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EFFECTS OF A PHYSICAL EXERCISE PROGRAM ON UNIVERSITY STUDENTS WITH BURNOUT SYNDROME

Doctoral Thesis of the Doctoral Program on Sport Science Branch Physical Activity and Health, supervised by Professor Doctor Jose Pedro Ferreira, submitted to the Faculty of Sports Sciences and Physical Education of the University of Coimbra.

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"There is only one good: knowledge. And there is only one evil: ignorance..."

- Socrates.

"…the use of exercise does conduce very much of the preservation of health…"

-Francis Fuller in Medical Gymnastics

"… exercise can contribute much to the recovery of the sick, and to the preservation of health..., and is useful to whatever one wish to apply it."

- Hippocrates

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Resumo

Antecedentes: A Síndrome de Burnout é um problema actual de grande impacto sobre a saúde dos estudantes universitários em todo o mundo. Programas de intervenção para prevenir ou tratar a Síndrome de Burnout são essenciais para melhorar a saúde dos estudantes. Na ausência de um programa eficaz, é provável que os estudantes sofram de um problema de saúde mental em estudo ou relacionado com o mesmo, no qual prevalecem factores de risco.

Objectivo: determinar a eficácia do exercício físico na redução dos níveis de Síndrome de Burnout nos estudantes universitários.

Métodos: Um estudo com pré-teste e pós-teste, com 2 grupos de intervenção (exercício aeróbico 28, exercício de força 26) e um grupo de controlo (sem exercício 27). A amostra foi probabilística e estratificada com participação proporcional. Variáveis de estudo e instrumentos incluídos: Maslach Burnout Inventory Students Survey (MBI-SS), Variabilidade da Frequência Cardíaca (HRV), cálculo da média RR, SDNN, e RMSSD. Para exercício físico, exercício aeróbico e de força foi aplicado durante 3 sessões semanais durante uma hora, em dias alternados, durante 16 semanas. Em ambos os grupos de intervenção, o exercício físico foi regido pelas últimas directrizes de prescrição de exercício do American College of Sports Medicine.

Resultados: O grupo aeróbico com Exaustão MBI-SS foi mais elevado, reduzindo os seus níveis em 26,4% (d=0,532), no Cinismo (-21,06, d=0,252) e na Eficácia (-13,11, 0,397). Grupo de força no Cinismo (-27,38, d=0,315), na Eficácia (-21,69, d=0,704), Exaustão (-19,55, d=0,299). O grupo de controlo Exaustão aumentou 10,26% (d=0,128). No HRV, o grupo aeróbio o SDNN teve a maior mudança percentual, com um aumento de 24,82 %, sobre a média RR e RMSSD (14,40 % e 16,45 %). Grupo de força e no controlo (21,77%, 14,24%, 12,60%; e 12,59%, 4,97% e 4,99% respectivamente). Houve uma mudança no RR médio nos grupos aeróbico e de força (d = 1,281 e 1,328). Na exaustão houve a maior percentagem de mudança no grupo aeróbico com uma redução de 26%, seguido pelo grupo de força (19,5%). No cinismo, foi o grupo de força que teve a maior redução (27%) sobre o grupo de aeróbica (21%). Na eficácia, o grupo de força foi 21% contra 13% do grupo de aeróbica. Comparação entre os testes finais dos grupos de aeróbica e força: a eficácia dimensional foi baixa (d =0,284, PD = 10,51 %), na exaustão e cinismo foram triviais (d =0,068, PD = 4,83 %; e 0,030, 3,39 %). Em HRV três variáveis com um tamanho de efeito trivial (d =0,071, 0,85%; 0,177, 5,22% e 0,075, 2,95%). O VHH comportou-se de forma diferente: Em RR a diferença foi notavelmente grande (d =0,905, 10,24%), em SDNN foi moderada (d =0,515, 14,48%), enquanto que em RMSSD foi pequena.

Conclusões: Sugere-se que a redução dos níveis de síndrome de burnout nos estudantes foi maior nos grupos de intervenção de exercício físico. Os exercícios aeróbicos foram mais eficazes na redução dos níveis de exaustão, enquanto os exercícios de força reduziram os níveis de cinismo e as dimensões de eficácia.

Palavras-chave: exercícios físicos, síndrome de burnout, estudantes, saúde mental

Abstract

Background: *Burnout syndrome is a current problem of great impact on the health of university students worldwide. Intervention programs to prevent or treat burnout syndrome are essential to improving the health of students. In the absence of an effective programme, students are likely to suffer from a mental health impairment under study or related to it, in which risk factors prevail.*

Objective: *to determine the effectiveness of physical exercise in reducing levels of burnout syndrome in college students.*

Methods: *A study with pre-test and post-test, with 2 intervention groups (aerobic exercise 28, strength exercise 26) and one control group (without exercise 27). Sample was probabilistic and stratified with proportional participation. Study variables and instruments included: Maslach Burnout Inventory Students Survey (MBI-SS), Heart Rate Variability (HRV), calculating RR mean, SDNN, and RMSSD. For physical exercise, aerobic and strength exercise was applied for 3 weekly sessions for one hour, on alternating days, for 16 weeks. In both intervention groups, physical exercise was governed by the latest exercise prescription guidelines of the American College of Sports Medicine.*

Results: *Aerobic group with MBI-SS Exhaustion were higher, reducing their levels by 26.4% (d=0.532), in Cynicism (-21.06, d=0.252) and in Effectiveness (-13.11, 0.397). Strength group in Cynicism (-27,38, d=0.315), in Effectiveness (-21,69, d=0.704), Exhaustion (-19,55, d=0.299). Control group Exhaustion increased 10.26% (d=0.128). In HRV, aerobic group the SDNN had the greatest percentage change, with an increase of 24.82 %, over the mean RR and RMSSD (14.40 % and 16.45 %). Strength group and in the control (21.77%, 14.24%, 12.60%; and 12.59%, 4.97% and 4.99% respectively). There was a change in the mean RR in the aerobic and strength groups (d = 1.281 and 1.328). In exhaustion there was the greatest percentage of change in the aerobics group with a reduction of 26 %, followed by the strength group (19.5 %). In the cynicism it was the strength group that had the greatest reduction (27%) over the aerobics group (21%). In effectiveness, the strength group was 21% against 13% of the aerobics group. Comparison between the final tests of the groups of aerobics and strength: dimension effectiveness was low (d =0.284, PD = 10.51 %), in exhaustion and cynicism were trivial (d =0.068, PD = 4.83 %; and 0.030, 3.39 %). In HRV three variables with a trivial effect size (d =0.071, 0.85%; 0.177, 5.22% and 0.075, 2.95%). HRV behaved differently: In RR mean the difference was remarkably large (d =0.905, 10.24%), in SDNN it was moderate (d =0.515, 14.48%), whereas in RMSSD it was small.*

Conclusions: *It is suggested that the reduction of burnout syndrome levels in students was greater in the physical exercise intervention groups. Aerobic exercises were more effective in reducing levels of exhaustion, while strength exercises reduced levels of the cynicism and effectiveness dimensions.*

Keywords: *physical exercises, burnout syndrome, students, mental health*

THIS THESIS INCLUDES THE FOLLOWING SCIENTIFIC PRODUCTION :

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Rosales-Ricardo, Y., & Ferreira, J. P. (2021). Prevalence of burnout syndrome in university students: a systematic review. *Salud Mental*. *44*(2), 91-102. https://doi.org/10.17711/SM.0185-3325.2021.013 (Indexed in: Web of Science-Social Science Citation Index - JCR= 0.689, SCOPUS, SciELO, PsycINFO, LILACS, Latindex 2.0)

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Síndrome de burnout en estudiantes universitarios de Ambato, Ecuador. Scientific communication in V Seminario Internacional Universidad y Sociedad 2020. Universidad Técnica de Cotopaxi-Ecuador.

Validación del Maslach Burnout Inventory-Student Survey en estudiantes universitarios del Ecuador. Scientific communication in II Congresso Internacional en Ciencias de la Actividad Física y el Deporte 2019, Universidad Técnica de Ambato, Ecuador

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Abbreviations

ACSM - American College of Sports Medicine

AI - Academic index

BS - Burnout Syndrome

CCI - Intraclass correlation coefficient

EMA - Academic Motivation Scale

HRV - Heart Rate Variability

ICD-11 - International Classification of Diseases

ISE - Socio-economic identification

KMO - Kaiser Meyer Olkim's

MBI-SS - Maslach Burnout Inventory Students Survey

PSS - Perceived Stress Scale

RMSSD - Square root of the mean value of the sum of the squared differences of all successive RR intervals

RR mean - Mean of the RR intervals

RSES – Rosenberg Self-esteem

SDNN - Standard deviation of the periods NN

SRM - Systematic Review with Meta-analysis

WHO - World Health Organization

WHO-5 - World Health Organization Welfare Index

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General Background

Burnout Syndrome (BS) is a health problem of great social impact today. The interest currently aroused by BS has facilitated an expansion of its field of study, which was initially in health professionals, as research was begun in many other professional fields and even among university students (Segura, 2014).

Feudenberger (1974) first used the term Burnout to describe a set of physical symptoms suffered by health care personnel as a result of their working conditions. According to this author it is typical of the care professions and is characterised by a state of exhaustion as a result of working. This approach argues that BS appears more frequently in the most committed professionals, in those who work more intensely under the pressure and demands of their work, putting their interests second. This is an inappropriate relationship between professionals, who are excessively jealous in their work, and clients who are excessively needy, a response from the care professional when they overexert themselves.

One of the essential aspects dealt with in the study of the BS has been its definition. This discussion has been very controversial from the different perspectives that deal with the explanation of the appearance of the BS. Freudenberger (1974) describes BS as a feeling of failure and an exhausted or worn-out existence resulting from an overload of the worker's energy, personal resources or spiritual strength.

When attempting to define BS, a multiplicity of definitions can be found. However, faced with this panorama, Barraza (2008) recognizes, in the study of this syndrome, the hegemonic presence of two different conceptual approaches: the three-dimensional and the one-dimensional. The first approach originates in the work of Maslach & Jackson (1981) and its diffusion allowed the definition of this syndrome through a three-dimensional construct (emotional exhaustion, depersonalization and low self-realization). The second approach starts with the work of Pines, Aronson & Kafry (1981) and its development provided a definition of this syndrome through a one-dimensional construct (emotional exhaustion),

The World Health Organization (2018) published the new International Classification of Diseases (ICD-11), which was immediately presented to the World Health Assembly for adoption by all Member States. This new classification will come into force on 1 January 2022. One of its novelties is the inclusion of BS as an "occupational phenomenon". In the ICD-10 it was already mentioned under the heading "problems related to difficulty in controlling life", but not in the definition and detail of the new version. In the current classification it is found in the chapter "Factors influencing health status or contact with health services". This new inclusion of the BS in the ICD-11 classification system is important because: it gives visibility to a syndrome that is particularly harmful to the health of workers and students, implies a new justification and relevance for the development of research that allows better early diagnosis and treatment, and pushes organizations to consider an occupational risk for which they will necessarily have to carry out preventive, interventional and health promotion assessments and interventions (WHO, 2018).

The present thesis is organized into five main chapters: Chapter I: Context of study, Chapter II: Theoretical background, Chapter III: Research methodology, Chapter IV: Results and discussion of studies and Chapter V: General Conclusions.

Chapter I | Context of study. This chapter presents a brief description of relevance, general and specific objectives, the research questions and the main hypothesis of the study.

Chapter II | Theoretical background describes two important systematic review studies that support the research: the prevalence of burnout syndrome in university students and the effects of exercise interventions in patients with burnout síndrome.

Chapter III | Research methodology is composed of the study protocol of our research in general. It is presented: the sample, the selection criterio, the study variables and instruments, the study design, the procedures and intervention, the statistical processing of data, the ethics in research, the strengths and limitations and the implications for practice.

Chapter IV | Results of studies includes five original studies: the validation of instruments for the measurement of burnout syndrome and perceived stress in university students in Ecuador, a prevalence study of burnout syndrome and perceived stress in university students in Ecuador, a study on the effects of physical exercises on burnout syndrome in university students, other study on the most effective physical exercise in treating burnout syndrome in university students and finally a study about the relationship of burnout syndrome with some determinants of mental health in Ecuadorian university students. Some of these studies

have already been published in indexed scientific journals and as book chapters in prestigious scientific publishers, others are in the process of being revised.

Chapter V | General Discussion which provide an overview of the different studies; the main findings of each study and how those findings influenced the next study.

Finally, in **Chapter VI | General Conclusions**, we offer the conclusions of the results and findings of our five empirical studies. Our objectives are revisited in light of our findings.

CHAPTER I

INTRODUCTION

1.1 RELEVANCE

Burnout syndrome (BS) is currently a health and social problem. Its field of study has expanded, as research was started in other professional fields and more recently studies with university students have emerged. There is a need to better understand the impact of burnout syndrome on university students and the type of implications that its onset and development may have on their health and quality of life. According to several studies the most common manifestations of BS in students are (Salanova, Soria, Martínez, Breso, LLorens, 2005; Bresó & Salanova, 2005; Gil-Monte, Rojas & Sandoval, 2009; Gil-Monte, 2005): Physical and mental Exhaustion, Dropping out of school, Decline in academic performance.

According to previous studies, these manifestations can be divided into three main groups: Psychosomatic: Cardiovascular alterations (tachycardia, ATH), chronic fatigue, headaches, gastrointestinal alterations, abdominal and muscular pain, respiratory and sleep alterations, dermatological and menstrual alterations. Behavioral: Drug, alcohol and tobacco abuse, absenteeism from school, poor eating behaviors, inability to relax. Emotional: Impatience, desire to drop out of school, irritability, difficulty concentrating due to experienced anxiety, depression, low self-esteem, lack of motivation.

This symptomatology is an unmistakable picture of a great state of psychosomatic stress, which can have serious consequences for not only psychological but also physical integrity. The main instrument proposed in the literature to evaluate the burnout syndrome in students is the MBI-SS, designed as specific measures for its evaluation. (Schaufeli et al, 2002), whose psychometric properties have been evaluated and its stability attested in several studies. Its application demonstrated the presence of a significant proportion of students who reflect exhaustion by the demands of the study, in addition to attitudes of disinterest, self-sabotage in front of academic activities and doubts about the value of the study (cynicism) and feelings of incompetence as students (academic effectiveness or self-efficacy) (Moreno-Jiménez et al, 2008; Pereda-Torales et al, 2009).

Intervention programs to prevent or treat burnout syndrome are essential to improve the health of workers and students. In the absence of an effective program, employees or students are likely to suffer from poor related mental health work or study where risk factors prevail. Review studies (Wendy et al., 2010; Colin et al, 2016) have shown that the vast majority of research conducted and found is psychological and cognitive interventions. However, there are a variety of studies which demonstrate the possible benefits of physical activity in any of its different forms.

The practice of physical exercise on a regular basis has beneficial effects for the integral health of the human being, in the physical sphere (Comin et al., 2018; Liu et al, 2018; Foright et al., 2018; Wiklund, 2016; Hyo-Bum, 2013; Kumar et al., 2017; Conchas-Cisterna et al, 2017; Negrin et al., 2015), mental (Colledge et al., 2018; Casado et al., 2014; Alonso et al., 2013; Revnic et al., 2013; Arcos-Carmona et al., 2011) and socio-affective (Baillot et al., 2018; Rammant et al., 2017; Womble et al., 2014; León, 2014).

Physical activity is any bodily movement produced by skeletal muscles that requires expenditure of energy. In contrast, physical exercise is a variety of physical activity that is planned, structured, repetitive, and performed with a goal related to improving or maintaining one or more components of physical fitness (WHO, 2014). Regular physical exercise could be an effective intervention to reduce burnout levels in workers and students suffering from this harmful syndrome.

Most of the above studies only involve medical students, leaving aside studies on other university students in which the prevalence of this syndrome has also been demonstrated. In addition, working students (mainly medical residents and postgraduate students who work) are mixed with full-time students, when the burnout in university students is fundamentally an academic and non-working organizational cause, which is why its dimensions and content are adapted to this particularity, it cannot be confused. Also included are studies evaluated with various instruments, some more validated and recognized than others, which does not allow a true comparison between them and makes it difficult to make a real analysis of their prevalence. This also includes studies that were evaluated with instruments not designed for student populations but for workers.

1.2 OBJECTIVES

1.2.1 GENERAL OBJECTIVE

To determine the effectiveness of physical exercises in reducing levels of burnout syndrome in Ecuadorian university students.

1.2.2 SPECIFIC OBJECTIVES

- To determine the evidence from studies on: the prevalence of burnout syndrome in college students in its three-dimensional approach and the effectiveness of physical exercise interventions in patients with burnout syndrome.
- To validate the MBI-SS instrument in Ecuadorian university students.
- To diagnose the levels of burnout syndrome in Ecuadorian university students.
- To determine the relationship between burnout syndrome and stress in university students.
- To determine the effectiveness of physical exercise in the reduction of burnout syndrome levels in Ecuadorian university students.
- To determine the most effective type of exercise to treat and prevent this syndrome: aerobic or anaerobic (strength).

1.3 RESEARCH QUESTIONS

- What are the levels of burnout syndrome among Ecuadorian university students?
- Is there a relationship between burnout levels and stress levels in Ecuadorian college students?
- Are physical exercises effective in decreasing burnout syndrome levels in Ecuadorian college students?
- Which exercises are most effective in decreasing levels of burnout syndrome in Ecuadorian college students: aerobics or strength training?

CHAPTER II

THEORETICAL BACKGROUND

2.1 PREVALENCE OF BURNOUT SYNDROME IN UNIVERSITY STUDENTS: A SYSTEMATIC REVIEW.

2.1.1 Introduction

Burnout Syndrome (BS) is nowadays a striking social and health problem taking place mostly in worplaces. This field of study has expanded drastically around the world, as research has begun in other professional fields and, more recently, studies with undergraduate university students. One of the essential aspects addressed in the study of BS has been its definition. Conceptualizing a complex process such as this syndrome, because of its similarity, but not equality, with the concept of high stress levels observed in organizations has been continuously questioning their theories. In the study of this syndrome, the hegemonic presence of the conceptual approache is: the three-dimensional icons. This approach originates in the work of Maslach & Jackson (1981) and its diffusion made it possible to define this syndrome through a three-dimensional construct (emotional exhaustion, depersonalization and low personal realization).

The generalization of the syndrome in the undergraduate student academic environment arises from the presumption that these students, like any other professional confronts pressures and overloads typical of academic work. Above mentioned Students, like any other employee, maintain a direct and indirect compensation relationship with their university, evidenced by financial support, scholarships, awards or prizes. This presumption allows us to investigate the individual's responses to stress and its implications for this group of students who are not able to be completelly successful in their studies (Moreno-Jiménez, Rodríguez-Carvajal, Garrosa-Hernández & Morante Benadero, 2008).

Moreover, students with high levels of burnout are exhausted by the demands of study, have a cynical and distant attitude toward schooling, and feel ineffective as students (Martínez, Marques-Pinto, Salanova & Lopes da Silva, 2002). According to several studies the most

common manifestations of BS in students are (Salanova, Soria, Martinez, Breso & LLorens, 2005; Gil-Monte, Rojas & Ocaña, 2009; Gil-Monte & Moreno-Jiménez, 2005): Physical and mental exhaustion, Dropping out of school and Decreased academic performance.

