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Resistance training and its impact on psychological health in participants of corporate wellness programs

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Abstract

Background: Currently the resistance training (RT), is considered a contributor to improved mental health, however, is not reported in the literature an frequency ideal of training. **Purpose:** The purpose of this study was to assess the impact of the practice of RT on the psychological health of employees participating in a corporate wellness program, in different numbers of weekly sessions (2, 3 and 4 times), for a total of 12 weeks. **Methods:** 77 individuals were selected; 33 women and 44 men, between the ages of 30 and 45, employees participating in a corporate wellness program. The individuals were randomly divided and classified as control group (n=10) and three more groups (G2,G3, and G4), according to weekly training frequency. The groups followed RT programs made up of eight exercises with medium intensity of 10RM for 12 weeks. The General Health Questionnaire with 12 items (GHQ-12) was applied before and after the intervention period. The GHQ-12 results were calculated using the Likert scale format. **Results:** Significant statistical differences were noted between pre and post-intervention periods in all groups, indicating improvement in psychological health, most noted in G4. **Conclusions:** The data revealed that RT is capable of improving mental state in its practitioners after three months of training and that weekly frequency has little influence in this improvement, even though the group that trained with more frequency presented slightly higher levels of improvement in psychological wellbeing.

Keywords: Resistance Training, Psychological health and corporate.

INTRODUCTION

Over the past few years, an increase in the number of people complaining about symptoms such as anxiety and depression, specific symptoms associated with psychological health and commonly confused with organic disorders [1], has been observed.

With the objective of minimizing this fact, exercise programs that benefit both body and mind have been used in order to improve aspects of physical and mental health [2,3].

Recently, these programs have been verified as possibly contributing to improvements in strength, flexibility and anthropometric measurements, such as anxiety symptoms [3]. This fact, backed up by the most recentAmerican College of Sports Medicine (ACSM) [4] recommendations, shows that the beneficial effects of RT are indisputable and can be reached through cardiopulmonary, neuromuscular and neuromotor training [4]. In this context, RT is one of the "tools" used in order to improve health, strength gains, muscle mass, reduce body fat and increase bone mass, resulting in extremely favorable changes in body composition and, from a functional standpoint, considered one of the most complete forms of physical preparation [4]. Furthermore, RT enables individuals to achieve personal goals, prioritizing muscle groups, or perfecting gains in strength, power, muscular resistance, or other important physical qualities, making it an important part of practically every single physical conditioning program [5].

The effect of RT has also been noted by studies that aim to assess the benefits of its practice on the psychological health of its practitioners. A study performed with middle-aged women and elderly women showed that a supervised 24 week program of RT promoted significant decrease in depression and improved health, which was noticed by the participants, suggesting that RT can be efficient when it comes to organic and psychological health [6].

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In another study, Singh *et al*. [7] assessed the effect of RT, in two different levels of intensity, on depression. The program lasted eight weeks with a training frequency of three times per week. The results demonstrated a decrease in depression for a number of people who did RT at a high intensity, two times superior to those who trained at a low intensity. Although such findings stimulate the use of RT as a potential promoter of psychological health aspects, the measurement of these benefits is considered difficult to obtain [8].

In this context, some studies have used validated questionnaires as a tool to measure results related to psychological health [2,6]. Among the diverse number of available questionnaires, the General Health Questionnaire (GHQ) has been applied more frequently to evaluate psychological wellness, especially in occupational studies, due to its practicality and efficiency [9]. The GHQ is a self-applicable questionnaire with versions containing 60 or 12 items, being that the shorter one (12 items) is more commonly used based on the fact that it provides a quick assessment of psychological discomfort without compromising the reliability of its scores [9]. Another aspect of this tool is that it is easy to fill out, including both negative and positive items, allowing it to be used in one or several different types of factors [10-13].

The GHQ has been used in different environments susceptible to depreciation in general health, especially in psychological health [14-18]. An example of this susceptibility is the corporate environment, which can be considered vulnerable when it comes to developing psychological problems, such as decrease in quality of life, stress among others [19]. Besides these aspects, cardiovascular and osteoarticular problems have been noted in this specific environment [19, 20], as well as physical and psychological health of employees, directly influencing factors such as employee production levels and absenteeism in the corporate setting [16].

