25 and 29.99 - overweight**;** between 30 and 34.99 – class I obesity; between 35 and 39.99 – class II obesity (severe); over 40 class III obesity (morbid).

For women, the Pollock 7 site formula was used, where

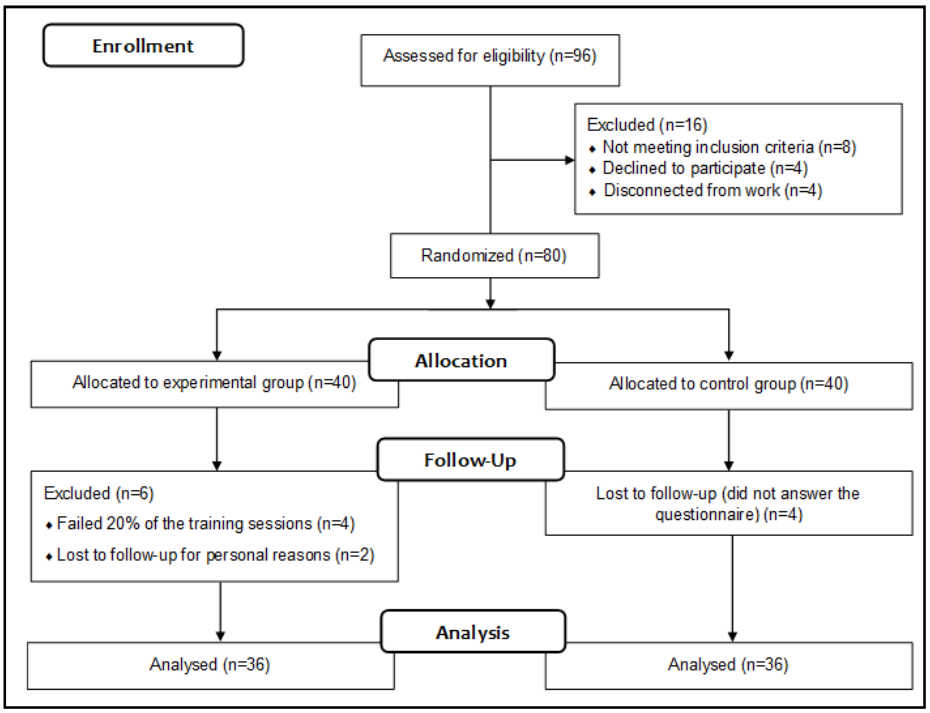
$$SF = 1.0970 - [0.00046971 (X1) + 0.00000056 (X1)^2] - [0.00012828 (X3)]$$

The WHOQOL-100 (FLECK, 2000) was used to identify the quality of life levels.This instrument uses a 5-point Likert scale, where 1 indicates strong disagreement and 5 strong agreement.A final score of four represents the lowest quality of life level and twenty the highest, fourteen being the minimum acceptable.The 100-question instrument contains facets that identify body image, appearance, ability to work, negative feelings, sexual capacity, social support and environment, divided into the following domains: physical, psychological, independence, social relations, environment and spirituality (FLECK, 2000).

In the EG, which underwent electroacupuncture, needles were inserted at points VC6, VC12, E25, E36, VB34 and BP3. Only electrodes VC6 [-] were connected to VC12 [+] and F3 [-] to E36 [+], a [-] sign indicating that the electrode emits electrons towards the positive pole [+]. This electron flow follows the energy direction of the channel or group of channels, stimulating energy flow and the previously described functions promoted by these points.The CG attended weekly meetings, where work difficulties and the metabolic syndrome (MS) were discussed.

Statistical Analysis

Data were analyzed using SPSS 20.0 and presented as maximum, minimum, mean and standard deviation. Shapiro-Wilk and Levene tests were applied to determine normality and homogeneity of variance of the data, respectively. Repeated measures analysis of variance (13) was used for the EG, CG and time (pre and post-test), followed by Tukey's post-hoc test to identify possible differences with Bonferroni corrections. The significance level was set at $p < 0.05$.