The development of the burnout study has been possible, among other studies, by the development of reliable and valid diagnostic tools. Research on burnout has pointed out that there is a common language (in terms of measurement) that comes from the Maslach Burnout Inventory (MBI) that has been, and is at the same time, the dominant measure of burnout. The MBI has been widely used, to the extent that the rest of the instruments have had little significant development in scientific literature. Therefore, it can be said that the MBI remains as the instrument par excellence for measuring and evaluating burnout.

The operationalization of academic burnout has been possible by the standardization of the Maslach Burnout Inventory-Student Survey (MBI-SS) of Schaufeli, Martínez, Marques, Salanova & Bakker (2002). This has made it possible to measure burnout outside the occupational realm by defining its dimensions in reference to the study in students. Its application demonstrated the presence of a significant proportion of students reflecting exhaustion from the demands of study, as well as attitudes of disinterest, self-sabotage in academic activities and doubts about the value of study (cynicism) and feelings of incompetence as students (academic effectiveness or self-efficacy) (Moreno-Jiménez et al, 2008; Pereda-Torales, Celedonio, Guillermo, Hoyos-Vásquez & Yánez-Zamora, 2009).

The prevalence of this syndrome in university student populations has been addressed in the international scientific literature in different ways, mainly on the basis of the diversity of instruments used for its assessment. This has led to a certain complexity in making comparisons and analysing results between these studies due to their heterogeneity. Unfortunately, most of these instruments were not developed and validated for students' populations, in this case on the assumption that the syndrome is not caused by work demands but by study demands. Below are some of these instruments used in students:

The MBI-SS (Schaufeli et al., 2002), has been, so far, the most used in most of the research at an international level (Hederich-Martínez & Caballero-Domínguez, 2016; Yavuz & Dogan, 2014; Adas, Reis, Leal, & Isper 2012; Faye-Dumanget, Carré, Le Borgne, & Boudoukha, 2017; Portoghese et al., 2018; Shin, Puig, Lee, Lee, & Lee, 2011; Ilic,

Todorovic, Jovanovic, & Ilic, 2017) because it is specifically suitable for students and has three well-defined dimensions: exhaustion, cynicism and academic effectiveness. In contrast, the MBI (Maslach & Jackson, 1981), is Maslach's basic general instrument and has also been frequently misused for the diagnosis of student populations (Hojat, Vergare, Isenberg, Cohen, & Spandorfer, 2015; Almeida, Souza, Almeida, Almeida, & Almeida, 2016) when it is suitable only for workers. Its three dimensions are: exhaustion, depersonalization and reduced personal accomplishment.

The Burnout Measure (Pines, Aronson & Kafry, 1981), consists of 21 reagents, and evaluates through the dimensions: emotional exhaustion, physical exhaustion, and mental exhaustion. As can be seen, there are different forms of exhaustion. The Oldenburg Burnout Inventory (Halbesleben & Demerouti, 2005), describes different states of emotional exhaustion, detachment and according to each element in the 4 point ordinal scale. The Questionnaire for the evaluation of BS (Gil-Monte, García-Juesas, Núñez, Carretero, Roldán et al., 2006; Gil-Monte, Rojas & Ocaña, 2009; Cáceres-Mejía et al., 2013), unlike the MBI, has 4 dimensions: illusion for work, psychic wear, indolence and guilt.

And finally, the Copenhagen Burnout Inventory (Kristensen, Borritz, Villadsen & Christensen, 2005) which consists of three scales measuring personal burnout, work-related burnout, and client-related burnout. In these cases, each dimension is defined differently and the same is not compared in each element, even though the predominant dimension in all three instruments is exhaustion. Unfortunately, in these instruments, there is neither unanimous criterion among the experts to establish the diagnosis, nor the percentages of prevalence and incidence, since the criteria varies for each study. Due to this absence of clear criteria, many studies have resorted to determine the syndrome using statistical standars linked to the sample: the use of one or half standard deviation around the mean, or the use of a number of predetermined percentiles (the tercil or the upper quartile are the most frequent), which the appearance of the syndrome in the sample, without this, creating the need to establish indicators that help through objective and subjective criteria, and to establish the cut-off points of the instruments that determine the presence of the syndrome. Furthermore, the fact that each instrument has different dimensions makes analysis between studies even more difficult.

Most of the previous reviews are only framed in medical students, leaving aside studies in other university students in which the prevalence of this syndrome has also been demonstrated. In addition, working students (mainly medical residents and postgraduate students who work) are mixed with full-time and undergraduate students, when the burnout of university students is fundamentally an academic and non-work organizational cause, and therefore its dimensions and content are adapted to this particular feature, cannot be confused. Also included, there are studies evaluated with various instruments, some more validated and recognized than others, which does do not allow a true comparison between them and make a real analysis of their prevalence difficult, and in addition, studies that were evaluated with instruments not designed for student populations but for employees.

Hence results from previous research of BS levels in university students remark to a variable prevalence of between 8% and 56.9% of the population studied. (Loayza-Castro et al., 2016; Bastidas, Ceballos, & Delgado, 2011). This variation is associated, among other variables, with the instrument used, the criteria for diagnosis and the career or specialty that the university student pursues (Loayza-Castro et al., 2016). It is limited by the possible influence of cultural aspects in the dimensions examined (Hederich - Martinez y Caballero - Dominguez, 2010). In addition to a lack of criteria for measuring subscales or dimensions when using the MBI-SS instrument (Adas et al., 2012). Some variables associated with the syndrome, mainly, we can highlight the age (20.31%), sex (20.31%), marital status or couple stability (14.06%), schooling (12.50%), the possibility of social interaction (6.25%), the number of children (3.12%), the relationship with the partner (3.12%) or the demands of the household (3.12%), mainly (Juárez-García, Idrovo, Camacho-Ávila, & Placencia-Reyes, 2014).

BS may persist beyond medical school, and it is, at times, associated with psychiatric disorders and suicidal ideation. A variety of personal and professional characteristics correlate well with burnout (IsHak et al., 2013). Gender, age and whether the student was from an urban or rural setting were all identified as significant predictors. The gender could influence as a significant predictor of burnout or it is at least one of its constructs, with male students experiencing a greater degree of suffering than female students. The emotional exhaustion in men tends to be significantly higher than in women. (Chunming et al., 2017)

The relevance of the burnout phenomenon among undergraduate university students, its differentiation, specificity, study and analysis of its prevalence with that presented in other student's groups and the early detection of significant symptomatic levels may constitute a strong indicator of possible future difficulties, in the plans of academic or professional success and an excellent opportunity for early intervention.

As explained above, in order to carry out an updated analysis of the prevalence levels of BS in university student populations in and abroad, it is necessary to carry out this study, based on the three-dimensional conceptions of the syndrome, specifically with results from the application of the MBI-SS, a specific instrument validated for university students in many countries, and based on these results, perhaps to be able to propose prevention and intervention programs in local universities.

In this context, it is intended to determine the main levels of prevalence of BS in undergraduate university students, according to its three-dimensional approach and thus to answer questions such as: What is the degree of BS in undergraduate university students according to its three-dimensional approach at the international level? Are there studies with other university students that are not only medical?

That is why, the aim of this study was therefore to synthesize the evidence from previous studies on the prevalence of BS in university students in their three-dimensional approach (only with the use of the MBI-SS instrument, specifically for undergraduate university students) by conducting a systematic review.

2.1.2 Methods

Search Strategies

The search strategies followed the PRISMA guidelines (Moher, Liberati, Tetzlaff, Altman, & Prisma Group, 2009) and were based on the following descriptive terms and keywords defined by the authors and indexed in the Medical Subject Headings (MESH): "burnout," "studies," "prevalence," "students." The following combinations were used: "burnout" and "students," "burnout" and "prevalence," "burnout" and "studies." The search was conducted in Spanish and English (burnout, studies, prevalence, students) using the same combinations. The combination of these keywords was or taken from into the following academic journal

databases: Pubmed (www.ncbi.nlm.nih.gov/pubmed/), Web of Science Core Collection (www. webofknowledge.com), PsicINFO (https://www.apa.org/pubs/databases/psycinfo) and Scielo (http://www.scielo.org).

The advanced meta-search option was performed, using the inherent resources to each database. The investigation proceedings were conducted from 1 July to 30 August 2018. The period selected for the search was: all articles, meeting the inclusion requirements, published between 1 January 2013 and 30 June 2018.

Data extraction

Two different researchers performed the initial search using the list of keywords developed for this analysis by the authors who wrote the paper. The following selection procedures were implemented to determine whether the articles obtained in the initial searches were relevant to the present study: a) reading the titles: if the titles appeared relevant, the citations would be stored in a specific software (Mendeley Desktop 1.17.).13) and all duplicates would be removed after the initial review; b) reading of abstracts: if abstracts did not provide sufficient information related to the inclusion criteria they would be excluded from the study; c) reading of full text articles: if the studies met the exclusion criteria, They would be excluded; d) in case of disagreement among the researchers, a third opinion was sought from an independent reviewer to assist with the assessment (including, excluding, and questioning) and discussion of the articles until consensus was obtained for their inclusion or exclusion in the systematic review; and e) to verify the quality of the information (QoI) from each study using STROBE (Von et al., 2008) to assess the methodological quality of the studies. This ensures the reliability of the data obtained and the quality of the selected studies and the conclusions that can be drawn from them. In order to be accepted, they had to have 66.6% or more of the correct items, i.e. 15 or more items out of a possible 22. For them to move on to the final discussion they had to have 17 items out of 22, i.e. about 75.0%.

The scientific journal repositories of Pubmed (www.ncbi.nlm.nih.gov/pubmed/), ISI Web of Knowledge (www.webofknowledge.com), Scielo (http://www.scielo.org), ScienceDirect (https://www.sciencedirect.com), Scopus (https://www.scopus.com/home.uri) and PsycoINFO (http://www.apa.org/pubs/databases/psycinfo/index.aspx) were accessed

through the search engines of their respective websites, from the virtual search platform of the University of Ambato library.

For our study we were able to access most of the international scientific databases, but we selected the previous ones because they were considered by the authors to be the most academically relevant and those that could have the highest number of articles on BS prevalence in undergraduate students with the required quality. In addition, if during the review of full-text articles, a study provided incomplete data, authors might have been contacted by email requesting missing information. If no response could have been obtained, the article would have been excluded from study as well.

Study selection criteria

The inclusion criteria used were: Articles from journals indexed in ISI Web of Knowledge (Core Collection), Pubmed, ScienceDirect, Scopus, PsicINFO and Scielo; in English or Spanish; last 5 years, i.e. studies published between 1 January 2013 and 30 June 2018; original and observational in nature; undergraduate university students only; exclusively MBI-SS is used for diagnosis (three-dimensional approach).

Within the exclusion criteria, the following criteria was taken into account: studies in employees or student-employee populations; in medical and health science residents; in graduate students; use of diagnostic instruments other than MBI-SS; stress and other variables related to mental health and not BS; review articles and/or meta-analysis. Articles that had no response from the authors. The presentation of data on the prevalence of burnout was made based on the results found in the previous bases and discriminating them according to their level of quality using the STROBE guidelines.

Quality assessment (QA)

The positioning guidelines of the PRISMA Declaration were followed (Moher et al., 2009) to assist in the methodological design of this study. These guidelines describe the four stages (identification, selection, eligibility, final selection) for conducting research and selecting manuscripts within a systematic review (SR) and present the graphic option of drawing a study flowchart (Moher et al., 2009). In addition, this SR follows the acronym PICOS

("patient, problem or population", "intervention", "comparison, control", "results") which guides the refinement of systematic research, making the process more effective (Panic, Leoncini, De Belvis, Ricciardi, & Boccia, 2013). The authors of the selected articles were contacted by email. First, the main author and, then, if he did not respond, to the following authors. A period of 30 days was defined for the respective response.

The assessment of heterogeneity determines whether or not there is a significant difference between the results of the randomised studies (Aguero, 2013). Since our study was a systematic review without reaching a quantitative meta-analysis, we did not quantitatively assess the heterogeneity of the selected studies. From a methodological point of view, there may be many sources of heterogeneity: chance, differences in delineation, the way patients were selected, differences in the interventions and in the way tests were evaluated (Sousa & Ribeiro, 2009; Dinnes, Deeks, Kirby & Roderick, 2005). The variation in the cut-off points for the reference values of the test in question. The Cochrane manual proposes seven strategies to address heterogeneity, the final decision should be discussed and made by the research group. In our case we used 4 because of the explained characteristics of our study (Higgins et al., 2019): verification again of the data, to reduce the possibility of heterogeneity the selection of the studies was made by two reviewers independently, in order to increase the reliability and safety of the process. When there were discrepancies between the two reviewers regarding the decision to include or not an article, a third independent investigator was appointed to arbitrate the discrepancies and ultimately make the final decision. The failure to perform a meta-analysis was taken on the basis of the large differences found between the student prevalence studies. Ignoring the heterogeneity, in this case the respective mathematical calculation was not carried out as a result of the elements explained above. Excluded studies, according to the criteria proposed above, that did not meet the above characteristics and thus reduce possible confusion in the results of the included studies.

Qualitative data were then extracted from the articles included in the study and organized into a specific table, using the PRISMA method. The different items included: authors, year of publication, country where the study was conducted, sample: type and number, age of the sample, sex of the sample, design of the research, factors controlled in the study, statistical treatment and main results of the study (see table 1).

An assessment of the quality of information (QoI) of the articles included in the systematic review based on the application of STROBE (STrengthening the Reporting of Observational Studies in Epidemiology) positioning guidelines was performed. The method evaluates a list of 22 items capable of quantitatively evaluating the quality of the information. The QoI value for the items and sub-items established a criterion for assigning a point for each completed item and sub-item. The checklist was conducted by two separated researchers. A minimum QoI criterion of 50% was established at ≥ to select the article to be included in the final RH, qualifying it as a highly relevant article for the topic under study. After performing the STROBE analysis the papers were reduced to a final sample of 20 studies that were accepted with an average of 74.3%, which were used in the systematic review (see Table 1). Then the selection process is summarized in the PRISMA flowchart (see figure 1).

In the total search of all the above databases, 1406 studies were found according to the descriptors used. Most of these were not directly linked to the systematic review study on the prevalence of BS in university students, and many were not even linked to the syndrome previously exposed by title and keywords, leaving 596 studies. From these studies, later, we proceeded to read the title and abstract of each article and exclude duplicates and studies that meet the exclusion criteria. There were 140 studies left, documents for full text reading, which were reduced to 46 studies for final analysis by means of the STROBE statement. Finally, there were 20 studies to take into account to conclude research at this level.

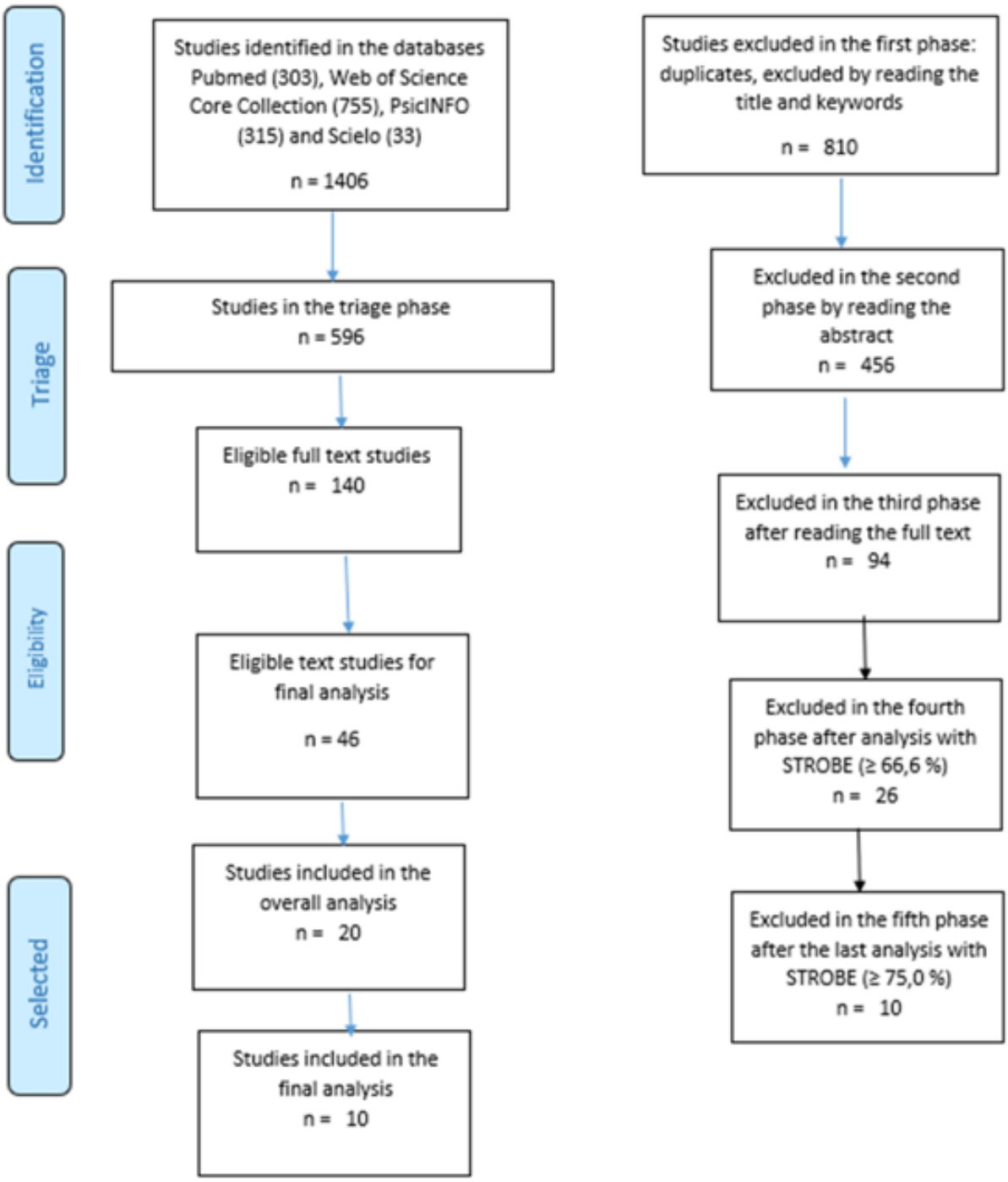

Figure 1. PRISMA Flowchart of the selection process

2.1.3 Results

The 20 studies selected were original and directed in foreign scenarios. One study (5%) was conducted in North America, 5 (25%) in Asia, 9 (45%) in Latin America and 5 (25%) in Europe. Out of the 20 studies evaluated in the systematic review, the ones that had the best overall evaluation in the STROBE analysis were selected for discussion, corresponding to 10 (out of 75 % of STROBE) and therefore the ones with the highest quality (see Table 1).

Among the variety of university students studied, the most important were those in medicine with 12 studies (60%), 7 in dentistry (35%), and 6 in nursing (30%). The other types of students found are: pharmacy, engineering, arts, information technology, psychology and social sciences. The range of samples ranged from 113 to 5647 students. The systematic review was finally carried out with the 10 selected studies. The sum of the samples from the previous studies is 11002 patient students. The characteristics of each study are detailed in Table 2.

All the selected studies coincided in being cross-sectional. The differences in their analysis methodology may have partly limited the possibility of comparing the results between them, although only studies using the MBI-SS as the only internationally validated three-dimensional instrument were selected to reduce the possible heterogeneity of the results.