With this in mind, the use of GHQ would be welcomed in a number of contexts where the practice of physical exercise is done, especially in gyms of Health Promotion Centers in companies, where the corporate environment is usually prone to psychological wellness variations [19]. However, the use of the GHQ isn´t recognized as a tool that can assess the effects of RT on the promotion of psychological wellness in participants of corporate programs. Therefore, the present study aimed to assess the impact of RT on psychological health of employees participating in a corporate wellness program in different numbers of weekly sessions (2, 3 or 4 times), with a duration of 12 weeks.

MATERIALS AND METHODS

Sample

77 people participated in this study, of which 33 were female (35 ± 7,5) and 44 of were male (36 ± 8,0),with ages ranging between 30 and 45 years (tables 1 and 2). All selected participants were enrolled in a corporate wellness program in a gym located in a specific company in Rio de Janeiro, RJ. Of this total, 10 subjects (5 men and 5 women) were part of a control group (CG) and didn't perform any kind of physical exercise during a period of 12 weeks and 67 were selected to follow a RT program during the same time period and divided into three groups: G2, a group that practiced RT twice per week; G3 (3x per week) and G4 (4x per week). A description of the sample can be seen below in tables 1 and 2.

Table 1: Male subjects' characteristics (average ± standard deviation)

Groups	Age (years)	Height (cm)	Body Mass (Kg)
Control[a](n = 5)	40 ± 10	181,3 ± 5,4	93,74 ± 11,28
G2 [b] (n = 12)	34 ± 4	179,4 ± 7,5	88,70 ± 18,59
G3 [c] (n = 20)	36 ± 12	176,3 ± 5,8	83,28 ± 12,62
G4 [d] (n = 7)	34 ± 7	176,34 ± 2,8	78,91 ± 9,43

Table 2: Female subjects' characteristics (average ± standard deviation)

Groups	Age (years)	Height (cm)	Body Mass (Kg)
Control [a] (n = 5)	42 ± 13	157,6 ± 9,0	71,28 ± 19,50
G2 [b] (n = 12)	33 ± 6	164,4 ± 4,1	60,60 ± 6,58
G3 [c] (n = 9)	32 ± 5	164,1 ± 4,9	59,32 ± 5,96
G4 [d] (n = 7)	37 ± 4	161,6 ± 3,7	64,31 ± 8,25

All subjects were selected following an inclusion criterion that concluded that they were apparently healthy, didn´t possess any impediments such as motor limitations or difficulty, heart disease or another type of chronic illness to perform the training tests and programs; hadn´t performed RT in at least one year; agreed not to practice any other kind of physical exercise, besides the RT exercises prescribed during the participation of the study; responded negatively to all the questions *Physical Activity Readiness Questionnaire – PAR-Q* [21] and agreed not to use any type of nutritional supplement. All recruits attained a 95% training adherence rate and signed a Free Informed Consent Form, according to the CONEP resolution at the beginning of the study. The study design was elaborated in compliance with the Declaration of Helsinki, from 1964, revised in 2008. The procedures of this study were approved by the Rio de Janeiro Federal University Ethics Committee as being favorable, filed as number 14336713.9.0000.5257, in 06/11/2013.

Instruments

The GHQ was developed by Goldberg and Blackwell as a tool to detect non-severe psychiatric illnesses. In this context, the GHQ permits a self-applicable evaluation of comorbidities or psychological discomfort [22]. Its first version was composed of 60 items, evolving to shorter versions with 30, 20 and finally 12 items, which is more commonly used due to its length [9]. The 12 item version of the GHQ (GHQ-12) aims to assess psychological morbidity [22], and considering this, the GHQ-12 was

applied to participants of the study before the intervention period, covering the two weeks before the initial assessment and after the three-month intervention period. The GHQ-12 was also used to confirm eligibility of participants based on the inclusion criteria.

With the objective of evaluating psychological discomfort, the GHQ-12 scores were calculated using the Likert scale format (e.g. question 2: 0- not at all; 1- no more than usual; 2- a little more than usual; 3- much more than usual) in full compliance to previous investigations that used this method to register answers [23]. The GHQ-12 questions are as follows:

Have you recently:

1. Been able to concentrate on what you´re doing?
2. Lost much sleep over worry?
3. Felt that you are playing a useful part in things?
4. Felt capable of making decisions about things?
5. Felt constantly under strain?
6. Felt you couldn´t overcome your difficulties?
7. Been able to enjoy your normal day to day activities?
8. Been able to face up to your problems?
9. Been feeling unhappy or depressed?
10. Been losing confidence in yourself?
11. Been thinking of yourself as a worthless person?
12. Been feeling reasonably happy, all things considered?