Trocar flow por flowchart, analysed = analyzed, trocar Failed por Missed, disconnected from work = no longer working at the institution

Figure 1. Flow of participants through the trial

Table 1. Sample characteristics

	EG	CG	F	p-value	n
	Mean ± SD	Mean ± SD	Levene	p<0.05	
Age (years)	35.39±11.95	39.86±12.31	-	-	36
Height (m)	1.60±0.05	1.61±0.04	-	-	36
BMI (kg/m^2)	33.57±6.30	35.40±7.50	6.080	0.001	0.53

SD: standard deviation; BMI: body mass index

RESULTS AND DISCUSSION

All the participants were women (72 nursing technicians and 20 nurses). Sixteen of the technicians worked 24-hour shifts, thereby hindering acupuncture sessions, and the other four worked 8-hour day shifts. Eight worked in the maternity ward, while the remainder worked in orthopedics, internal medicine and general surgery. The procedures were performed after permission was obtained from the sector chief and when the workload allowed it. At the meetings, the subjects reported work overload and being physically and mentally exhausted from their 24-hour shifts and second jobs. Although all of the participants declared that they were aware of the adverse effects of metabolic syndrome and a BMI of more than 30 and how to avoid them, they did not have time to follow a proper diet or engage in physical activities, since their work occupied most of their time and what was left was used for a second job, household chores and family activities. Table 1 demonstrates that all the study subjects were obese.This level of obesity compromises the mobility required to perform work duties. The same table shows that electroacupuncture promoted a significant difference ($p<0.001$) in body mass between the EG and CG. It is important to underscore that the EG also reported being better able to perform their work activities.Likewise, ΣSF exhibited a significant difference for $p<0.002$. By contrast, Table 2 shows a significant intra and intergroup difference (EG, $p<0.002$ and EG x CG, $p<0.001$), demonstrating an increase in the metabolism of transforming fat mass into lean mass.

Figure 2 shows that Independence and Spirituality exhibited significant intergroup differences ($p<0.01$) in the post-test.The EG showed a better work attitude after the third session, reporting restorative sleep and alertness after rising, variables that were not investigated here. Table 3 shows that electroacupuncture promoted significant positive changes ($p<0.05$) in weight.These participants exhibited lower weight and were more inclined to adhere to physical exercise programs. Quality of life is a multifactorial variable based on the health-disease process, which hinders its assessment. Nevertheless, improving the quality of life of the population is driven by public policies aimed at health promotion and prevention, in order to devise new health practices that enhance QoL (ASSUNÇÃO *et al*., 2010; SANTOS and CARDOSO, 2010). However, we identified no policy intended to improve the quality of life of nurses at the study site. Significant positive intergroup differences were observed post-test in domain 2 (psychological), which measures positive feelings, thoughts, learning, memory and concentration, important factors when working in a hospital setting. This change likely occurred due to the feeling of well-being promoted by electroacupuncture, prompting the release of endorphins and relieving pain. In a study conducted by Kogien and Cedaro(2014), the authors disregarded the physical domain and showed no statistical relation with psychological factors. In research carried out by acupuncturists who conducted group sessions in individuals with orthopedic disorders, improvements were observed not only in physical conditions and pain but there was also greater willingness to