The studies that gave the highest value according to this STROBE analysis were those by Pagnin et al. (2014); Kristanto, Chen & Thoo (2016) and Eren et al. (2016) that were over 80% stronger in methods and discussion of results. In contrast to Liu et al. (2018); Mafla et al. (2015); Escuderos, Colorado, & Sañudo (2017); Lee, Choi & Chae (2017) and Ríos-Risquez, García-Izquierdo, Sabuco-Tebar, Carrillo-Garcia & Martinez-Roche (2016) who were below 70 % (see Table 1).

Table 1. Analysis STROBE.

Author (year)	Title and Summary	Introduction: Context	Introduction:	Methods: study	Methods: Context	Methods: Participants	Methods: variables	Methods: Data, measures	Methods: biases	Methods: sample size	Methods: Quantitative variables	statistical methods	Results: Participants	Results: descriptive data	Results: Data outcome variables	main results	other analyzes	Discussion: Key Results	Discussion: Limitations	Discussion: interpretation	Discussion: generalizability	Financial information	Total sum items	Total percentage
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	XXII	22	100%
Almaki et al. (2017) *	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**17**	77.3%
Pagnin et al. (2013)	1	1	1	1	1	1	1	1	0	0	1	1	0	1	1	1	0	1	0	1	0	0	15	68.2%
Boni et al. (2018) *	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**17**	77.3%
Tomaschewski-Barlem et al. (2014)	1	1	1	1	1	0	1	1	0	0	1	1	1	1	1	1	0	1	1	1	0	0	16	72.7%
Da Silva et al. (2014)*	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**1**	**0**	**0**	**17**	77.3%
PAGNIN and de Queiroz, (2015)	1	1	1	1	1	0	1	1	0	0	1	1	1	1	1	1	0	1	0	1	0	0	15	68.2%
Pagnin et al. (2014)*	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**18**	81.8%
Liu et al. (2018)	1	1	1	1	1	0	0	1	0	1	1	1	1	1	1	1	0	1	0	1	0	0	15	68.2%
Mafla et al. (2014)	1	1	1	1	0	1	0	1	0	0	1	1	1	1	1	1	0	1	1	1	0	0	15	68.2%
Ferrel et al. (2017) *	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**17**	77.3%
Marenco-Squires et al. (2017)	1	1	1	1	0	0	1	1	0	1	1	1	1	1	1	1	0	1	0	1	0	0	15	68.2%
Chae et al. (2017)	1	1	1	1	0	0	1	1	0	1	1	1	1	1	1	1	0	1	1	1	0	0	16	72.7%
Lee et al. (2017)	1	1	1	1	0	0	1	1	0	1	1	1	1	1	1	1	0	1	0	1	0	0	15	68.2%
Galan et al. (2014)	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	0	1	0	1	0	0	16	72.7%
Rios-Risquez et al. (2016)	1	1	1	1	0	0	1	1	0	1	1	1	1	1	1	1	0	1	0	1	0	0	15	68.2%
Győrffy et al. (2016) *	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**17**	77.3%
Kristanto et al. (2016) *	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**0**	**0**	**18**	81.8%
Atalayin et al. (2015) *	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**1**	**0**	**0**	**17**	77.3%
Eren et al. (2016)*	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**0**	**19**	86.4%
Bughi et al. (2017) *	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**0**	**1**	**0**	**0**	**17**	77.3%
Average total percentage																								**74.3%**

* Above 75% STROBE

The analysis of overall prevalence was extracted from 10 studies that had the best overall evaluation in the STROBE analysis (over 75% STROBE, see table 1). Information on the overall prevalence of each dimension of the syndrome was estimated at 55.4% (6095 of 11002 students) for emotional exhaustion, 31.6% (3482 / 11002) for cynicism and 30.9% (3399 / 11002) for academic efficacy. In all of them, the specific instrument for students MBI-SS was used for their evaluation. Showing a considerably high prevalence globally and also individually in each study (see table 2).

As this can be seen in the general results above, emotional exhaustion dimension was the highest in the studies analyzed with a maximum of 70.6% in medical students in Brazil (Boni et al., 2016) and a minimum of 9.8% in psychology, medicine, dentistry, environmental engineering, civil systems, electronics and industrial students in Colombia (Ferrel et al., 2017). With high prevalence not only in the first study presented but also in others such as those conducted also in Brazilian nursing students with a prevalence of 64% (da Silva et al., 2014), in Arts and Social Sciences, Business, Engineering, Information Technology, Medicine, Health Sciences and Pharmacy students from Malaysia (Kristanto et al., 2016) with 66.7% and in medical students from the United States with a prevalence over 60% of exhaustion (Bughi et al., 2017). In contrast, in European medical students from Hungary (Győrffy et al., 2016) and Turkey (Atalayin et al., 2015) the prevalence levels of burnout were slightly lower than average (38.6% and 22.3% respectively). And thus, slightly reducing the average overall depletion levels, the main dimension of the BS.

In contrast, the prevalence of the cynicism dimension was slightly lower overall and individually in the studies. The highest levels were found in 58.6% of medical students in Saudi Arabia (Almaki et al., 2017) and again in students in Malaysia (58.3%). Low levels were found in two studies conducted in Eurasian Turkey with prevalence in dentistry students below 20% (Atalayin et al., 2015; Eren, 2016). The female gender (62.7%, 6898) was most affected by the syndrome over the male (37.3%, 4104) in the overall results of the studies analyzed.

AUTHORS	YEAR	COUNTRY	MEAN CARACTERISTIC	STATISTICAL TREATMENT	MAIN AIMS	MAIN RESULTS
Almaki et al.	2017	Saudi Arabia	249 medical students. Both genders. 32.5% women. Between 19 and 30 years, with a mean age of 21.8 years (SD = 1.4).	Frequency and percentage. Chi-square test of Pearson. Odds ratios (OR) and confidence intervals of 95% (95% CI). p <0.05 statistically significant.	Assess levels of burnout of students of a medical college in Saudi Arabia.	Burnout level of 67.1% (n = 167). Most (62.3%, n = 155) of students had high levels of cynicism, 58.6% (n = 146) had high levels of emotional exhaustion, and 60.2% (n = 150) had low levels of professional efficiency.
Boni et al.	2018	Brazil	279 medical students of both sexes enrolled in the first and fourth year.	Frequency tables for qualitative variables and mean and standard deviation χ test, p value. Multiple logistic regression.	To evaluate the prevalence and associated factors with the development of burnout among medical students.	n = 187, 70.6%, students with high emotional exhaustion, 140 (n = 140, 52.8%) as high cynicism, and 129 (n = 129, 48.7%) exhibit low academic efficiency. According to the study bidimensional (high cynicism high exhaustion +), 119 (n = 119, 44.9%) experienced students exhaustion.
Da Silva et al.	2014	Brazil	570 nursing students of both sexes.	minimum and maximum values, average, standard deviation. Exact probability test Fischer Cronbach's alpha	To determine the association between stress and burnout in nursing students from Brazilian universities.	64.04% of students had a high level of emotional exhaustion, 35.79% had a high level of cynicism and 87.72% a low level of professional efficiency.
Pagnin et al.	2014	Brazil	127 Medical Students sophomore at Fluminense Federal University (Niteroi, Brazil). Average age 21 (M = 21.35, SD = 2.27), and women accounted for 55% (70%). 127) of the sample.	Descriptive statistics such as frequency, relative frequency, mean and standard deviation.	Evaluate the relationship between burnout and sleep disorders in students the preclinical phase of medical school.	emotional exhaustion 76 students (59.8%). Average: 4.15 (SD = 1.08) Cynicism 26 students (20.5%). MDia 2.29 (SD = 1.62); Academic Effectiveness 22 (17.3%). Average of 3.95 (SD = 0.99).
Ferrel et al.	2017	Colombia	stratified sample of 280 students of psychology, medicine Dentistry, Environmental Engineering, Civil Systems,	software SPSS v19.0 ANOVA statistical analysis for the respective Variances.	Compare the dimensions of burnout and engineering students	47.6% had a low level of emotional exhaustion, 42.5% had an average level and 9.8% had a high level. Cynicism, most students (92.5%) had a level

			Electronics and Industrial. Both genders.		Health Sciences in relation to academic and sociodemographic variables.	low, 4.7% had an average 2.8% level and high level. academic efficiency, it was found that 66.1% has a high level, 32.3% and an average level only 1.6% showed a low level.
Győrffy et al.	2016	Hungary	721 students of general medicine in the four Hungarian hospitals medical universities (Budapest, Debrecen, Pécs and Szeged). M f	frequency, average and standard deviation. Percentage differences between variables. t-test and chi-square test	relation between altruistic student engagement and burnout.	emotional exhaustion low: 61.45% (438 students), medium or high: 38.6% (275 students) Cynicism under: 65.5% (472 students), medium or high: 34.0% (249 students) Reduced academic efficiency low: 76.0% (544 students), medium or high: 24.0% (172 students).
Kristanto et al.	2016	Malaysia	132 students of the School of Arts and Social Sciences, School Business, School of Engineering, School of Information Technology, School of Medicine and Health Sciences Jeffrey Cheah School of Sciences and the School of Pharmacy.	(Mean, standard deviation, median, minimum descriptive statistics and maximum) frequency and internal consistency percentage (Cronbach). Wilcoxon test Mann-Whitney test was conducted in abnormal cases distributed data	Research the prevalence of academic exhaustion as well as exploring the potential relationship between academic burnout and eating disorder among college students.	66.7% of participants had a high level of exhaustion, 58.3% tuvieronbalto level of Cynicism and 50.0% had low academic efficiency. 11.4% of participants had a low level of academic burnout, 25.0% had a medium level and 63.6% high level. Exhaustion Moderate Low 20 15.1% 24 18.2% 88 66.7% High Cynicism 9 6.8% Moderate Low 46 High 77 34.9% 58.3% Academic effectiveness Moderate Low 66 50.0% 48 36.4% 18 13.6% High
Atalayin et al.	2015	Turkey	Preclinical Dentistry School students randomly selected Dentistry (n = 329, 50.5% women and 49.5% men) from 18 to 24 years old	Pearson Correlation was used to establish the relationship between variations; ty testing the way ANOVA was also used to test if the variation dependent with respect to independent changes differed. Chi-square (c2), Mean square error of approximation (RMSEA)	investigate the prevalence of burnout among a group of Turkish students in pre-clinical dentistry	22.3% of students had a high level of emotional exhaustion, 16.7% of students had a high level of cynicism and 17.9% of students were suffering from a high level of academic effectiveness reduced.

Eren et al.	2016	Turkey	Preclinical and clinical students at the Faculty of Dentistry at the University of An¬kara in Turkey periods. 458 dental students were included.	simple descriptive statistics, Kruskal-Wallis test was performed, the correlation analysis and t test. Statistical significance was indicated by P <0.05.	To investigate the prevalence of burnout and limiting occupational participation among students of a dental school in Turkey.	26% of students were exhausted and 25% of the students had emotional exhaustion, 18% of students had cynicism and 14% of the students had academic effectiveness reduced.
Bughi et al.	2017	USA	182 medical students of 1st year at a school in urban medicine in California. (52.3%) were male students.	descriptive to report demographics and prevalence statistics. We check the quality of the data using effect sizes and reliability. Parametric tests based on our adequate sample size and distribution.	To examine the relationship between levels of stress and burnout.	Higher scores were reported by exhaustion 118/182 (64.8%), cynicism in 76/182 (41.8%), and decreased professional effectiveness in 38/182 (20.9%) 21 (11.5%) of respondents had high scores in the three dimensions of exhaustion (i.e. , exhaustion, cynicism, and decreasing professional effectiveness), 6 (3.3%) of moderate level 6 (3.3%) and low scores 149 (81.9%).

Table 2. Summary and characteristics of the final studies selected

2.1.4 Discussion

The primary objective of this study was to synthesize evidence from previous research over the past five years on the prevalence of BS levels in its three-dimensional approach (only the use of the MBI-SS instrument, specifically for undergraduate university students) by conducting a systematic review of university students worldwide. Information in the overall prevalence of each dimension of the syndrome was estimated at 55.4% for emotional exhaustion, 31.6% for cynicism and 30.9% for academic efficacy. Overall in the BS, there was almost a 40% prevalence in the selected studies. Hence, showing a considerably high prevalence globally and also individually in each study. By career, the highest prevalence levels were found in medical careers (Almaki et al., 2017; Bughi et al., 2017; Boni et al., 2016), nursing careers (da Silva et al., 2014), and engineering and information technology students (Kristanto et al., 2016). In contrast, there were lower levels in students of Arts, Social Sciences, Business (Kristanto et al., 2016), and Dentistry (Atalayin et al., 2015; Eren, 2016).

A comparison of the results between the different studies selected shows how they are very diverse. High levels of prevalence of the BS depletion dimension were found in studies conducted among medical students in Saudi Arabia (Almaki et al., 2017), medical students in Brazil (Boni et al., 2016), (da Silva et al., 2014), nurses in Brazil (da Silva et al., 2014), in students from various university courses such as Arts and Social Sciences, Business, Engineering, Information Technology, Medicine, Health Sciences and Pharmacy from Malaysia (Kristanto et al., 2016), and in medical students from the United States (Bughi et al., 2017). In contrast, European medical students in Hungary (Győrffy et al., 2016) and Turkey (Atalayin et al., 2015) had lower levels of depletion prevalence than before. The highest prevalence levels of the cynicism dimension were found in medical students from Saudi Arabia (Almaki et al., 2017) and again in students from Malaysia (Kristanto et al., 2016). Two studies in Eurasia Turkey found low levels among dentistry students (Atalayin et al., 2015; Eren, 2016). They were also moderately low in Central European students in Hungary (Győrffy et al., 2016). In this overall analysis it could be seen that, at least in the selected studies, the highest levels of BS prevail over students from Latin America, the USA and Asia, while in European students the levels found in the dimensions exhaustion and cynicism, the two main dimensions of BS in university students, were considerably lower. The possible explanation for the cause of

these two particular situations would require another study, although we find this peculiarity very interesting.

Two studies, similar to our systematic review, have been conducted in recent years with different results. But these researchers use different instruments from the MBI-SS, which is the specific one for students, and at the same time they can be compared with other similar studies in the evaluation of the prevalence of the syndrome. On the opposite, they will have done the research more exhausting and uncertain. On the other hand, by using the MBI-SS, we will have approached to certainty, so here is the difference and fundamental contribution of our study. The greater number of studies in the other systematic reviews with or without meta-analysis is given because they do not discriminate the instruments. In fact, some were elaborated and validated only for populations of employees and not students. Consequently, they would not be evaluating what is really desired: levels of BS in students.

At the same time, we also consider that to study prevalence only in medical students could be a mistake, because even though it is in this population where the syndrome has been studied the most, this might not represent the reality of its prevalence since it is also very common in most university students as other studies show (Kristanto et al., 2016; Boni et al.; 2018; Ferrel et al., 2017). As a matter of fact, our study does not discriminate student populations from any other part of the world, because the selection of students is based on their quality according to the STROBE criteria and therefore may or may not include studies from all regions and may or may not gain in representativeness as a possible limitation.

Examples of these studies are those conducted by Frajerman, Morvan, Krebs, Gorwood, & Chaumette (2019). This was aimed at estimating the prevalence of BS in medical students worldwide. The BS should have been evaluated using a validated scale (in this case the Maslach Burnout Inventory or the Copenhagen Burnout Inventory, which, as mentioned above, neither instrument was developed for students and comparing studies is complicated by the difference in dimensions that make up the syndrome between the two instruments). The prevalence was 8060 undergraduate students suffered from BS (44.2%). Information on the prevalence of each dimension of the syndrome was estimated at 40.8% for emotional exhaustion, 35.1% for depersonalization and 27.4% for personal achievement. In our study the overall prevalence of each dimension was 55.4% for emotional exhaustion, 31.6% for cynicism and 30.9% for academic effectiveness. In this

case only the exhaustion dimension would coincide because in the other cases depersonalization is neither considered cynicism nor personal achievement as academic efficacy. Even though the first dimension matches the name, it is not the same because the first one is work product of emotional exhaustion, but the one we study is product of the research according to the instrument we used.

And the second research made by Erschens et al. (2019), with the same objective as the first: to analyze the prevalence of BS among medical students. But in this case we used only studies that applied the Maslach Burnout Inventory Human Services Survey (MBI-HSS) instrument, an instrument that is focused on the detection of the syndrome only in service employees populations, a similar situation to the previous study in terms of the instruments used for employees adapted to students. The weighted mean values for the three dimensions of the MBI-HSS were M¼22.93 (SD¼10.25) for Emotional Exhaustion, M¼8.88 (SD¼5.64) for Depersonalization, and M¼35.11 (SD¼8.03) for Self-Realization. The rates of professional exhaustion ranged from 7.0% to 75.2%, in our case the oscillations found were between 9.8% and 70.6%, relatively similar, although it is difficult to analyze and compare them due to the instrument used for workers, similar to the previous case.

Our study assumes that BS may occur in any university population, and not only in medical students, as demonstrated by the results of this systematic review. There are examples of other similar quality reviews, but framed only for populations of medical students (Dyrbye & Shanafelt, 2016; Erschens et al. 2018; Chunming et al. 2017).

In our case, the spectrum was extended to all types of undergraduate university students, since it might be considered a mistake to think that the university burnout occurs only in medical students, even though it has been more studied in them. In addition, the MBI-SS instrument is considered to be the most suitable and specific instrument for diagnosing burnout in these student populations. The use of other instruments is considered to not really assess the syndrome in this population as they are not specific for this population, therefore, only the studies that used this instrument were considered in this review.

Three included investigations from Europe and the United States made some difference in the overall results of our study because of the moderate levels found. This may have led to a slight reduction in the average prevalence found, at least in the depletion and cynicism dimensions. Overall, BS levels, at least in the studies analyzed in this systematic

review, were slightly higher in university students from Latin America than from Europe and the United States.

The strength of this study is to consider it as one of the first reviews that takes into account all undergraduate university student populations, regardless of the degree they study, and not just health and specifically medical students as is the case with most similar reviews to date. In addition, it only includes studies that use MBI-SS as it is the most specific and validated instrument for this population. In contrast, the limitations are that, while a comprehensive systematic review was conducted in the main international databases, the quantitative level of meta-analysis was not reached. Only a search of materials published in the last five years was carried out: this may be a strength in really presenting the latest research on the subject, but it could also be a limitation for not going further in time. What is more, the prevalence values by career and age group of students are not specified.

For future studies it would be recommended to analyze why there is such a high prevalence of this syndrome among university students, by possibly performing a meta-analysis. To determine whether sex or gender influences the prevalence levels of BS in student populations or is a determining factor, through correlational studies. Also determine whether the prevalence is higher in undergraduate students than in other types of students (e.g., graduate or high school). In addition, determine the possible explanation as to why higher levels of BS are prevalent among students in Latin America, the United States and Asia, while lower levels are found among European students. Finally, it is proposed to carry out psychological, psychosocial and health promotion intervention studies in this important population.

As it can be seen from previous studies, moderate levels of BS generally prevail in the different populations of university students of various degrees worldwide. In only a few studies the prevalence is low and could be due to multiple evaluative variables that are not the case in our study. The prevalence of each dimension of the syndrome was estimated at 55.4% for emotional exhaustion, 31.6% for cynicism and 30.9% for academic efficacy. Consequentially, showing a considerable high prevalence globally and also individually in each study. The female gender (62.7%) was most affected by the syndrome over men (37.3%).