Procedures

An anamnesis, GHQ-12 and 10RM test was performed during the pre-test to verify training intensity [24] and the GHQ-12 was performed during the post-test, as observed in figure 1. After the pre-test assessments, the volunteers began a 12-week experimental intervention, with a RT program consisting eight exercises executed in the following order: front seated cable lat pull down, leg press, chest press, seated leg extension, seated row, seated hamstring curl, seated shoulder press and abdominal crunch.This training program was supervised by experienced force training professionals.

With the exception of the three first exercises of the performed sequence, the order of the exercises was changed monthly, remaining within the scope of the training methodology(alternated by segment). The participants performed three sets of 10-12 repetitions, with the exception of the abdominal crunch that was executed with 15-20 repetitions per set [25]. The loads were readjusted once the maximum training zone was surpassed. The rest interval between sets was 60-90 seconds. Before each training session, the subjects performed two sets of training specific warm-ups using 50% of the load used for the first and second exercise of the sequence for 15 repetitions [26].

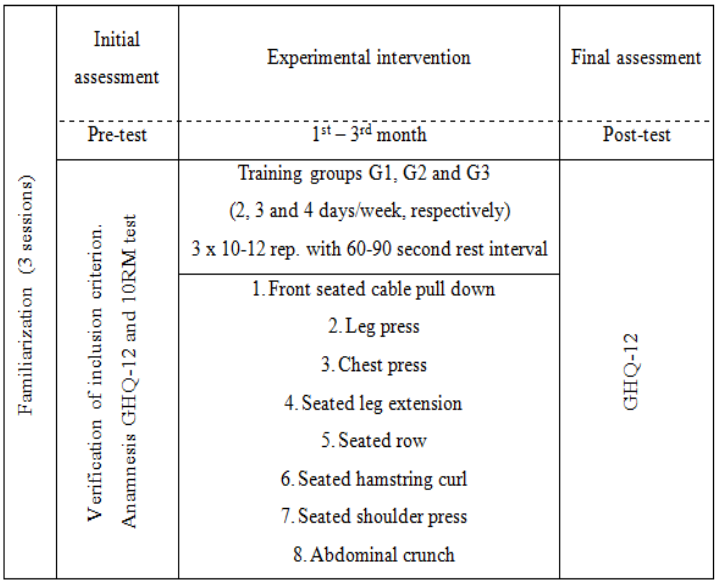

Figure 1: Experimental design of study

Statistical Analysis

Descriptive statistical analyses were done through tables and graphs and also as appropriate measurement summaries of the variables of interest. For the total GHQ-12 score, an average, deviation standard and size effect was calculated. A paired t-test was used to calculate size effect for the statistical significance analysis of the temporary variations within each group. The ANOVA and paired t-test were used, respectively, in order to compare total scores between groups with or without activity and between different weekly frequencies. The statistical software used was SPSS version 17.0.

RESULTS

The CG, as well as the groups that trained (G2, G3, and G4) presented significant statistical differences between pre and post RT intervention periods (14.0 vs. 9.4 p= 0.018 e 16.5 vs. 11.3 p<0.001, respectively). Although the results demonstrated improvements in all groups,the results attained by the groups that practiced RT were slightly higher than the control group (- 5.2 x – 4.6 p= 0.727)however, without any statistical significance. In regards to size effect, the groups that trained presented higher results than the group that did not(-0.96 vs. 0.74). These results can be seen in table 3.

The intervention groups (G2, G3 and G4) indicated significant statistical differences between pre and post intervention periods. In group G2, there was a variation from 16.7 to 11.6 (p<0.001), in group G3, this variation was from 16.3 to 11.2 (p<0.001), while in group G4 it was reduced from 16.5 to 10.6 (p=0.003). In regards to the deltas (variations), no differences were noted between the three training groups (p=0,894)

No significant statistical differences were observed during the comparison between the three intervention groups when analyzing pre (p=0.967) and post (p=0.758) intervention periods individually. These results can be seen in table 4.