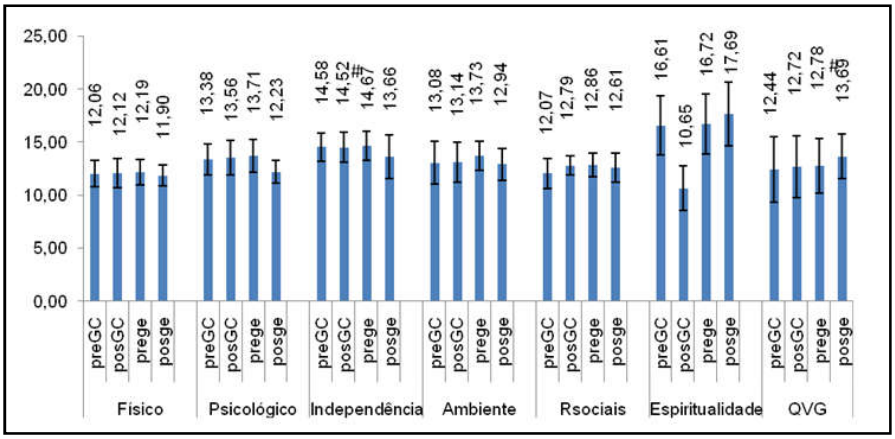


Figure 2. Intergroup comparison of quality of life levels preCG, preeg, postCG, posteg, Physical, Psychological, Independence, Environment, Social Relations, Spirituality, Overall QoL e trocar virgulas por pontos (ex: 5,00 = 5.00)

Table 2. Comparison of mean body composition corrected by the Bonferroni test

Variables			Mean±SD	Mean±SD	Δ%	Δ	p-value
Body mass	preEG	postEG	86.27±16.75	79.46±11.32	0.79	6.81	0.555
	preCG	preCG	86.27±16.75	91.56±19.02	0.91	-5.29	1.000
	posEG	postCG	79.46±11.32	91.64±19.77	0.91	-12.181*	0.017
	preCG	postCG	91.56±19.02	91.64±19.77	0.91	-0.08	1.000
BMI	preEG	postEG	33.57±6.30	31.85±4.73	0.32	1.73	1.000
	preCG	preCG	33.57±6.30	35.40±7.50	0.35	-1.83	1.000
	posEG	postCG	31.854.73±7.50	35.22±8.44	0.35	-3.38	0.236
	preCG	postCG	35.40±7.50	35.22±8.44	0.35	0.18	1.000
WHR	preEG	postEG	1.15±0.11	1.19±0.10	0.01	-0.04	0.451
	preCG	preCG	1.15±0.11	1.19±0.08	0.01	-0.04	0.522
	posEG	postCG	1.19±0.10	1.20±0.11	0.01	-0.01	1.000
	preCG	postCG	1.19±0.08	1.20±0.11	0.01	-0.01	1.000
ΣSF	preEG	postEG	234.82±4.61	213.74±4.05	2.32	21.07	0.214
	preCG	preCG	234.82±4.61	247.65±3.66	2.32	-12.83	1.000
	posEG	postCG	213.74±4.05	250.63±4.20	2.11	-36.88*	0.002
	preCG	postCG	247.65±3.66	250.63±4.20	2.45	-2.98	1.000
MLEAN	preEG	postEG	54.57±7.24	47.15±6.49	0.54	7.417*	0.002
	preCG	preCG	54.57±7.24	54.83±7.87	0.54	-0.27	1.000
	postEG	postCG	47.15±6.49	59.96±11.28	0.46	-12.80*	0.000
	preCG	postCG	54.83±7.87	59.96±11.28	0.54	-5.13	0.065

SD: standard deviation; BMI: body mass index
ΣSF – Sum of skinfolds; MLEAN – Lean body mass in kilograms; WHR – Waist-hip ratio; * p<0.01