2.2 EFFECTS OF EXERCISE INTERVENTIONS IN PATIENTS WITH BURNOUT SÍNDROME: A SYSTEMATIC REVIEW WITH META-ANALYSIS

2.2.1 Introduction

The Burnout Syndrome (BS), is a mental health problem of great social impact (insert reference). The currently growing interest in this topic has facilitated the extension of it´s field of study, progressively moving from health professionals field, to other professional fields and other areas as it is the case of university students (Rosales et al., 2018; Segura, 2014). Freudenberg (1974) used the term Burnout for the first time to describe a set of physical symptoms suffered by the health personnel as a result of their working conditions. He described BS as a sense of failure and an exhausted or worn out existence that resulted from an overload due to demand of energy, personal resources or spiritual strength of the worker.

Maslach & Jackson (1981) stated that BS is configured as a three-dimensional syndrome characterized by emotional exhaustion, depersonalization and reduced personal fulfillment. Currently most studies are framed in a three-dimensional approach which claims that BS is composed of emotional exhaustion, depersonalization and loss of personal fulfillment at work (Li et al., 2018; Mikalauskas et al., 2018; Kavanagh, & Spiro, 2018; Armenta-Hernández, et al, 2018; Bruschini et al., 2018, Kawamura et al, 2018, Roskam, et al., 2017, Leiter & Maslach, 2017; Schoenfeld & Bianchi, 2016). Meanwhile and in the case of students, the three dimensions would be emotional exhaustion, cynicism and efficiency or academic self-efficacy (Erschens et al, 2018; Liu et al, 2018; Liébana-Presa et al., 2017; Erbil et al., 2016). Clearly, university students like any other workers/professionals, are under pressure and overloaded in terms of typical academic work.

Therefore, effective intervention programs developed to prevent or treat burnout syndrome are essential to improve the health and well-being of both workers and students. Without them, they are likely to suffer from poor mental health both at work or in study prevailing the incidence of risk factors for mental illness. Review studies (Colin et al., 2016) have shown that the vast majority of research studies conducted to prevent and treat BS, in both workers/professionals and university students, are based on psychological and cognitive interventions, and that more limited evidence exists to support the use of physical activity, including exercise and sport interventions However, many authors

support the idea that regular physical exercise has positive and beneficial effects for an holistic human development including the physical (Montero-Herrera et al., 2019; Comin et al., 2018; Jen-Hao et al, 2018; Foright, Presby, & Sherk, 2018), the mental (Soriano-Gillué et al., 2018; Colledge et al., 2018; Goit et al, 2018; Wiklund, 2016) and the socio-affective domains (Baillot et al, 2018; Bultijnck, 2017; Womble et al., 2014).

Additionally, and according to the World Health Organization (2014) physical exercise is a variety of physical activity, planned, structured, repetitive and performed with an objective purpose related to the improvement or maintenance of one or more components of physical fitness. Thus, regular physical exercise is seen as an effective intervention tool which can be used to reduce the levels of Burnout both in workers/professional and students suffering from this harmful syndrome. The *aim* of the present systematic review with meta-analysis was to identify the magnitude of the effects of the intervention programs with physical exercise in patients with Burnout syndrome. Only intervention studies were selected to integrate this systematic review with meta-analysis.

2.2.2 Methods

Search strategies

The search strategies used followed the PRISMA (Moher et al., 2009) guidelines and were based on the following descriptive terms defined by the authors and indexed in the Medical Subject Headings (MESH): "exercise", "physical activity", "burnout". The following combinations were used: "exercise" and "burnout", "physical activity" and "burnout". The search was conducted in English, Spanish, and Portuguese language using the same combinations. The combination of these keywords were used to search in the following electronic academic journals databases: Pubmed (www.ncbi.nlm.nih.gov/pubmed/), ISI Web of Knowledge (www.webofknowledge.com), Scielo (http://www.scielo.org), ScienceDirect (https://www.sciencedirect.com) and PsycoINFO (http://www.apa.org/pubs/databases/psycinfo/index.aspx). The advanced meta-search option was carried out using the resources from each database. The research advanced procedures were carried out from 1st to30th of March 2018. All articles published until 30th of March 2018 were included in this study.

Data extraction

Two different researchers performed the initial searches using the list of keywords developed by the authors for the present analysis. The following screening procedures were implemented to determine if the articles obtained in the initial searches were relevant for the present study: a) Titles reading, if the titles seemed relevant, the citations were saved in a specific software (Mendeley Desktop 1.17.13). After the initial screening all duplicates were removed; b) Abstracts reading, if the abstracts did not provide enough information related to the inclusion criteria or that seemed unavailable, were excluded from the study; c) Full-text articles reading, if the articles did not meet the inclusion criteria, they were excluded from the study; d) in case of disagreement between researchers, a third opinion was requested from an independent reviewer to help with the evaluation (included, excluded and doubtful) and discussion of the articles until consensus was obtained for the inclusion or exclusion of the article in the systematic review with meta-analysis; e) Quality of the information (QoI) verification was performed for each study using TREND (Des Jarlais, Lyles, & Crepaz, 2004) statement to evaluate the methodological quality of the studies (Vallvéa et al., 2005). This was done to ensure the reliability of the data obtained and the quality of the selected studies and the conclusions that may derive from them. A total score equivalent to a value above 50% of the items correct was defined to accept the study for the present meta-analysis, this is, 11 or more out of 22 possible items. In addition, and if during the full-text articles analysis a study showed to provide incomplete data, authors were contacted by email requesting for the missing information. If no response was obtained, that article was excluded from the study (see table 3).

Table 3. TREND analysis of the systematic review.

Author (year)	Title and Abstract	Introduction and Background	Methods and Participants	Methods and Participants	Objetives	Methods: variables	Methods: sampling size	Methods: assignment method	Methods: masking	Methods: analysis unit	Methods: statistical methods	Results: participants flow	Results: recruitment	Results: baseline data	Results: baseline data equivalence	Results: quantitative analysis	Results: trends	Results: secondary analyzes	Results: adverse events	Discussion: interpretation	Discussion: extrapolation	Discussion: evidence together	Total sum items	Total percentage
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	XXII	22	100 %
1. Han Hui Tsai et al. (2013)	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0	1	1	0	0	1	0	1	16	72,7 %
2. Méndez-Cerezo, (2011)	1	1	1	1	1	1	1	0	0	0	1	0	1	1	0	1	0	0	0	1	0	1	12	54,5 %
3. Gerber et al. (2013)	1	1	1	1	1	1	1	1	0	0	1	0	0	1	0	1	0	0	0	1	0	1	13	59,1 %
4. Freitas AR et al. (2014)	1	1	1	1	1	1	0	0	0	0	1	1	0	1	0	1	0	0	0	1	0	1	12	54,5 %
5. Weight et al. (2013)	1	1	1	1	1	1	1	0	0	0	1	0	0	1	0	1	0	0	0	1	0	1	12	54,5 %
6. Bretland and Thorsteinsson, (2015)	1	1	1	1	1	1	1	1	0	0	1	1	0	1	0	1	1	0	0	1	0	1	14	63,6 %
7. de Vries et al. (2016)	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0	1	0	0	0	1	0	1	15	68,2 %
8. de Vries et al. (2017)	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0	1	0	0	0	1	0	1	15	68,2 %
9. Gerber et al. (2015)	1	1	1	1	1	1	1	1	0	0	1	0	1	1	0	1	0	0	0	1	0	1	14	63,6 %
10. Eskilsson et al., (2017)	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0	1	0	0	0	1	0	1	15	68,2 %

11. Stenlund et al., (2012)	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0	1	0	0	0	1	0	1	15	68,2 %
12. Stenlund et al., (2009)	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0	1	0	0	0	1	0	1	15	68,2 %
13. Alexander et al. (2015)	1	1	1	1	1	1	1	1	0	0	1	1	1	1	0	1	0	0	0	1	0	1	15	68,2 %
Total mean percentage																								**64,0 %**

Selection criteria

The *inclusion criteria* for the studies were: i) any type of physical activity including exercise or sport activities; ii) intervention studies from any of the experimentation levels (pre, quasi or experimental); iii) any type of intervention using exercise or sport as a therapeutic intervention tool aiming to modify the incidence of the Burnout symptoms; iv) any population or age group.

Regarding to the *exclusion criteria*, four major aspects were considered: i) studies that presented evidence of results that did not include the burnout syndrome in their analysis and instead only other psychosomatic disorders; ii) descriptive studies where only diagnoses of burnout syndrome were made without intervention; iii) studies where interventions were only proposed, but not implemented; iv) correlation studies where only the analysis of existing correlations between the burnout syndrome and any type of physical activity was performed.

Quality assessment (QA)

The present study followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement (Liberati et al., 2009; Panic et al., 2013) for organizational purposes. PRISMA describes the four stages (identification, selection, eligibility and final selection) needed to perform the search and selection of manuscripts within the systematic review with meta-analysis (SRM) and presents the graphical option of drawing a flowchart of the study.

Additionally, the present SRM follows the PICOS acronym ("patient, problem or population", "intervention", "comparison or control", "outcomes" and “study design") that directs the refinement of systematic research, making the process more effective (Panic et al., 2013). Subsequently, qualitative data was extracted from the articles included in the study and organized into a specific table, according to the PRISMA method. The different items included author, year of publication, country where the study was conducted, sample (type and amount), age and gender of the sample, type of study, research design, the instrument used to measure Burnout syndrome, type of physical activity in the intervention, controlled factors in the study, statistical treatment, main objective of the study, main results of the study.

The quality of the information (QoI) from the articles included in the systematic review was assessed based on the Transparent Evaluation Report with Non-Randomized Designs (TREND) positioning guidelines Statement (Fuller et al., 2014; Mayo-Wilson et al.,

2013). The method evaluates a checklist of 22 items (general criteria) subdivided into 59 sub-items (specific criteria) capable of quantitatively assess the quality of the information. To each completed position and sub-position is assigned one point. The checklist was elaborated by two investigators separately. A minimum criterion of QoI ≥ 50% was pre-defined to select an article to be included in the final meta-analysis, qualifying it as of high relevance for the subject under study.

Publication bias

An exhaustive search of the literature was carried out in order to locate published and unpublished studies within the current topic. The final set of studies in the SRM was calculated in a funnel plot using the standard error (Y axis) and the standard difference in means (X axis) to determine whether the plot was balanced. According to the literature, the funnel diagrams are symmetric or asymmetric. Studies without publication bias are symmetrically distributed over the mean effect size, because the sampling error is random. Whereas, studies with publication bias are expected to follow the model, with a symmetry at the top, a few studies missing in the middle and more studies missing near the bottom. Because the interpretation of the funnel plot is largely subjective, different tests have been proposed to quantify or test the relationship between sample size and effect size (Egger et al., 1997). In the present study, the visual impression of the funnel plot is confirmed by the Egger's test that, in case of publication bias, yields a statistically significant p-value.

Effect size calculations

The effect size was calculated using the software Comprehensive Meta-Analysis (CMA) version 2 (Borenstein et al., 2006). The metric of the effect size selected was standard difference in means, since all studies evaluated the same result, but measured it with different criteria. In such circumstances, it is necessary to standardize the results of the study on a uniform scale before they can be combined (Borenstein et al., 2009).

The data extracted from the different included studies used the previous and subsequent mean. (M), the standard deviation (SD), the sample size (N) and the effect direction as primary methods for calculating the size of the effect. If these data were not available, the F values and the pre-post correlation values were extracted and used. A random effects model was used for the present meta-analysis, since it uses both the sampling error and the variance between studies to estimate the effect size (Borenstein et al., 2009). Standard deviations and sample size values were presented in the manuscript. Effect sizes (Cohen's

d) were calculated for the central outcome of studies (Burnout incidence). Thresholds were used to interpret the effect sizes were: trivial ($d \leq .20$), small ($.21 < d < .50$), moderate ($.51 < d < .79$) and large ($d > .80$) (Batterham & Hopkins, 2006).

Variance heterogeneity

It was assumed that there would be variability in the actual size of the effects between the studies due to the expected differences in the sampling error and between the variances of the studies. The following statistics were used to quantify the heterogeneity between the studies: Q value, I squared (I^2), tau squared (τ^2) and tau (τ). The Q Cochran statistic is used as a test of significance to test the null hypothesis and evaluate whether all the manuscripts involved in this SRM share a common effect size. Any variation is due to the error of the sample within the studies. If all the studies share the same effect size, the expected Q value is equal to the degrees of freedom (df), that is, the number of studies minus one. The I^2 statistic corresponds to the quotient of the real heterogeneity of the total variation of the observed effects, that is, it shows the proportion (percentage) of the observed variance that reflects the differences in the actual size of the effect rather than the error of the sample (Dinnes et al., 2005). τ^2 is the variation of the true sizes of the effects (in units of record) between the studies, while the value τ refers to the standard deviation of the true effects.

2.2.3 Results

Studies selection

The overall analysis of the databases revealed 4768 studies related with the descriptors used in the systematic search. Most of these had no direct link with the burnout syndrome and physical activity topic or were not about the syndrome itself, thus, 4101 were excluded. Six hundred and sixty-seven manuscripts were selected for initial screening. After examining the titles and the summaries 631 were excluded due to different reasons narrowing down the number of manuscripts to 36. After reading the full text we realized that some of them did not include longitudinal intervention with any sort of physical activity.

Thirteen selected studies including longitudinal intervention with some level of experimentation (pre, quasi or experiment) with random or non-random sampling were included in the final group. It was found that 8 of those studies (61.5%) used the Maslach Burnout Inventory in any of its versions, and 4 of them (30.8%) used the Shirom-

Melamed Burnout Questionnaire. Three studies (23.1%) were conducted in North America, one (7.7%) in Asia, two (15.4%) in Latin America and 7 (53.8%) in Europe. Considering the types of exercise used we found 8 studies (61,5 %) where the intervention was performed only with aerobic exercise, while two other studies (15.4%) used combined aerobic and strength exercises. Finally, 2 studies (15.4%) used the oriental gymnastics Qigong and one study (7.7%) applied yoga movements. The characteristics of each study are detailed in Table 4.

Table 4. Characteristics of the included articles selected for the TREND analysis.

STUDY	TOTAL SAMPLE	AGE	TYPE OF STUDY / DESIGN	GENDER	MEASURE OF BS	INTERVENTION	CONTROLLED FACTORS	STATISTICAL TREATMENT	MAIN GOAL	RESULTS
Han Hui Tsai et al., (2013)	Taiwan Bank workers n=89	G1 33,3±9,4 G2 34,8±7,0 G3 41,0±7,2	Intervention Not random Control group: exercise regimes on their own. Low intensity group: one session of exercises per week. Intensity group: two sessions of exercises per week.	M/F	Copenhagen Burnout Inventory (C-CBI)	Work gymnastics for office workers (15 min.), Aerobic exercises (30 min.) And stretching (15 min.).	Burnout syndrome Metabolic syndrome	Descriptive and frequency statistics, variance, linear regression	Estimate the effects of exercise on the relationship between Burnout Syndrome and Metabolic Syndrome	The effective focus of the exercise intervention in the workplace and the intensity of the exercise played an important role in reducing BS levels.
Méndez-Cerezo, (2011)	México Medical residents n=20	26.85 ± 1.69	Intervention Random Intervention group (10): Aerobic exercise Control Group (10): without activities	M	*Maslach Burnout Inventory* (MBI)	Aerobic exercise sessions monitored by means of the heart rate	Burnout syndrome	Descriptive and comparative statistics with the tests of Wilcoxon and Friedman.	Evaluate the exercise as an intervention strategy to reduce the degree of Burnout in resident doctors.	Reduction from severe to mild grade with values of 2.48, 1.78, 1.75 corresponding to weeks 0, 4 and 8 of the study (p = 0.001).
Gerber et al., (2013)	Basel (Switzerland) Miscellaneous n=12	45.8 ± 6.8	Intervention Not random An intervention group with pretest and posttest.	M	*Maslach Burnout Inventory* (MBI)	Aerobic exercises: ANTISPASM automatic bike, rolling mat, and a rowing ergometer done for about an hour, two or three days per week.	Burnout syndrome	Descriptive and frequency statistics, variance, linear regression	Explore whether a three-month aerobic exercise workout reduces BS levels.	Reduction of perceived general stress, symptoms of BS and depression. The magnitude of the effects was large, revealing substantial changes in practice. The mood profiles improved considerably after the individual exercise sessions.
Bretland and Thorsteinsson, (2015)	New England Several workers and students n=52	36.8 ± 13.51	Intervention Random Control group: without activity Intervention group 1: with aerobic exercises Intervention group 2: with strength exercises.	M/F	*Maslach Burnout Inventory* (MBI)	Not specified aerobic and strength exercises applied 3 times a week for 30 min.	Burnout syndrome Stress	Descriptive statistics Analysis of covariance Pearson correlations	Compare the cardiovascular exercise with strength exercise to assess its relative effectiveness in the	Cardiovascular exercise increases the well-being and decreases psychological distress, perceived stress, emotional stress and BS. The strength exercise was effective to increase well-being

									well-being, perceived stress and BS	and personal fulfillment and to reduce perceived stress.
de Vries et al., (2016)	New England Several workers and students n=97		Intervention Random Intervention group: they were intervened with physical exercises Control group: they did not perform any activity.	M/F	*Maslach Burnout Inventory-Students Survey* (MBI-SS)	Aerobic exercise 60-minute sessions: warm-up of about 15 minutes (runs of low intensity alternated with walking exercises and flexibility), a basic alternating running program with a 30-minute walk, and 15-minute cooling. During the six weeks	Burnout syndrome Stress Cognitive function	Descriptive statistics	Evaluate the effectiveness of an intervention with exercises to reduce BS levels in students.	Participants in the intervention group showed a greater overall decrease in BS levels related to the study, compared to controls.
de Vries et al., (2017)	Nijmegen, Netherlands Miscellaneous workers n=96	G1 44.2 ± 11.9 G2 46.29 ± 9.30	Intervention Random Intervention group: they were intervened with physical exercises Control group: they did not perform any activity.	M/F	*Maslach Burnout Inventory* (MBI)	Aerobic exercise (runs) of low intensity three times a week for six consecutive weeks.	Burnout syndrome Stress Cognitive function	Descriptive statistics	Evaluate the effectiveness of the intervention with exercises in reducing BS levels in workers.	Intervention group reduction in BS levels and general fatigue, better sleep quality, work capacity and self-reported cognitive function than the control group
Gerber et al., (2015)	Basel (Switzerland) Miscellaneous workers n = 169	42,74 ± 9,34	Intervention Not random Intervention Group 1: General instructions and training with physical exercises. Control group 2: General instructions only.	M/F	Shirom–Melamed Burnout Measure	Not specified aerobic exercise program for 18 weeks.	Burnout syndrome	Univariate analysis of variance (ANOVAs) and Chi-square Evidence of differences between reference groups.	Examine changes in exercise habits in patients with BS.	The symptoms of BS related to stress were reduced with the application physical exercise program.
Eskilsson et al., (2017)	Umeå (Sweden) Miscellaneous workers n = 88	45.31 ± 7.7	Intervention Random Intervention group: aerobic physical exercises. Control group: no activities.	M/F	Shirom-Melamed Burnout Questionnaire (SMBQ)	Aerobic physical exercises of moderate intensity for 12 weeks. Spinning in group. 40-minute sessions, three times per week	Burnout syndrome Cognitive function	Pearson's Chi2 tests (categorical variables) and independent sample t tests (continuous variables)	Investigate the effects on cognitive performance and psychological variables of an aerobic	No further improvements in BS levels, depression or anxiety were observed in comparison between the intervention group and the control group.

									training program in patients with BS	
Stenlund et al., (2012)	Umeå (Sweden) Miscellaneous workers n = 136	25–55	Intervention Random Group (A): cognitive behavioral rehabilitation oriented in combination with Qigong Group (B): Qigong only.	M/F	Shirom-Melamed Burnout Questionnaire (SMBQ)	The Qigong program consisted of three parts: 1) warming (2) movements that affect the body awareness, balance and coordination, breathing and muscle tension; and (3) relaxation and attention.	Burnout syndrome Stress	Descriptive statistics	Evaluate the long-term effects of two different rehabilitation programs for patients with BS.	Patients in group A reported being significantly more recovered from their BS levels (p = 0.02). They reduced their use of medications for depression (p = 0.002) with a value above group B´s rate.
Stenlund et al., (2009)	Umeå (Sweden) Miscellaneous workers n = 82	44.3 ± 9.1	Intervention Random Intervention Group: Qigong Control group; no intervention	M/F	Shirom-Melamed Burnout Questionnaire (SMBQ)	Qigong session: warming movements; basic movements of body awareness, balance and coordination, breathing and muscle tension; relaxation and full body attention	Burnout syndrome	Descriptive statistics	To evaluate the efficacy of Qigong in the rehabilitation of patients with BS.	There are no significant differences in treatment efficacy between the groups. Both groups improved significantly over time, with reduced levels of BS, fatigue, anxiety and depression. There was also an increase of dynamic and physical balance capacity.
Alexander et al., (2015)	Texas Hospital nurses n = 40	46.38 ± 10.23	Intervention Random Intervention group: Yoga. Control group: no activity was applied.	M/F	*Maslach Burnout Inventory* (MBI)	Yoga postures, deep breathing, simple meditations. For 8 weeks.	Burnout syndrome	Descriptive statistics	Examine the effectiveness of yoga in reducing BS in nurses.	Control group showed no changes. Intervention group showed significant improvement in the final BS scores (p = 0.008).