Table 3: GHQ-12 statistical scores for both pre and post 3 month intervention period for groups who practiced RT and CG (Likert scale)* in a corporate gym (n=77)

Period	Physical Activity				Comparison between those with or without activity	
	Yes (n=67)		No (n=10)			
	Average	DS	Average	DS	Difference between averages	P- value of t-test
Initial (pre)	16.5	5.5	14.0	6.2	2.5	0.189
After 3 months	11.3	3.9	9.4	5.0	1.9	0.179
Difference (Δ)	-5.2	5.4	-4.6	5.0	-0.6	0.727
Effect size*	-0.96		-0.74			
P- value of paired t-test	< 0,001		0,018			

*Ratio between difference (Δ) and deviation standard

Table 4: Pre and post intervention period total statistical scores of GHQ-12 (Likert scale)* for individuals participating in a RT program, with varying frequencies at a corporate gym (n=67)

Period	Sample total (n=67)		Weekly physical activity frequency						ANOVA P-value
			2x (n=24)		3x (n=29)		4x (n=14)		
	Average	DS	Average	DS	Average	DS	Average	DS	
Initial (pre)	16.5	5.5	16.7	4.9	16.3	5.9	16.5	5.8	0.967
After 3 months	11.3	3.9	11.6	4.3	11.2	4.0	10.6	2.8	0.758
Difference (Δ)	-5.2	5.4	-5.1	5.5	-5.1	5.2	-5.9	6.1	0.894
Effect size*	-0.96		-1.03		-0.86		-1.02		
P-value of paired t-test	< 0.001		< 0.001		< 0.001		0.003		

*Ratio between difference (Δ) and initial deviation standard

Every question in the questionnaire represents, in some way, the psychological state of its responders. However, it is worth noting that question number 9 (have you recently felt sad or depressed?) is the one that representsan important psychological condition that must be highlighted and which presented positive results after the RT intervention period, where a shift was seen between categories 1 and 2 (before 1<2, after 1>2), as seen in figure 2.

Score frequency of answers tothe GHQ-12 question “Have you recently felt sad or depressed?” by individuals in a corporate gym, pre and post 3 months of RT (n=67) 0- not at all, 1- not more than usual, 2- a little more than usual, 3- much more than usual

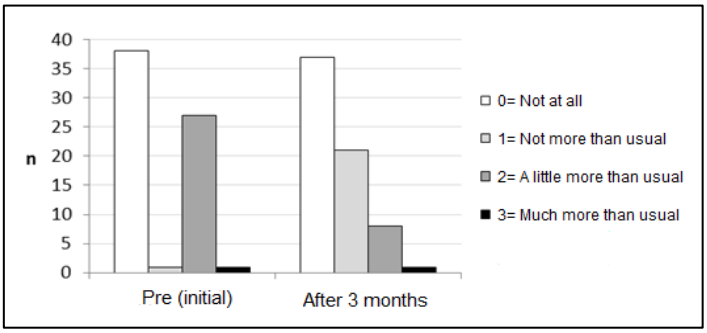

Figure 2: frequency of responses to question number 9 of the GHQ-12 (Likert scale), related to depression

DISCUSSION

Our study aimed to assess the impact of the practice of RT with different numbers of weekly training sessions (2, 3 and 4 times) on the psychological health of employees participating in a corporate wellness program. Our results indicate that, in general, after assessing psychological health, using the GHQ-12 as a tool, the participants demonstrated considerable improvement in psychological health, after a three- monthRT intervention period. Such results corroborate with previous studies with or without the use of the GHQ-12, such as the Fernandes *et al.* [6] study. The authors investigated the effects of RT and a number of daily activities, on psychological variables (perception of health state, body image satisfaction, life satisfaction and depression) in elderly women, after 24 weeks of supervised training. The results showed that after this period, significant differences in perception of health state and depression occurred, indicating that RT is capable of promoting positive results in both aspects. Even though the study in question did not use the GHQ-12 as an assessment tool, RT benefits according to psychological variables can be seen, regardless of weekly training frequency and of the population used in the study. Kerr and Vos [27] assessed the effect of a RT corporate program on psychological wellness. The program lasted 12 months and the test subjects were made up of 156 banking executives. The results indicated improvement in psychological aspects in the group that practiced RT, although no statistical differences were noted between groups with our without RT. These findings corroborate with our own,

where no statistical differences were noted between groups with or without RT, even though the intervention period was much shorter, 12 weeks of training.