Table 3. Comparisons of mean body composition using Bonferroni's correction

Variables			x-sd	x-sd	Δ%	Δ	p-value
Weight	preEG	postEG	86.27±16.75	79.46±11.32	0.79	6.81	0.555
	preCG	preCG	86.27±16.75	91.56±19.02	0.91	-5.29	1.000
	postEG	postCG	79.46±11.32	91.64±19.77	0.91	-12.181*	0.017*
	preCG	postCG	91.56±19.02	91.64±19.77	0.91	-0.08	1.000
BMI	preEG	postEG	33.57±6.30	31.85±4.73	0.32	1.73	1.000
	preCG	preCG	33.57±6.30	35.40±7.50	0.35	-1.83	1.000
	postEG	postCG	31.854.73±7.50	35.22±8.44	0.35	-3.38	0.236
	preCG	postCG	35.40±7.50	35.22±8.44	0.35	0.18	1.000
WHR	preEG	postEG	1.15±0.11	1.19±0.10	0.01	-0.04	0.451
	preCG	preCG	1.15±0.11	1.19±0.08	0.01	-0.04	0.522
	postEG	postCG	1.19±0.10	1.20±0.11	0.01	-0.01	1.000
	preCG	postCG	1.19±0.08	1.20±0.11	0.01	-0.01	1.000
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	preCG	preCG	54.57±7.24	54.83±7.87	0.54	-0.27	1.000
	postEG	postCG	47.15±6.49	59.96±11.28	0.46	-12.80*	0.001*
	preCG	postCG	54.83±7.87	59.96±11.28	0.54	-5.13	0.065

SD: standard deviation; BMI: body mass index
ΣSF – Sum of skinfolds; MLEAN – Lean mass in kilograms; WHR – Waist-hip ratio; * p<0.01

continue treatment, in contrast to the initial study (ANTHEA and ADRIAN, 2012). In another investigation, where health-related factors reported by obese patients were analyzed using the SF-36 instrument, the mental status of patients was positively related to physical activity level, BMI and stress. These results corroborate those obtained here, since the participants were sedentary, obese and unmotivated at work (WANG *et al*., 2013). There was a significant intergroup (EG x CG) difference in favor of the EG in the post-test ($p < 0.000$) and intragroup difference ($p<0.000$) in domain 6, which

measures spirituality, religion and personal beliefs.Figueira *et al*., (2010) found improved quality of life levels in elderly individuals submitted to acupuncture due to the enhanced well-being reported by these patients at the end of the experiment. Another positive intervention is leisure physical activity, which also causes positive changes by restoring physical and mental strength, thereby improving concentration at work (PEREIRA, 1997). An intervention study on the quality of life of obese individuals showed differences between obese and non-obese subjects in terms of overall health, psychological levels and psychiatric disorders.The number of attempts to lose weight with diets, self-perceived body image and the amount of leisure physical activity does not completely explain the psychosocial behavior of severely obese individuals (ZAPKA *et al*., 2009). The autonomous nervous system controls the visceral functions of the body, including blood pressure, gastrointestinal motility, secretion, urinary output, body temperature and the cardiac muscle.The effects of stimulating the parasympathetic nervous system are to a large extent opposite to those of the sympathetic response. The parasympathetic system, however, is not normally activated as a whole.Stimulating the parasympathetic nerves separately may result in a lower heart rate, dilated visceral blood vessels and increased digestive tract activity.

A recent review investigated the effects of electroacupuncture on heart rate and found that the number of sessions influenced the response, that is, the adequate dose, in addition to the importance of methodological rigor and a control group.This model suggests that the technique influences cardiorespiratory conditioning, thereby facilitating physical and work activities (ANDERSON, *et al*., 2012). From the standpoint of traditional Chinese medicine (TCM), the essential mechanism of acupuncture uses interconnected meridians to form a large energy network. In addition to maintaining homeostasis and potentially correcting imbalance, stimulating acupoints sends signals through this network of interconnected channels to restore harmony(LANGEVIN and YANDOW, 2002; AHN *et al*., 2005).

Conclusion

The nurses who participated in the study reported that electroacupuncture promoted positive changes in well-being and disposition at work, even though the instrument used could not detect significant changes in overall quality of life. It is noteworthy that electroacupuncture caused changes in the body composition of the experimental group, reducing fat percentage and BMI.Complementary therapies such as electroacupuncture, physical exercise and leisure programs should be implemented by institutions to promote the well-being of nurses, with a view to improving care in health services.

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