The TREND methodology guidelines were applied to 13 eligible articles included in the final revision to assess the QoI, with a global average value of 64%. Results with a minimum of 55% of QoI were accepted and regarded as satisfactory for the quantitative evaluation and included in the systematic review with meta-analysis (see table 1). In QoI assessment process, two studies were excluded because they did not reach the QoI minimum values as they did not present enough statistical information needed for the meta-analysis, leaving 11 studies ready to be analyzed using the Comprehensive Meta-analysis software version 2.0. The selection process is summarized in the flow PRISMA diagram (see figure 2).

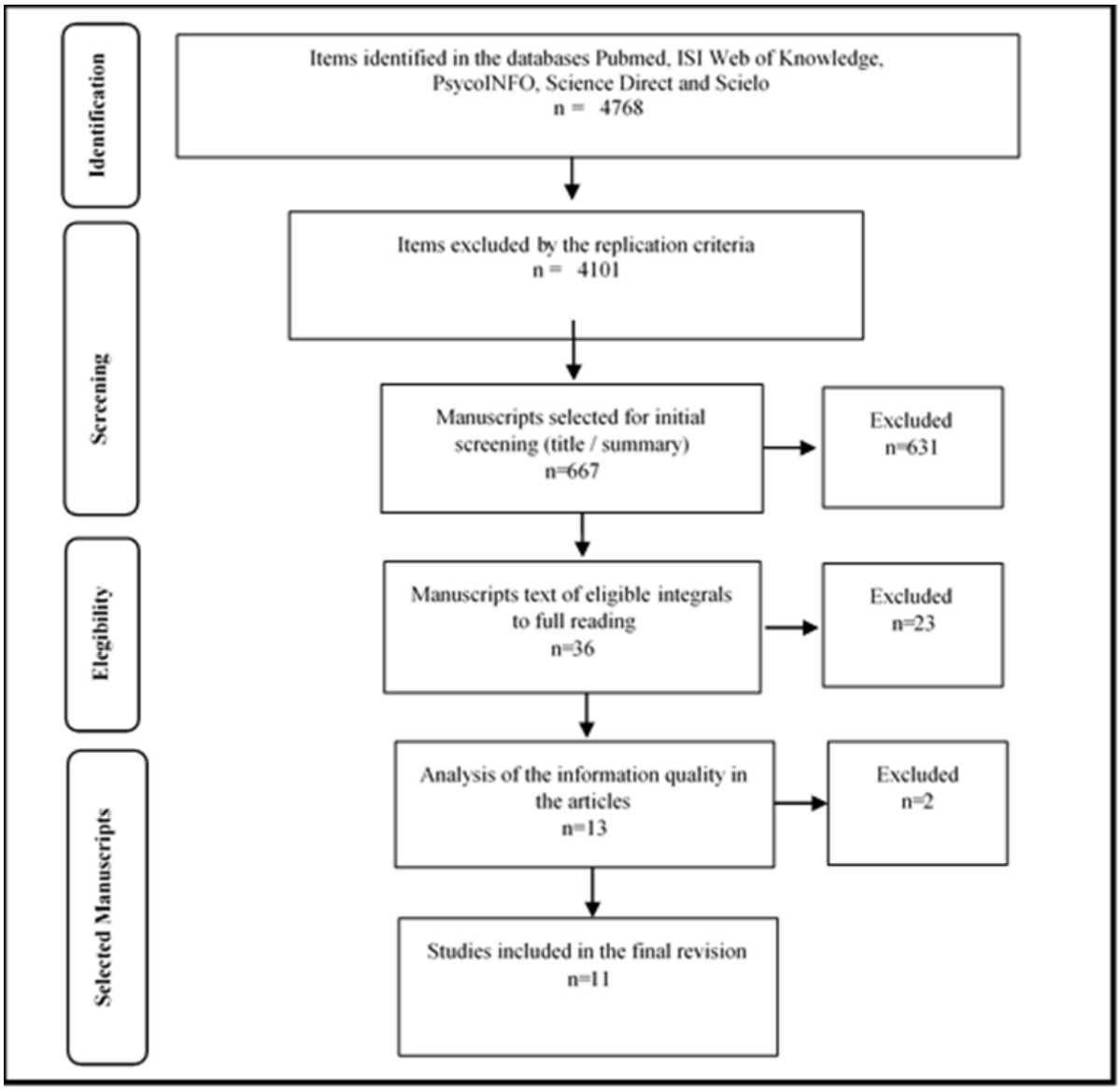

Figure 2. Scheme of information about the different phases of systematic search through the positioning PRISMA guidelines.

The meta-analysis was performed with the 11 studies with a total number of 881 patients. In these articles, the emotional exhaustion dimension of the BS was analyzed since it was a common factor. The mentioned studies used either the Maslach Burnout Inventory (MBI), the Shirom-Melamed Burnout Questionnaire (SMBQ) or the Copenhagen Burnout Inventory (C-CBI). In spite of the different instruments used in each study to assess emotional exhaustion in any of it´s forms, the results of the assessment are similar. On the other hand, just 3 studies assessed, apart from the emotional exhaustion, the depersonalization and the personal accomplishment dimensions, however in the number is not enough to allow a quantitative evaluation.

Meta-analysis outcomes

The 11/13 studies included in this SRM (De Vries et al., 2017; Eskilsson et al., 2017; De Vries et al., 2016; Gerber et al., 2015; Han Hui Tsai et al., 2013; Gerber et al., 2013; Stenlund et al., 2009; Bretland et al., 2015; Alexander et al., 2015; Stenlund et al., 2012; Méndez-Cerezo, 2011) were all non-randomized intervention trials. They followed the same research testing whether intervention programs with physical exercise would produce a positive effect on the reduction of levels of intensity of the Burnout Syndrome. The variation of the results was analysed based on the average of the individual experiences to burnout before and after the intervention with physical exercise. The effect size is represented here by the standard difference in means, expressing the effect size of the intervention in each study regarding the variability observed in the same study. In fact, the intervention effect is the result of the difference in means and not the result of the mean of the differences.

Effect model used

The random-effects model was used for the present meta-analysis as it combines sampling error and between-study variance to estimate effect size (Borenstein, Hedges, Higgins, & Rothstein, 2009). The 11 studies included in the meta-analysis were diverse in terms of participant's methodologies used, types of physical exercises applied in the intervention, and different populations and samples sizes.

Effect size of differences between groups

The main question of this study of systematic review with meta-analysis is to identify the magnitude of the effects of intervention programs with physical exercise in patients with Burnout Syndrome. The effect size was determined by the difference in means. This difference between the two groups analyzed is 0.417. This means that the patients belonging to the control group (no exercise) have 0.4 times higher levels of intensity of Burnout Syndrome compared with those included in the intervention groups (intervention with exercise), when fulfilled the inclusion and exclusion criteria of the study. The confidence interval for the difference in means is 0.249 to 0.586. This means that the raw difference in means in the population studied can be located somewhere in the previous interval. This result does not include the differences of zero since the true difference in means is probably different from zero (see figure 3).

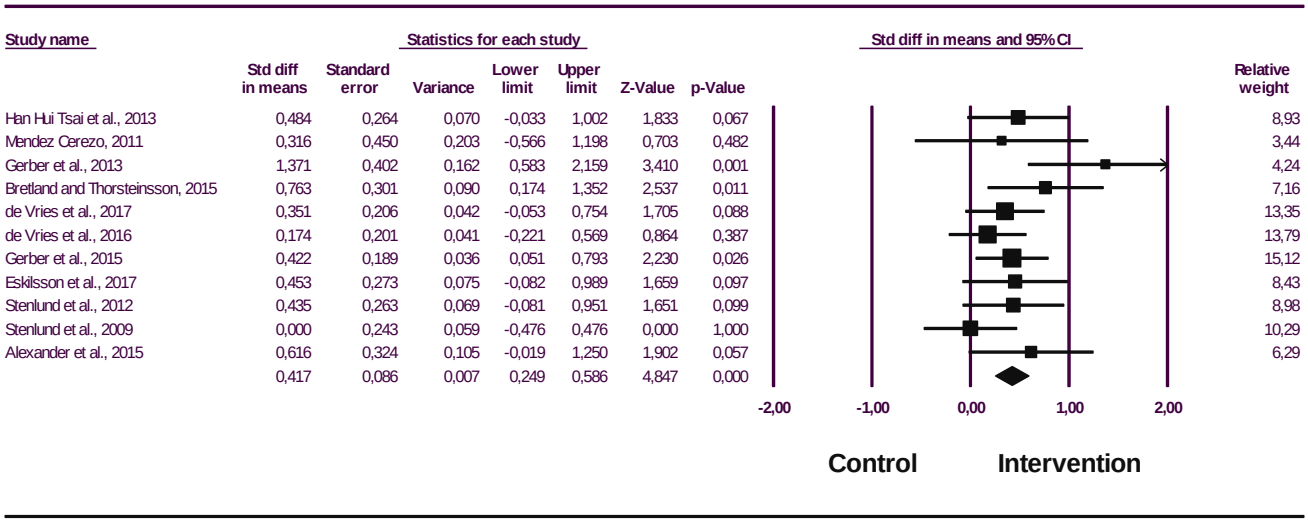

Figure 3. Forest plot of meta-analysis

In this study the Z values, that were obtained to test the null hypothesis, where the difference in means is zero, showed a Z = 4.847 with a value of p <0.05. Thus, the null hypothesis was rejected and the alternative hypothesis accepted. In all analysed studies those patients who did not do any type of physical exercise showed an increase on the incidence of BS symptoms, with a standard difference in means of 0.4 points when compared with doses who did intervention with physical exercise (see table 5).

Homogeneity of the effects

Another important aspect in the study is to determine whether the effect size varies across studies. Observed effect size usually varies from study to study with some level of variation associated to the sampling error Therefore it is important to analyze if this observed variation falls within the interval attributed to the sampling error, which would mean a lack of evidence in the variation of the true effects or, on the other hand, if it exceeds this interval. For this reason, two parameters were used. First, the Cochran Q value was used to test the null hypothesis that all studies included in the SRM shared a common effect size, and if any variation would be due to the sample error within the studies. If all the studies share the same effect size, then the Q value is equal to the degrees of freedom, i.e., the number of studies minus one. The Q value is 11.966 with 10 degrees of freedom and with a $p=0.287$ ($p>0.05$), thus accepting the null hypothesis in which the true effect size is the same in all studies included in the SRM (see table 3). While the observed variation falls within the range that could be due to the sampling error, our estimate of the variance in true effects is not zero, as reflected in the following statistics. Moreover, the I^2 corresponds to the true heterogeneity ratio of the total variation of the observed effects, indicating the percentage of the observed variance that reflects the true differences in effect size, instead of the sampling error. In this meta-analysis $I^2 = 16.430$ which means that approximately 16.43% of the difference of the observed effects reflects the difference of the true effects, exposing a low percentage of heterogeneity between the studies, which allows an adequate interpretation of the results (see table 5).

On the other hand, T^2 corresponds to the difference in the true effect size between the different studies analyzed, which overall value was 0.013. The T value in relation to the standard deviation results in the true effect size which, in this meta-analysis, is 0.115 (see table 5).

Table 5. Complementary data from meta-analysis

Model	Effect size and 95% confidence interval						Test of null (2-Tail)		Heterogeneity			
Model	Number Studies	Point estimate	Standard error	Variance	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared
Fixed	11	0,407	0,077	0,006	0,255	0,559	5,261	0,000	11,966	10	0,287	16,430
Random	11	0,417	0,086	0,007	0,249	0,586	4,847	0,000				

Tau-squared			
Tau Squared	Standard Error	Variance	Tau
0,013	0,036	0,001	0,115

Publication bias

The detection of publication bias can be visualized in the Funnel Plot of the 11 studies. 10 of them are positioned within the triangle of the graph, and in the upper-middle area of the graph. Of these, 6 are very close to the mean of the effect size calculated by the difference in means of the meta-analysis results. Clearly, the studies are mostly located symmetrically on the graph showing the existence of a low publication bias (see figure 3). In a complementary analysis, the Egger test was carried out to test the null hypothesis according to which the intercept is equal to zero in the population. In the table, the intercept is 2.43477, at 95% confidence interval (-0.25501 to 5.12356), with t = 2.04845 and gl = 9. The recommended p value is 0.07079 (p>0.05). Thus, there is no statistical evidence for the existence of publication bias (see figure 4).

Egger's regression intercept

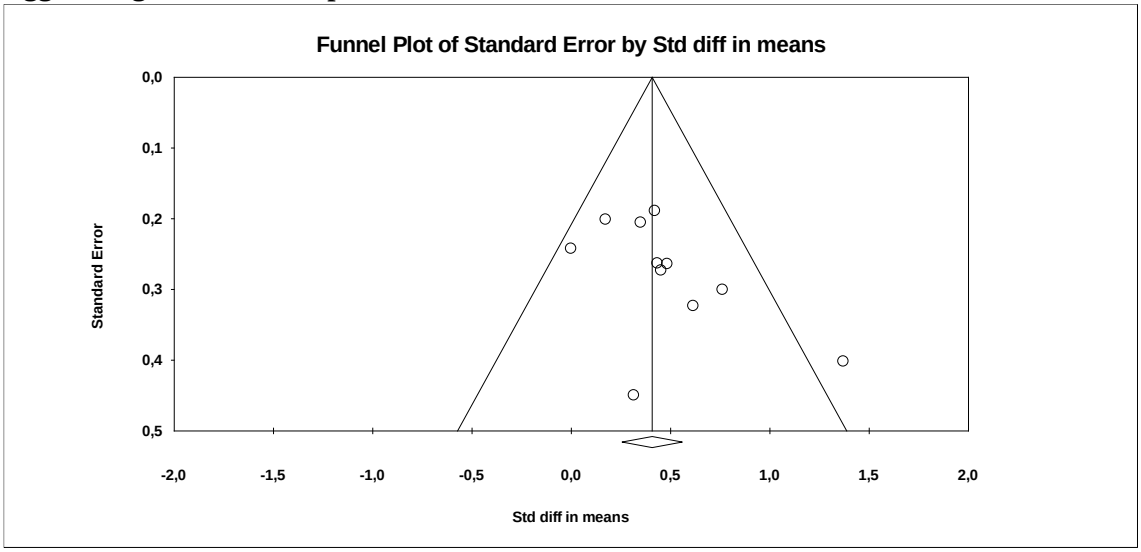

Figure 4. Funnel plot and Egger test of meta-analysis

2.2.4 Discussion

The main objective of this study was to synthesize the evidence from previous research on the effectiveness of interventions with physical exercise in patients with burnout syndrome by conducting a systematic review with meta-analysis. The results show that by means of the intervention with physical exercise, in any of its varieties, it could reduce the levels of intensity of burnout syndrome, although sometimes this reduction could not

be very considerable. From the eleven studies evaluated in the meta-analysis, those with the highest *relative weight* (RW) were selected in the results presented in the forest plot for discussion. In the review, no similar meta-analysis was found to be able to be analyzed and used for discussion.

Han Hui Tsai et al. (2013), (RW=8.93), explored the effectiveness of an exercise program for bank and insurance workers with BS. In the process of the study, a practical program of exercises was developed in the workplace within bank and insurance companies, during three months (12 weeks) after which, their benefits were evaluated. After the exercise program BS levels showed a significant improvement in the intervention groups ($F = 3.46$, $p = 0.036$). The comparison of the pre-post difference between the groups showed that the post-effect differences of BS ($p = 0.031$) decreased significantly with the high intensity intervention group than with the control group that did not perform another activity.

De Vries et al. study (2016), (RW=13.79) analyzed the extent to which an exercise intervention is effective in reducing BS indicators in students. The participating patients were students with high levels of BS. These were randomly assigned to a six-week exercise intervention (three time a week, n = 49) or to a waiting list (control group without intervention, n = 48). All participants were evaluated before the intervention, and immediately after the intervention. The participants in the intervention group showed a greater decrease in BS levels in a general way. These results highlight the value of low intensity exercise for college students with a high level of BS related to the study. Participants in the intervention group showed a greater BS decrease ($t (48) = 6,82$; $p = < 0,001$; Cohen's $d= 0,90$) than those of the control group ($t (47) = 3.08$, $p =,003$; Cohen's $d= 0,46$). Additionally, the chi-square test revealed that, the proportion of recovered participants was higher in the intervention group than in the control group ($\chi (1) = 3,72$, $p =.054$, $\varphi = ,196$).

In a subsequent study, De Vries et al. (2017), (RW=13.35) evaluated the effectiveness of an intervention with exercises to reduce BS at work in patients who had various professions, using a set of exercises for 6 weeks. They had an intervention group (IG, n=49) and a control group that was on a waiting list (WLC; n=47). All the participants' height was measured before (T0) and after (T1) the intervention. EI participants were also measured at weeks 6 (T2) and 12 (T3) after the end of the intervention. The analysis of covariance results (ANCOVA) revealed that, in T1, the intervention group reported a

lower BS level than the WLC group. This study demonstrates that, in the case of BS related to work, exercise may be seen as a powerful therapeutic tool for those who follow the treatment. The ANCOVA analysis revealed that the EI group obtained a significantly lower score in T1 on BS [mean 2.44 (SD 1.25); F1.61=4.42, P=0.04, η=0.06] and over the BS mean: 24.03 (SD 5.63); F1.63=4,.42, P=0.04, η=0.06] in comparison with the WLC group [mean 3.24 (SD 1.31); mean 29.14 (DE 7.10), respectively].