Another study, using the GHQ-12 as a tool to assess psychological state, submitted participants to a *body balance* (yoga and flexibility) program. The study lasted 12 weeks and included 40 healthy adults at an average age of 43 years old. After the intervention period, it was concluded that anxiety state was improved after the practice of *body balance* [28]. In our study, we assessed a greater number of individuals, the age group varied between 30 and 45 and the duration was also 12 weeks long. Even though these authors used a stretching exercise program, unlike the RT program used in our study, both studies presented improvements in general psychological health. This hypothesis is further reinforced by another study that used the GHQ as an assessment tool and verified the improvement of general health in 30 elderly participants with an average age of 64 years old that practiced Pilates throughout 8 weeks, this time using the GHQ 28 question version [29]. These findings support the hypothesis that, regardless of the type of physical exercise, its practice favors the wellbeing of its participants.

Another interesting finding in our study is related to depression, which was possible to confirm through answers to question number 9 of the GHQ-12 – "have you recently felt sad or depressed?'' Many negative responses to the question were noted after the three-month RT intervention period, demonstrating that after this period, a decrease in depression levels was noted in most participants. Mendonça *et al*. [30] investigated the effect of different types of exercise, including RT, on body composition and psychological dimensions, such as general health perception, physical appearance satisfaction and depression levels. The study was made up of women with an average age of 35 years old. Better indicators of improvements in psychological aspects were observed in the group that practiced physical exercise compared to the control group. Although this study was cross-sectional, its results corroborate with the findings of the present study, due to its association of RT and improvement of psychological wellbeing.

The strategy of adopting physical activity in order to improve anxiety and depression levels has been successful in healthy individuals who don't suffer from psychological discomfort (therapeutic effect) and can also be adapted to those who find themselves in a different clinical profile [31,32]. In this context, different kinds of exercises have been proposed as alternative depression treatments. Our study evaluated if the number of weekly RT sessions interfered or not with the improvements of psychological aspects of the assessed subjects, where it was found that no significant differences occurred between groups that trained twice, three or four times per week. Although such result was noted, the group that trained 4 times per week reduced the assessed psychological discomfort a little more, indicating that higher training volume, with a higher number of weekly sessions, doesn´t necessarily contribute significantly to the improvement of psychological health. In this sense, a relation between RT volume and psychological health improvement doesn't seem to exist. Similar findings highlighting the effect dose response have been previously reported [32,33].

The mechanisms responsible for the reduction of anxiety and depression levels through physical exercise are not yet totally elucidated [32,34]. Both physiological and social aspects have been considered as present elements of physical exercise which supposedly explains its efficiency as therapy for depression. However, an emphasis on physiological aspects has been considered more important [32]. In this sense, the increase in the release of neurotransmitters such as serotonin, dopamine and β endorphin related to psychological wellbeing after physical exercise has been highlighted [34-36].

In regards to the results showing improvements of GHQ-12 scores in both groups, a possible justification could be that the possibility of participating in the study voluntarily motivated these individuals to practice physical exercise due to a common work environment for both control and intervention groups throughout the training period. In this context, the psychological condition of the control group could have been affected by the interaction with their colleagues who trained at the corporate gym.

CONCLUSION

With regard to weekly RT frequency, little influence on improvement of psychological state was found, although the group that trained more times per week presented slightly higher levels of psychological wellbeing. Although improvements in psychological wellbeing were noted in both the control and intervention groups, it is clear that exercise programs have been capable of favoring both physical and mental health. Such fact has been highlighted by the improvement of the answer scores to the GHQ-12 noted after 12 weeks of RT, where participants of the corporate wellness programs were observed and obtained positive responses related to psychological aspects post intervention period.

We recommend, therefore, that psychological wellness assessments through the GHQ-12 be used in conjunction with assessments related to employee production, such as absenteeism and productivity levels.

Conflicts of interest

We declare there is no conflict of interest.

Authors' Contribution

RHODES SERRA: Main author responsible for data collection, writing of all text, statistical analysis.

FRANCISCO SAAVEDRA: Collaborating author in data collection, revision of the methodology, revision of all text.

NUNO GARRIDO: Collaborating author in data collection, revision of the text.

DIOGO CARDOZO: Collaborating author in reviewing the text and collecting data.

BRUNO JOTTA: Collaborating author in data collection, revision of the text.

JEFERSON NOVAES: Collaborating author in the revision of the whole text, statistical analysis.

ROBERTO SIMÃO: Collaborating author in the revision of the whole text, revision of the statistical part, general orientation.

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