Gerber et al. (2013), (RW=15.12), concluded in their study that the patients in the guided exercise group increased the duration of their exercise more than the patients in the general group of instruction (5,1% of the variance). This study has shown that substantially increasing exercise intensity can reduce BS levels in patients through comprehensive and regular general treatment.

Eskilsson et al. (2017), (RW=8.43), applied a 12-week aerobic training program performed at a moderate-vigorous intensity for BS patients. In a randomized controlled study, 88 patients diagnosed with BS participated. The patients were randomized into two groups, one intervention group with 12-week aerobic exercise and a control group without additional training. In the final evaluation, a decrease in BS levels was reported in the intervention group (pretest: 4.75 (0.98), posttest: 3.92 (1.10)), while in the control group the decrease in the BS level was much lower (pretest: 4.84 (1.01), (posttest: 4.40 (1.08)); F (1.54) = 2.82, p-value = 0.10; ηp2 = 0.05.

Stenlund et al. (2009), (RW=10.29), evaluated the efficacy of Qigong (traditional Asian exercises) in the rehabilitation of patients with BS. Therefore, they performed a prospective randomized controlled trial. Patients in the intervention group received basic care and performed Qigong twice a week for 12 weeks. It was found that there were no significant differences in treatment efficacy between the intervention and control groups. Both groups improved significantly over time, with reduced BS levels and increased dynamic balance and physical ability. Additionally, there were no significant differences in BS score among patients who completed the intervention and no additional effects of Qigong training on recovery from exhaustion, at least in this study.

Gerber et al. (2015), (RW=15.12), concluded in their study that the patients in the trained exercise group increased the duration of their exercise more than the patients in general group of instruction (5,1% of the variance). This study has shown that substantially increasing exercise levels can reduce BS levels in patients through comprehensive and regular general treatment.

As evidenced from the previous studies, there is a trend for the reduction of burnout syndrome levels of intensity in patients exposed to physical exercise intervention when compared with those not doing any type of exercise (controls). In other words, and according to the results of the present RSM, those not doing any type of physical exercise tend to present an increase of 0.4 in the levels of intensity of BS than those doing exercise. One of the major limitations of this SRM is that, due to the small number of studies using interventions with exercise, we had to analyzed studies applying different types of physical exercise (aerobic exercises in different variants, strength, Qigong Asian gymnastics and yoga postures) to different populations and different evaluative instruments to assess the Burnout Syndrome. Due to this complexity, it was sometimes difficult analyze and discuss the results however, and in spite of this diversity, the intervention with exercise was mostly effective. Future intervention studies are needed to strengthen the evidence for the effectiveness of physical exercises in the treatment and prevention of BS, specifically in the university population where it is important to determine which type of exercise (aerobic or strength) is more effective in this specific group.

After the application of different types of physical exercises and demonstrated by the difference of means between the two groups analyzed where it is explicit that patients in the control groups have higher average values of burnout syndrome above 0.4 times in relation to those of the intervention groups.

CHAPTER III

METHODS

The sample will be identified in the period October - December 2018 and it will start from the population of students diagnosed with burnout syndrome at a public university in Ecuador, where a wide variety of university degree (in health sciences, engineering, education sciences, economics and business, agronomy, law, tourism and social sciences) will be studied.

The sample shall be probabilistic and a stratified sample with proportional participation shall be used. In the case of medical students, the sixth year or internship is excluded, since at this stage students are considered more workers than students because of the characteristics of this year. The sample size shall be obtained from the standard error of the proportional sample distribution and the critical value K, corresponding to the chosen confidence level. The sampling method considered most appropriate is the stratified random sampling method, which allows for a representative population and the calculated sample.

First, a stratified random sample will be selected from the student population of the Technical University of Ambato, Ecuador, to which the exposed diagnostic instruments will be applied (n1). After the students who are diagnosed with moderate or high levels of BS a sample will be selected by simple random sampling (n2). Finally, from this last sample, the following will be selected a sample randomly assigned to the 3 groups of the quasi-experiment study (n3) (see figure 1).

3.2 Selection criteria

From the total population of students at the University of Ambato who met the inclusion criteria, a large initial sample was randomly selected through a stratified random sampling, to which the MBI-SS instrument was applied. After the population diagnosed with moderate or high levels of BS by the instrument, a sub-sample was selected by simple random sampling and divided into the 3 groups of similar composition following simple random criteria. The other diagnostic instruments explained in the section "study variables and measurements" were also applied to this last subsample. At the end of the intervention the same instruments were applied again to the 3 groups. Therefore, the study was an intervention study (two experimental groups and a control group) with an

initial test and a final test. The sample of this study was selected according to the following selection criteria: - Diagnosis of burnout syndrome in university students of both sexes from the most validated instrument used specifically for this population: Maslach Burnout Inventory Students Survey (MBI-SS) (Schaufeli et al. 2002). - Signature of the informed consent about the knowledge and the concordances with the procedures and objectives of the investigation of the selected sample.

3.3 Study variables and measurements

- Burnout syndrome in students: is defined as a negative, persistent, student-related emotional response, consisting of a feeling of being exhausted, of no longer being able to perform tasks as a student (exhaustion); a cynical or distancing attitude to the meaning and usefulness of the studies being conducted (cynicism); and a feeling of academic incompetence as a student (effectiveness) (Liu et al, 2018; Boni et al, 2018; Erschens et al, 2018; Liébana-Presa et al, 2017; Erbil et al, 2016; Shaufeli et al., 2002). The Maslach Burnout Inventory Students Survey (MBI-SS) will be used (Schaufeli et al. 2002).

- Stress: "the set of physiological reactions that the body prepares for action" (WHO, 2013). In global terms, it is a biological alert system necessary for survival. Any change or different circumstance that occurs in our lives can generate stress. A certain degree of stress stimulates the organism and allows it to reach its objective, returning to the basal state when the stimulus has ceased. The problem arises when the pressure is maintained and a state of resistance is entered. When this sensation is maintained over time, a state of exhaustion can be reached, with possible functional and organic alterations. Specifically, academic stress is defined through the impact that educational institutions can have on their students (Muñoz 2003; Polo, Hernández and Pozo 1996). The Perceived Stress Scale (PSS) (Cohen et al. 1983) will be used in its Spanish version (Remor and Carrobles, 2001).

- Self-esteem: is a concept closely related to general well-being (Rojas-Barahona et al., 2009; Lightsey et al., 2006; Chen et al., 2004), suggesting that it could be a good indicator of mental health (Garaigordobil, 2008; Robis, 2001). Therefore, their knowledge is a valuable information that would enable the prediction of possible psychopathological disorders and their prevention (Rojas-Barahona et al., 2009; Fan, 2001). The Rosenberg RSES Self-esteem Scale will be used (Rosenberg, 1965)

- Academic Motivation: is a hypothetical concept used to describe the result of internal and external forces that produce initiation, direction, intensity and persistence of

behavior. Motivation is the cause of a behavior, that is to say, the factors that, operating on the psychological plane of the individual, determine the execution or not of an activity. It is, in short, the reason for behavior (Vallerand and Thill, 1993; Ramajo, 1992). The Academic Motivation Scale will be used (EMA, Manassero and Vázquez, 1998).

- Socio-economic identification: Socio-economic evaluation will be carried out on the basis of the classification criteria used by the Ministry of Economic and Social Inclusion (MIES) of the Republic of Ecuador.
- Heart Rate Variability (HRV): It is the beat-to-beat variation in either heart rate or the duration of the R-R interval. The heart is innervated by the central autonomic network, through both postganglion sympathetic fibers and vagally mediated parasympathetic nervous system (PNS). This network allows the individual to adapt in a flexibly manner to a continuously changing environmental demands. The vagal innervation slows down the heart rate, whereas the sympathetic nervous system (SNS) increases the heart rate – often in situations with perceived threats or danger. The variability between heart beats is affected by several brain areas such as the prefrontal cortex, a brain area also involved in regulating emotions. With emotional arousal, e.g., emotional stress responses, the SNS produces higher heart rates when there are difficulties in emotion regulation, the PNS may not slow down this heart rate and the physiological stress responses. The dominance of the SNS on heart rate will therefore lead to a lower HRV. High HRV in a resting state indicates a flexible PNS, and conversely, low HRV indicates sympathetic and more inflexible influence of the heart rate (Visted et al., 2017; Billman et al., 2015). It was measured using a transmitter band and the Elite HVR android application.
- Physical exercise: is a variety of physical activity, planned, structured, repetitive and performed with an objective purpose related to the improvement or maintenance of one or more components of physical fitness (WHO, 2018). Aerobic and anaerobic (strength) physical exercise, controlled by the heart rate and individual perceived exertion scale, shall be applied.

3.4 Study design

The study design includes a sequence of studies which will allow us to carry out:

1. A literature review study of the literature so far on the application of physical exercise in patients with burnout syndrome, the prevalence of this syndrome in university student populations, and the benefits of physical exercise in this population.
2. A validation study of the MBI-SS in university students in Ecuador.

3. A diagnostic study of the levels of burnout syndrome, stress, self-esteem and academic motivation in university students in Ecuador.

4. A study on the overall effectiveness of physical exercise in reducing levels of burnout syndrome in university students in Ecuador and determining which exercise is most effective: aerobic or anaerobic.

5. A study of the correlation between burnout syndrome, stress, self-esteem and academic motivation in university students in Ecuador.

3.5 General procedures

After due approval of the PhD project by the Faculty of Sports Sciences and Physical Education of the University of Coimbra and by the scientific and ethical board of the selected Ecuadorian university. Initially, the MBI-SS will be applied to a randomly selected sample of 200 university students to validate the instrument in the Ecuadorian population. The validated instrument will then be applied to the selected and stratified sample according to the criteria explained above in order to diagnose the burnout levels in students of all university careers. In addition, other instruments will also be applied to determine stress levels, self-esteem, academic motivation and nutritional status in the same sample.

After knowing the number of students diagnosed with burnout with MBI-SS, the heart rate variability (HRV) was measured using a transmitter band and the Elite HVR android application. From there begins the application of the physical exercise programs. According to some studies, HVR is the main cardiovascular biomarker for the prevention and early detection of BS (Gómez-Alcaina, Montero-Marín, Demarzo, Pereira and García-Campayo, 2013).

They were divided into three groups of similar composition. A control group to which no activity was applied, an experimental group 1 to which aerobic exercises were performed, an experimental group 2 to which anaerobic strength exercises were applied. In both intervention groups 3 weekly frequencies were applied for approximately one hour, on alternate days, for 16 weeks. Before the training sessions, the initial MBI-SS and HRV test was applied. In week 17 the same both measurement instruments will again be applied to the 3 groups and longitudinal and cross-sectional comparisons was made. See flow chart (Figure 5).

Participants in all three groups were monitored throughout the program to ensure that they did not consume stimulant beverages and/or any type of medication that might affect

the results. A control group to which no activity was applied, an experimental group 1 to which aerobic exercise (jogging, walking and/or stationary bicycle for approximately 30 to 50 minutes, divided into an initial part of warm-up and stretching, a main part with planned aerobic exercise and a final part of recovery.) will be applied and an experimental group 2 to which anaerobic (strength) exercise (hands-free exercises such as push-ups, sit-ups, fixed bar, leg squats, with 30 to 50 minute sessions divided into warm-up and stretching parts, main part with planned strength exercises and final part of recovery) will be applied.

During the intervention in the aerobics group, to confirm that it was really an aerobic workout, what was applied to the members of this group was kept in the values proposed by the American College of Sports Medicine (ACSM, 2017) for this purpose, and during the training, their heart rate was monitored every 3 minutes, individually, which they had to maintain between 60 and 75% of the maximum FC of each one of them calculated initially, and thus control the intensity of cardiorespiratory exercise to be moderate. In addition, the Perceived Exertion Scale was also applied in unison and its monitoring maintained the intensity all the time between 12 and 13 RPE which are the values recommended by the ACSM (2017) to maintain cardiorespiratory exercise at moderate intensity. In the case of strength exercises applied to the other intervention group, it was monitored by the percentage of intensity relative to a maximum repetition also recommended by the ACSM, in this case vigorous exercise was maintained between 70 and 84% of 1 RM in each exercise.

In both intervention groups, physical exercise was governed by the latest guidelines for exercise prescription: ACSM's Guidelines for Exercise Testing and Prescription, of the American College of Sports Medicine (ACSM, 2017) and 3 weekly sessions will be applied for one hour, on alternating days, for 16 weeks. The physical exercises were applied in the sports areas of the University, by a single instructor qualified and trained for that purpose, with a bachelor's degree in physical activity and sports.

3.6 Intervention with physical exercise

The three groups were divided of similar composition. A control group to which no activity was applied, an experimental group 1 to which aerobic exercises were performed (jogging, walking and/or stationary bicycle for 30 to 50 minutes, divided into an initial warm-up and stretching part, a main part with planned aerobic exercises and a final recovery part.) An experimental group 2 to which anaerobic strength exercises were

applied (hands-free exercises such as push-ups, sit-ups, sit-ups, fixed bar, leg squats, with 30 to 50 minute sessions divided into warm-up and stretching parts, the main part with planned strength exercises, and the final part of recovery). In both intervention groups, physical exercise was governed by the latest exercise prescription guidelines (ACSM's Guidelines for Exercise Testing and Prescription) from the American College of Sports Medicine (ACSM, 2017) and 3 weekly frequencies were applied for approximately one hour, on alternate days, for 16 weeks (ACSM, 2017).

Aerobic exercises

A frequency of 3 or more days was applied for the week of moderate exercise. Moderate and/or vigorous intensity for most students. In a time of 30 to 60 minutes per day (150 minutes x week) of intentional moderate exercise. Involving the major muscle groups and continuously and rhythmically in their nature. Increasing the number of steps by 2000 steps per day to achieve and maintain a daily 7000 step number (ACSM, 2017). In our study, aerobic exercises were performed (jogging, walking and/or stationary bicycling for approximately 30 to 50 minutes, divided into an initial warm-up and stretching part, a main part with planned aerobic exercises and a final recovery part.

Strength exercises

Each muscle group was trained 2 to 3 days a week. With an intensity of 60%-70% of 1RM (moderate to hard intensity) for beginners to intermediate to improve strength. With exercises involving each of the major muscle groups. Using a variety of exercise equipment and/or body weight to perform these exercises. 8 to 12 repetitions to improve strength and power. With 2-3-minute rest intervals between each set of repetitions. And a 48-hour rest between sessions for each muscle group. With a gradual progression of greater endurance, and/or more repetitions per cast, and/or an increasing frequency (ACSM, 2017). In our study, strength exercises were applied (hands-free exercises such as push-ups, abdominals, sit-ups, fixed bar, leg squats, with 30 to 50-minute sessions divided into warm-up and stretching parts, the main part with planned strength exercises and the final part of recovery).

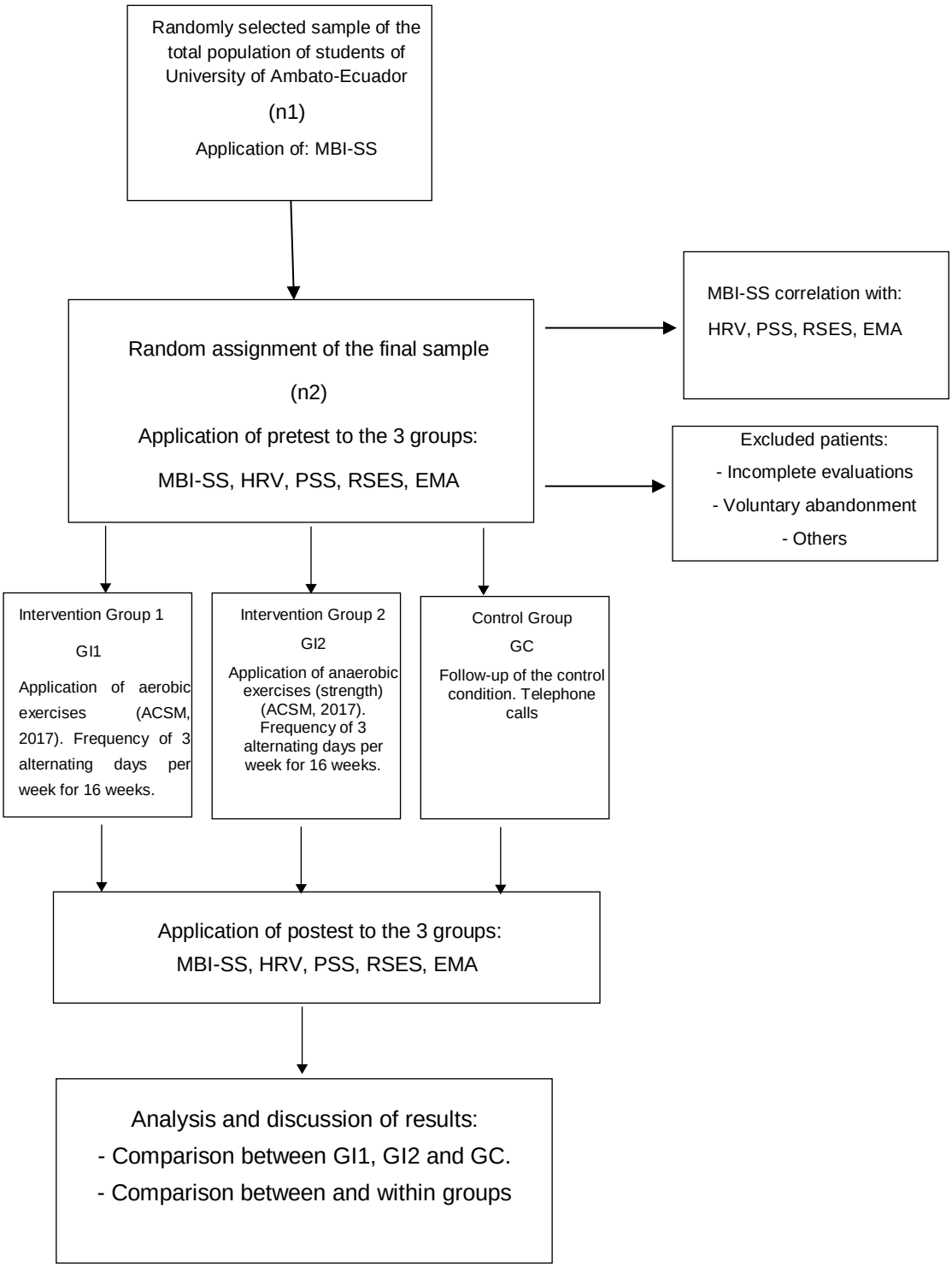

Figure 5. Study Protocol Flowchart.

n1: Sample 1 (sample selected by stratified random sampling from the entire population of the University of Ambato who were given the MBI-SS to diagnose BS)

n2: Sample 2 (of all students in sample 1, diagnosed with BS, another sample was re-selected by simple random sampling those who were assigned to 3 groups. The instruments were also applied to them: HRV, PSS, RSES, EMA. That together with the MBI-SS formed the results of the pretest)

3.7 Statistical processing of data

All the data collected will be analyzed using the SPSS "Statistical Package for the Social Sciences, version 25.0 for Windows" software. Descriptive statistics include mean, median, standard deviation, perceptiles, amplitude, correlation coefficients between variables and percentage calculation. Different statistical methods will be used according to the specificities of each study.

3.8 Ethics in research

The planning of this research was carried out taking into account the guidelines of the Declaration of Helsinki of 1973, revised in 1986 and amended in October 2013, and was also governed by the standard regulations in force in the Republic of Ecuador for the conduct of biological studies. Students will be explained what the research consists of in order to obtain informed consent to participate in the research and a document will be signed by both the patients and the research author for the record. The study was approved by the corresponding ethics committee, with the code: CEISHSOLCAQ.OBS.19.129.

3.9 Strengths and limitations

The main strength of this study is the quality of its methodology: the use of controlled design, since the sample will be probabilistic and a stratified sample with proportional and representative participation of the university student population diagnosed with BS will be used. Representative samples shall be taken on a simple random basis from each stratum of all years and from both sexes of all careers. Therefore, the current intervention could add to the existing scientific literature on the effect of physical exercise on levels of burnout syndrome in pure university students. In addition, this study will validate the MBI-SS in Ecuadorian students and thus be able to diagnose this syndrome in time.

Despite their strengths, some questions concerning our studies deserve attention. First, our study is not blinded, because the active participation of the participants is necessary in our intervention. Furthermore, because the number and timing of outcomes differed between the intervention and the control group, it was not possible for the researchers involved in this study to be blind to the condition they were assessing.

In addition, only 2 BS meters will be used for pre/posttest evaluation: the MBI-SS (as a psychological meter) and the HRV (as a cardiovascular physiological meter), and no other immunological physiological meters will be used that would have given more strength to these evaluations. Like the PSS for stress and the RSES for self-esteem, these instruments are well validated internationally, but are also of a psychological nature.

3.10 Implications for practice

This study is relevant because Burnout Syndrome is now a social and health problem for university students. Therefore, it is essential to know the prevalence levels of burnout syndrome in international university students and the effectiveness of physical exercise interventions in patients with burnout syndrome. In addition, it will validate the use of the MBI-SS in Ecuador, creating the possibility of making a better diagnosis, evaluation and study of the burnout in university students in this country. In so doing, this study will determine the effectiveness of physical exercise in reducing burnout syndrome levels in Ecuadorian university students and its possible relationship with stress levels in this important academic population. Finally, the most effective type of exercise to treat and prevent this syndrome will be determined: whether it is aerobic or anaerobic (strength).

If the intervention is found to be effective, this would suggest that there is a simple, cost-effective and accessible strategy for reducing BS in this important and large academic population. The results of this could be used to provide better evidence-based policy and practice to university students in different careers and to health policy makers in relation to the exercise effect on the well-being of university students.

CHAPTER IV

RESULTS OF STUDIES

In this chapter, the five studies carried out in a logical and orderly manner are detailed below:

1. A validation study of the MBI-SS in university students in Ecuador.
2. A diagnostic study of the levels of burnout syndrome, stress, self-esteem and academic motivation in university students in Ecuador.
3. A study of the correlation between burnout syndrome, stress, self-esteem and academic motivation in university students in Ecuador.
4. A study on the overall effectiveness of physical exercise in reducing levels of burnout syndrome in university students in Ecuador and determining which exercise is most effective: aerobic or anaerobic.
5. A study to determine the most effective type of exercise to treat and prevent this syndrome: aerobic or anaerobic (strength).

4.1 VALIDATION OF INSTRUMENTS FOR THE MEASUREMENT OF BURNOUT SYNDROME AND PERCEIVED STRESS IN UNIVERSITY STUDENTS IN ECUADOR.

4.1.1 Introduction

"Mental health is an integral and essential component of health. It is considered more than the absence of mental disorders or disabilities. (WHO, 2018). In college students, good mental health is essential for optimal development at this stage of life. Initiating the study of a professional career can be a source of tension that threatens psychological well-being, which can be compromised in academic achievement, physical health or mental health (Cano, 2008). Since entering university, he is exposed to a number of challenges, decisions, problems and demands typical of the educational context, where training, learning and academic performance are aspects that can become sources of stress. This type of stress generates a negative impact not only on health, but also on academic performance. This could generate feelings of incompetence, anger and guilt, which generates higher levels of stress and burnout (Puentes & Díaz, 2019).

Two of the most prevalent and dangerous determinants of poor mental health in college students are Burnout Syndrome and Stress. Burnout Syndrome (BS), also known as physical and mental exhaustion syndrome, is a problem of great social repercussion in our time (Caballero et al., 2015). The current interest in BS has facilitated a broadening of its field of study, as research began in other professional fields and, much more recently, arose studies focused on university students.

In its origins, BS was developed in the area of assistance and occupational health care, although it has also been observed in university students. (2002) demonstrated, using the Maslach Burnout Inventory-Student Survey (MBI-SS), that students reflect experiencing exhaustion from the demands of study, having a cynical attitude of detachment and feeling of incompetence as students. This has been confirmed by recent studies (Ortega-Maldonado & Salanova, 2018; Ventura, Salanova & Llorens, 2015; Salanova, Martínez, Bresó, Llorens & Grau, 2005). It is then that the academic BS in students, as defined by the MBI-SS, is a three-dimensional syndrome composed of exhaustion, cynicism and efficacy (Shaufeli, Salanova, et al., 2002).

Stress, meanwhile, is a "the set of physiological reactions that the body prepares for action" (WHO, 2013). In global terms, it is a biological alert system necessary for survival. Any change or different circumstance that occurs in our lives can generate stress. A certain degree of stress stimulates the organism and allows it to reach its objective, returning to the basal state when the stimulus has ceased. The problem arises when the pressure is maintained and a state of resistance is entered. When this sensation is maintained over time, a state of exhaustion can be reached, with possible functional and organic alterations. Specifically, academic stress is defined through the impact that educational institutions can have on their students (Muñoz 2003; Polo, Hernández and Pozo, 1996).

Muñoz (2003) indicates that stressful situations in studies have a negative impact on student health and performance. In the case of Perception of stress, stressful academic experiences and coping in health studies, stress negatively affects the immune system. The Perceived Stress Scale (PSS-14) has proven to be understandable and easy to respond to in other contexts where it has been applied, including university. And it has been validated in several countries (Puentes & Díaz, 2019; Yokokura et al., 2017; Torres-Lagunas et al., 2015; Ezzati et al., 2014; de la Rubia & de León, 2014; Katsarou et al., 2012; Leung t al., 2010; Campo-Arias et al., 2009). However, no references have been found to its application in the Ecuadorian university student context.

In Ecuador, very few studies have been found on the prevalence of both determinants of poor mental health, and much less in this important population of university students that could allow a correct diagnosis, prevention and treatment in both cases. In the field of Ecuadorian university education, it would be very important to have instruments that allow us to know in a fast, accurate, valid and reliable way, the levels of burnout syndrome and perceived stress in the university students of the different careers. This could also lead to the adoption of more appropriate coping styles by students. Therefore, the objective of this study was to validate the MBI-SS and PSS-14 in university students in Ecuador.

4.1.2. Material and methods

A cross-sectional validation study of the MBI-SS (Schaufeli et al., 2002) and PSS-14 (Cohen et al. 1983) instruments was conducted. This is a questionnaire for the evaluation of the BS and Stress in students of collective application and individual work.

Sample

A sample of 210 (128 women and 82 men) randomly selected students from the population of the Technical University of Ambato, Ecuador, from its different Faculties (Health Sciences, Human and Educational Sciences, Jurisprudence and Social Sciences, Accounting and Auditing, Agricultural Sciences, Engineering Sciences) was used. The study was conducted during the month of October 2018. The sample was probability-based and a stratified sample with proportional participation was used. Simple randomly representative samples were taken from each stratum of all the years and from both sexes of all the careers of all the faculties.

Study instruments

Burnout Syndrome: the Maslach Burnout Inventory Students Survey (MBI-SS) was used (Schaufeli et al. 2002). It is structured in 3 dimensions divided into 15 items: Emotional exhaustion (With items 1, 2, 3, 4 and 6. For example, "I am tired when I get up in the morning ˜ and have to face another day at the university"), Cynicism (With items 8, 9, 13 and 14. For example, "I doubt the transcendence and value of my studies") and Academic Effectiveness (With items 5, 7, 10, 11, 12 and 15. For example, "I think I contribute effectively during classes at the university"). The response scale is Likert type and ranges from 0 ("never") to 6 ("always").

Stress: The Perceived Stress Scale (PSS-14) was used (Cohen et al. 1983) in its Spanish version (González y Landero, 2007). It has 14 items evaluated by means of a Likert scale of 5 points (from 0 to 4), valuing the level of stress perceived during the last month. The scale scores between 0-56, with higher scores indicating greater perceived stress. It uses a Likert type response format of five alternatives ranging from 0 ("Never") to 4 ("Very often").

Procedures and intervention

After knowing the study sample, MBI-SS and PSS-14 were applied to students after informed consent. The participants were guaranteed anonymity and confidentiality of the information provided following the guidelines of the American Psychological Association (2002). The informed consent form indicated whether or not to participate, ticking the appropriate option, and was signed. The questionnaire, delivered later, did not request personal identification data, thus maintaining the anonymity of the participant. In the database, each case was identified with a number. The questionnaires were distributed

throughout September and October 2018. They were delivered individually, with a brief explanation of the objective of the research being carried out, and the guarantee of anonymity and confidentiality of the responses. Its exclusive accessibility to team members for research purposes was highlighted.

The validity of the MBI-SS and PSS-14 was determined through factorial analysis using Bartlett's test (B), which indicates that there is a correlation between the variables with which factorial analysis would make sense; it is considered adequate with a level of significance less than 0.05; and the Kaiser Meyer Olkim index (KMO), which indicates the degree of interrelation of the variables; if it is greater than 0.7 it is considered feasible (Carvajal, Centeno, Watson, Martínez, & Sanz-Rubiales, 2011).

The reliability of the instrument was evaluated through its internal consistency and stability. For internal consistency, the Cronbach Alpha coefficient (C) was calculated, which measures the correlation of the items within the questionnaire, evaluating how the different items of the instrument measure the same characteristics. It is considered the most suitable indicator because it gives a single value of consistency and provides the data of the half and half reliability technique. The Cronbach alpha range ranges from 0 to 1. High values denote greater internal consistency. Cronbach's alpha below 0.5 shows an unacceptable level of reliability; if it were a value between 0.5 and 0.6 it could be considered a poor level; if it were between 0.6 and 0.7 it would be a weak level; between 0.7 and 0.8 it would refer to an acceptable level; in the interval 0.8-0.9 it could be qualified as a good level, and if it were a value higher than 0.9 it would be excellent. (Carvajal, Centeno, Watson, Martínez, & Sanz-Rubiales, 2011).

For stability the test-retest was applied, with an interval of 12 days using 25 students randomly selected from the initial sample, using the Sperman-Brown correlation indices and the intraclass correlation coefficient (ICC). Correlation values above 0.7 reflect that the instruments are equivalent (Carvajal, Centeno, Watson, Martínez, & Sanz-Rubiales, 2011). In addition, a confirmatory factor analysis (CFA) was performed to assess the goodness of fit for the three factors structure proposed by Schaufeli et al. (2002) for the MBI-SS in the Ecuadorian university student´s population. The sample was randomly selected from the entire university student population, using simple random sampling. After locating the selected students, the instrument was applied to them.

Ethics in research

The planning of this research was carried out taking into account the guidelines of the Declaration of Helsinki of 1973, revised in 1986 and amended in October 2013, in addition was governed by the standard regulations in force in the Republic of Ecuador, for the conduct of biological studies. The students were explained what research consists of in order to obtain informed consent to participate in the research and to have evidence, a document was signed by both the patients and the author of the research. Data confidentiality was protected by encryption. The study was approved by the corresponding ethics committee, with the code: CEISHSOLCAQ.OBS.19.129.

Statistical treatment of data

For statistical analysis, the SPSS 25.0 package was used and the following indices were calculated: Bartlett's test, Kaiser Meyer Olkim's index, Cronbach's Alpha coefficient, Spearman-Brown correlation indices, Intraclass correlation coefficient (CCI) and the Shapiro-Wilk test. With a significance level of .05.

4.1.3. Results

The sample of 210 students (128 females and 82 males) ranging in age from 18 to 23 years (X = 21.3; SD = 2.21), from the Technical University of Ambato, Ecuador, from the Faculties of Health Sciences (medicine, physical therapy, clinical laboratory and nursing), Human Sciences and Education (initial education, basic education, physical activity and sport, tourism, psychopedagogy, languages, educational psychology), Jurisprudence and Social Sciences (law, social communication, social work), Accounting and Auditing (accounting and auditing, economics, finance), Agricultural Sciences (veterinary medicine, agronomy, Engineering Sciences (computer science, electronics, automation, telecommunications, industrial).

3.1 MBI-SS validation results

Table 6 shows the descriptive values of the application of MBI-SS. Shapiro Wilk's contrast yields a significance of less than 0.01, which is why the null hypothesis was accepted.

Table 6. Descriptive statistics of all MBI-SS items

ITEMS	X	SD	Shapiro-Wilk	Sig.
The academic activities of this career have me emotionally exhausted (AE)	2,99	1,800	,938	,000

I find myself physically exhausted at the end of a college day. (AE)	3,68	1,646	,918	,000
I'm tired in the morning when I wake up and have to face another day in college. (AE)	2,91	1,726	,932	,000
Studying or going to class all day is a strain on me. (AE)	2,24	1,575	,919	,000
I'm exhausted from studying so much. (AE)	2,52	1,643	,925	,000
I've lost interest in the career since I started college. (CIN)	1,13	1,534	,745	,000
I've lost enthusiasm for my career. (CIN)	1,18	1,563	,759	,000
I doubt the importance and value of my studies. (CIN)	1,39	1,645	,796	,000
I have distanced myself from my studies because I think they will not really be useful. (CIN)	,87	1,306	,698	,000
I can effectively solve problems related to my studies. (EA)	4,00	1,459	,891	,000
I think I contribute effectively to the classes at my university. (EA)	3,70	1,464	,933	,000
In my opinion, I'm a good student. (EA)	4,06	1,380	,918	,000
It stimulates me to achieve goals in my studies. (EA)	4,44	1,444	,862	,000
I've learned a lot of interesting things during my career. (EA)	4,89	1,299	,790	,000
During the classes, I have the assurance that I am effective in finalizing things. (EA)	3,89	1,453	,912	,000
				p<0.01

Generally speaking, in the analysis of the three dimensions, the reliability levels calculated according to C are good, the CCI and Spearman showed good equivalence between both measurements. Validity was also considered good according to KMO and B. Bartlett's contrast yields a significance of less than 0.01 so the null hypothesis was accepted. In the Emotional Exhaustion dimension, the level of reliability was considered good according to C, CCI and Spearman and showed good equivalence between both measurements. The validity was also considered good according to KMO and B. In this dimension the highest values of validation were obtained among the three that integrate the syndrome. Bartlett's contrast yields a significance of less than 0.01 so the null hypothesis was accepted. In the Cynicism dimension the level of reliability was considered acceptably good according to C, CCI and Spearman and the validity was also considered good in this dimension according to KMO and B. Bartlett's contrast gives a

significance of less than 0.01 so the null hypothesis was accepted. In the Academic Effectiveness dimension, the level of reliability was considered acceptable according to C, CCI and Spearman; and the validity was also considered good in this dimension according to KMO and B in this last dimension. Bartlett's contrast yields a significance of less than 0.01 so the null hypothesis was accepted (see table 7).

Table 7. Reliability and validity of the three dimensions (15 items), emotional exhaustion (5 items), Cynicism (4 items), efficacy (6 items).

Reliability	Value 3 dim	Value Exh	Value Cyn	Value Eff	Validity	Value 3 dim	Value Exh	Value Cyn	Value Eff
Cronbach's Alpha	.779	.805	.794	.737	Kaiser-Meyer-Olkin Index	.752	.771	.723	.762
CCI (test-retest individual measures)	.773	.836	.709	.692	Bartlett's test (Chi-square approx.)	282.740	330,786	278,701	238,733
CCI (average test-retest measurements)	.871	.911	.830	.789	Bartlett test (gl)	10	10	6	15
Sperman Index (retest)	.756	.810	.570	.505	Bartlett's Test (Sig.)	.000	.000	.000	.000

p<0.01

Table 8 shows the variance, the alpha of C of the scale if the element is eliminated, which indicates the value that the mean would have in the case of eliminating each of the items, in addition to the corrected total-element correlation, which is the corrected homogeneity coefficient. In this case the values are adequate and acceptable and the elimination of items is not considered necessary.

Table 8. Statistics total-element

Items	Var. if element is removed	Corrected element-total correlation	C if element is removed
The academic activities of this career have me emotionally exhausted (AE)	25.186*	.619	.758*
I find myself physically exhausted at the end of a college day. (AE)	26.167*	.638	.752*
I'm tired in the morning when I wake up and have to face another day in college. (AE)	26.676*	.559	.777*
Studying or going to class all day is a strain on me. (AE)	27.666*	.571	.773*

I'm exhausted from studying so much. (AE)	27.249*	.563	.775*
I've lost interest in the career since I started college. (CIN)	13.557	.608	.742
I've lost enthusiasm for my career. (CIN)	13.184	.630	.731
I doubt the importance and value of my studies. (CIN)	13.540	.539	.780*
I have distanced myself from my studies because I think they will not really be useful. (CIN)	14.473	.664	.723
I can effectively solve problems related to my studies. (EA)	22.426	.485	.696
I think I contribute effectively to the classes at my university. (EA)	23.564	.390	.724
In my opinion, I'm a good student. (EA)	22.555	.518	.687
It stimulates me to achieve goals in my studies. (EA)	21.703	.555	.675
I've learned a lot of interesting things during my career. (EA)	23.813	.454	.705
During the classes, I have the assurance that I am effective in finalizing things. (EA)	23.015	.439	.710
*Significant values: above .750 in C; and above 25 in Var.			**p<0.01**

A subsample (n=105) of the initial sample (N=210) of university students from Ecuador was used to run a confirmatory factor analysis (CFA) to assess the goodness of fit for the three factors structure proposed by Schaufeli et al. (2002) for the MBI-SS in the Ecuadorian university student´s population.The ratio of participants to item in this subsample was 7:1 (105 respondents to 15 items) which is close to the generally recommended ratio of 10:1 (Tabachnick & Fidell, 2007) and higher than the 5:1 minimum ratio usually accepted. Figure 6 shows the first order MBI-SS confirmatory factor analysis three factors model used with this subsample of university students from Ecuador (*N* = 105)

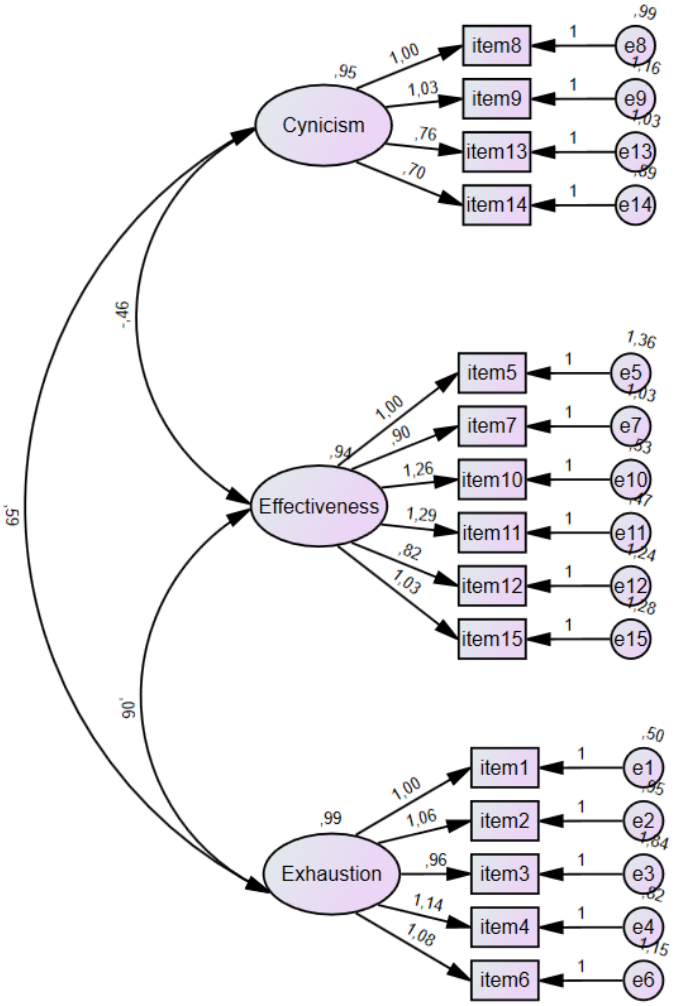

Figure 6 - First order MBI-SS confirmatory factor analysis three factors model: university students from Ecuador (*N* = 105)

Table 9 shows the MBI-SS three factors structural model goodness of fit indices results for the total sample of university students from Ecuador.

Table 9 – MBI-SS structural model goodness of fit indices: university students from Ecuador (N=105)

Sample groups	χ^2	df	χ^2/df	*p* value	NFI	IFI	CFI	RMSEA
Total (n=105)	239.414	89	2.69	.000	.72	.80	.80	.130

The χ^2 value obtained was (239.41) and differ significantly from the independence model ($p < .001$), assuming that all relationships among measured variables are zero. The χ^2/df, a ratio value used to assess the adjustment to the model, was 2.69 and lower than 3.0

showing a good adjustment (Jöreskog, 1969). The NFI, IFI and CFI indices across the different subgroups were .72, .80, .80 and RMSEA was .130. The analysed model of three correlated latent variables showed a poor goodness of fit and the results obtained for the majority of the fit indices was not satisfactory for the total sample as NFI = .72, IFI = .80, CFI = .80, lower than the minimum acceptable value of .90. Additionally, RMSEA = .130, i.e. higher that the recommended interval between .060 and .080 (Hu & Bentler, 1999).

3.2 PSS-14 validation results

Items with the highest mean owere: In the last month, how often have you felt confident about your ability to handle your personal problems? and In the last month, how often have you felt that things were going the way you wanted? Meanwhile, the items with the lowest averages were: In the last month, how often have you felt unable to control the important things in your life? S In the past month, how often have you been upset about something that happened unexpectedly? As we can see in Table 10.

Table 10. Descriptive statistics of all PSS items

Items	X	SD	Sig.
In the last month, how often have you been upset because of something that happened unexpectedly?	1.69	1.074	.000
In the last month, how often have you felt that you were unable to control the important things in your life?	1.64	1.183	.000
In the last month, how often have you felt nervous and "stressed"?	1.98	1.079	.000
In the last month, how often have you dealt successfully with day to day problems and annoyances?	2.61	.974	.000
In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life?	2,69	.894	.000
In the last month, how often have you felt confident about your ability to handle your personal problems?	2,91	.970	.000

In the last month, how often have you felt that things were going your way?	2.90	.922	.000
In the last month, how often have you found that you could not cope with all the things that you had to do?	1.94	1.129	.000
In the last month, how often have you been able to control irritations in your life?	2.78	.914	.000
In the last month, how often have you felt that you were on top of things?	2.61	.864	.000
In the last month, how often have you been angered because of things that happened that were outside of your control?	2.05	1.042	.000
In the last month, how often have you found yourself thinking about things that you have to accomplish?	2.70	.906	.000
In the last month, how often have you been able to control the way you spend your time?	2.54	.927	.000
In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	1.74	1.076	.000
			p<0.01

The levels of reliability in the PSS according to Cronbach's Alfa can be considered acceptable (.701) and validation by KMO was considered very feasible (.819) as well as the results obtained in the Bartlett's test because the contrast yields a significance of less than 0.01, so the null hypothesis was also accepted in this construct (see table 11).

Table 11. Reliability and validity of the PSS and their 14 items.

Reliability	Value	Validity	value
Cronbach's Alpha	.701	Kaiser-Meyer-Olkin Index	.819
		Bartlett's test (Chi-square approx.)	469.723
		Bartlett test (gl)	91
		Bartlett's Test (Sig.)	.000
			p<0.01

As can be seen in table 12 the levels of mean, variance and alpha C of the PSS scale if the element is removed are adequate, in addition the corrected coefficient of homogeneity was also favorable and it was not considered necessary to remove the elements.

Table 12. Statistics total-element

Ítems	Mean of the scale if the element is removed	Var. if element is removed	Corrected element-total correlation	C if element is removed
In the last month, how often have you been upset because of something that happened unexpectedly?	31.08	27.741	.246	.580
In the last month, how often have you felt that you were unable to control the important things in your life?	31.13	28.491*	.142	.603*
In the last month, how often have you felt nervous and "stressed"?	30.79	28.878*	.141	.600*
In the last month, how often have you dealt successfully with day to day problems and annoyances?	30.15	27.370	.329	.565
In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life?	30.08	28.096*	.293	.573
In the last month, how often have you felt confident about your ability to handle your personal problems?	29.85	27.876	.279	.574
In the last month, how often have you felt that things were going your way?	29.86	30.120*	.070	.609*
In the last month, how often have you found that you could not cope with all the things that you had to do?	30.83	26.982	.292	.571
In the last month, how often have you been able to control irritations in your life?	29.99	27.835	.312	.569
In the last month, how often have you felt that you were on top of things?	30.15	29.977*	.101	.603*
In the last month, how often have you been angered because of things that happened that were outside of your control?	30.71	26.663	.365	.557
In the last month, how often have you found yourself thinking about things that you have to accomplish?	30.06	28.110*	.286	.574
In the last month, how often have you been able to control the way you spend your time?	30.23	29.493*	.132	.599
In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	31.03	26.531	.360	.557

*Significant values: above .600 in C; and above 28 in Var. **p<0.01**

4.1.4. Discussion

The prevalence of Burnout Syndrome and Perceived Stress are increasing among university students; however, no validated and reliable measure is yet available to evaluate the BS and Stress of this important population in Ecuador. Thanks to this latest version of the MBI and the PSS, it has been possible to carry out a correct evaluation both elements in university student populations worldwide. On the other hand, in Ecuador those instruments had not yet been validated in spite of its international use. Therefore, the main objective of this study was to validate both instruments in university students in Ecuador.

The development of the BS study has been possible thanks, among other aspects, to the validation of diagnostic instruments. The most commonly used instrument to identify the BS is the Maslach Burnout Inventory (Maslach and Jackson, 1981), which currently has four different versions aimed at: professionals from the general population (MBI-GS), with large human participation (MBI-HSS), teachers (MBI-ES) and students (MBI-SS) (Schaufeli, Leiter & Maslach, 2009). Initially, the MBI-SS presented, in a sample of Spanish students, satisfactory indices of internal consistency: .74 in emotional exhaustion, .79 in cynicism and .76 in academic effectiveness according to the alpha of C (Schaufeli et al., 2002).

A study examines the factorial validity of the MBI-SS, the consistency of the proposed scales and contrasts the results obtained in its application to a sample of 820 students of health careers at universities on the Caribbean coast in Colombia. The results indicate a good adjustment of the instrument to what was expected. Several interpretations of the findings are elaborated. The KMO sample adequacy measure, which results in an index of .869 are considered very good (Hair, Anderson, Tatham, & Black, 1999); on the other hand, Barlett's spherical contrast shows a Chi-square of 3357.84, gl = 105, $p<.001$. These two results indicate the relevance of running a factorial analysis on these 15 elements.

A first inspection of the communality levels of the 15 items shows that 14 of them have extractions greater than .4, as expected, but one, the self-efficacy item Efi 6-35, shows an extremely low communality level (.19). Using the criterion of self-value greater than 1, the analysis of major components identifies three components that explain 52.75% of total variance. In the first factor are located all items of academic self-efficacy with an explained variance of 29.38%, except for item Efi 6-35, which was identified by its low

communality and is located in the third factor. In the second factor, with a variance of 14.19%, all the items of the exhaustion dimension are located and, finally, in the third factor, with an explained variance of 9.18%, are all the items of the cynicism scale, plus the item already indicated of self-efficacy, which shows a small and negative load in this factor. The Alpha of C gave .77 for exhaustion, .72 cynicism and .82 efficacy (Hederich-Martínez & Caballero-Domínguez, 2016).

The previously tested Sinhalese version of MBI-SS was administered to a sample of 194 students in the district of Kurunegala, Sri Lanka. The validity of the MBI-SS construct was assessed using multiple trait scaling analysis and factorial confirmation analysis (CFA), while reliability was assessed using the internal consistency and reliability of the repetition test, which was assessed after a two-week interval (Darshana, Devani, Dissanayake, Sajiwa & Abeywardena, 2018).

The MBI-SS three-factor model fitted the data better than the one-factor model and the two-factor model. All three subscales showed high internal consistency with Cronbach coefficient values of .837, .869 and 0.881 and retest reliability was high ($p < 0.001$). Data from a group of 22 students collected two weeks after the initial administration of the MBI-SS were evaluated for instrument reliability and the evaluation of instrument reliability revealed strong positive correlations for each of the three MBI-SS subscales. For the EX, CY and rPE subscales, the correlation coefficients were .858, 0.910 and .890 respectively. The correlation coefficients were statistically significant at $p < 0.001$. The 15-item sinhala version of the MBI-SS is a valid and reliable instrument for assessing the state of exhaustion among Sri Lankan university cycle students (Darshana, Devani, Dissanayake, Sajiwa & Abeywardena, 2018).

In a validation study in Turkish students using C alpha the levels were .838; .844 and .875 in the exhaustion, cynicism and efficacy dimensions respectively (Yavuz & Dogan, 2014). In another study conducted on medical students in Serbia the overall Cronbach coefficient of the MBI-SS questionnaire was .757, while the Cronbach coefficients for Emotional Exhaustion, Cynicism, and Academic Effectiveness were .869, .856 and .852, respectively. In the test-retest the correlation coefficients were .01 for EX, CY and AE (.673, .714 and .667, respectively), which demonstrated good stability. These results show that this version of the instrument in Serbia represents a reliable and valid instrument (Ilic et al., 2016).

The psychometric properties of the MBI-SS version were evaluated in the Hungarian student population of 496 medical and engineering students. The internal consistency of the MBI-SS was high (Cronbach - alpha=.82). The temporal stability (2-week interval) of the evaluated measure was relatively high ($r=0.73$; $p<0.001$). The PCA of the 15 MBI-SS items showed a three-dimensional structure (exhaustion, cynicism and efficacy). The concurrent validity of the MBI-SS with the MBI-HSS revealed a strong correlation ($r=.71$; $p<0.001$), while the discriminant validity was confirmed by the partial correlations found between depression, perceived stress, somatization and MBI-SS scores ($r=.34$-$.61$; $p\leq0.003$). The Hungarian version of MBI-SS appears to be a reliable and valid measure of exhaustion among students (Anikó, János & Szilvia, 2010).

In another MBI-SS validation research conducted on university students in Colombia the overall internal consistency was $\alpha=0,806$. The factorial solution showed three factors that explain 56.6% of the variance. Confirmatory factor analysis showed: $\chi2=926,036$; gl=85; RCEMA= .106 (90% confidence interval, .100 - .112); ICA= .947; ITL= .934 (Simancas-Pallares, Fortich & González, 2017).

Another important research carried out the cross-cultural adaptation of the Portuguese version of the MBI-SS and investigated its reliability, validity and intercultural invariance. The Portuguese version was completed in 2009, via the Internet, by 958 Brazilian and 556 Portuguese students from the urban area. As a result, the Portuguese version of the instrument presented adequate reliability and validity, but its factorial structure was not invariable between countries, pointing out the absence of intercultural stability. This study examined the psychometric properties of the MBI-SS version, confirms the stability of the three-dimensional structure of the instrument in independent samples and attests to the importance of three dimensions in the definition of the burnout construct (Campos & Maroco, 2012).

The dimensional structure of MBI-SS was investigated using data collected from a sample of 1499 university students from China. The Cronbach alpha coefficient values were not very high, but were acceptable ranging from .60 to .69 for Emotional Exhaustion, from .68 to 0.80 for Cynicism, and from .65 to .77 for Academic Effectiveness. Compared to the study by Schaufeli et al. (2002) and those in the present study, Cronbach alpha values are relatively low and some alpha values did not meet the cut-off criterion of .70 (Hu & Schaufeli, 2009).

Another MBI-SS validation study was performed on 2061 university students in Japan. The alpha C was .76, .85 and .78, in exhaustion, cynicism and efficacy respectively with similarity to the current study (Tsubakita & Shimazaki, 2016). Another study was carried out in Brazil on university nursing students at a public university in the South, in which the overall C alpha of the instrument corresponded to .72, while the coefficients of the three dimensions varied between 0.72 and 0.78, which proved the overall and dimensional reliability of the instrument (Tomaschewski-Barlem et al., 2014).

In the case of Perceived Stress, the results obtained in the Cronbach Alpha coefficient coincide with previous validation studies of the 14-item version of the Perceived Stress Scale. An example of this was the validation studies carried out in Greece, where a value of .795 was obtained and in the French version the value reached was 0.81 (Lesage et al. 2012).

In relation to the factorial analysis, it was possible to verify that the results obtained coincide with those obtained by Cohen, Kamarck and Mermelstein when creating the instrument and are also similar to those reached in studies of scale validation, carried out in university population both in Colombia (Campos et al., 2009) and in Mexico (Gonzáles et al., 2007).

In a study carried out with medical students from the University of Medical Sciences of Pinar del Río, Cuba, psychometric properties were established as a function of the reliability and construct validity of the Perceived Stress Scale where high values (.84) of Cronbach's Alpha were obtained, which demonstrated reliability in the tests a little higher than those found in our study. The factorial analysis obtained two dimensions or factors, obtaining adequate correlations between the items belonging to each factor (Puentes & Díaz, 2019).

Structural equation analysis results interpretation suggests that structural equation models (SEMs) whose GFIs indices exceed .90 indicate a good model fit (Bentler, 1990; Lindwall et al., 2011). The tested MBI-SS model of three correlated latent variables showed poor, however the model also showed some potential level of improvement (Bentler & Bonett, 1980) and should not be immediately refused. The GIFs obtained for the model were tested with a small sample of university students from Ecuador and that may have had some interference in the results. CFA results should not be interpreted isolated from other psychometric parameters for internal consistency and reliability reported in this study,

reinforcing the idea that potential increments in the model are very much possible and desirable and that a developmental process should be the following step.

Among the possible **strengths** of this study are the correct use of the both instruments and reliability tests (internal consistency using Cronbach's alpha and stability using the retest test) and validity (through factor analysis using Bartlett's test and Kaiser Meyer Olkim's index) and the confirmatory factor analysis. The most used in the international bibliography found to validate the MBI-SS and PSS-14 in its different versions and even similar instruments.

On the other hand, regarding **limitations** it could be stated that it was not possible to take a sample of all the university students of the country within the framework of the sierra region of Ecuador. Although there are students in this university from different regions of the country, those from the central sierra predominate.The MBI-SS instrument cannot yet be recommended for free use among this population because further work is needed to review some of its elements and the way in which university students in Ecuador perceive and interpret its specific content.

According to the results of this study, the MBI-SS and the PSS-14 had favorable results in terms of validity and reliability in this preliminary study, but the confirmatory factor analysis in the case of MBI-SS was not so because the tested model of three correlated latent variables was poor, however the model also showed some potential level of improvement.

4.2 BURNOUT SYNDROME AND PERCEIVED STRESS IN UNIVERSITY STUDENTS IN ECUADOR

4.2.1 Introduction

"Mental health is an integral and essential component of health. It is considered more than the absence of mental disorders or disabilities. It can be defined as a state of well-being in which a person realizes his or her capabilities and is able to cope with the normal stresses of life, to work productively, and to contribute to his or her community. In this positive sense, mental health is the foundation of individual well-being and the effective functioning of the community. It is related to the promotion of well-being, the prevention of mental disorders and the treatment and rehabilitation of people affected by such disorders. (WHO, 2013).

"Individual mental health is determined by multiple social, psychological and biological factors. Persistent socio-economic pressures constitute a well-known risk to the mental health of individuals and communities. Poor mental health is also associated with rapid social change, stressful working conditions, gender discrimination, social exclusion, unhealthy lifestyles, risks of violence and physical ill health and violations of human rights" (WHO, 2013).

Specifically, in university students, good mental health is essential for optimal development at this stage of their lives. Initiating the study of a professional career can be a source of tension that threatens psychological well-being, which can be compromised in academic achievement, physical health or mental health (Cano, 2008).

College students are increasingly experiencing mental health problems that affect their performance, their well-being, and their lives in general. The period between the ages of 18 and 25 is associated with a number of risk factors that can affect a young person's mental health. Academic demands, ostensibly more pronounced than those faced in school life, may be among the most tense factors, in addition to the academic pressure of university life arising from a considerable change in relation to the school education system, in which young people are much less autonomous (Cova et al., 2007; Rioseco et al., 1996). Two of the most prevalent and dangerous determinants of poor mental health in college students are Burnout Syndrome and Stress.

Burnout Syndrome (BS) in students is defined as a negative, persistent, student-related emotional response, consisting of a feeling of being exhausted, of no longer being able to

perform tasks as a student (exhaustion); a cynical or distancing attitude to the meaning and usefulness of the studies being performed (cynicism); and a feeling of academic incompetence as a student (ineffectiveness) (Shaufeli, Salanova, etc.), 2002). exhaustion by the demands of study, in addition to attitudes of disinterest, self-sabotage in front of academic activities and doubts about the value of study, as well as feelings of incompetence as a student (Palacio, Caballero, González, Gravini & Contreras, 2012; Caballero, Hederich & Palacio, 2010).

Stress, on the other hand, is a set of physiological reactions that prepares the organism for action. In global terms, it is a biological alert system necessary for survival. Any change or different circumstance that occurs in our lives, such as changing jobs, speaking in public, appearing for an interview or changing residence, can generate stress. However, it will also depend on the physical and psychological state of each individual. A certain degree of stress stimulates the organism and allows it to reach its objective, returning to the basal state when the stimulus has ceased. The problem arises when the pressure is maintained and one enters a state of resistance. When certain circumstances, such as work overload, economic or social pressures, or a competitive environment, are unconsciously perceived as a "threat," a sense of discomfort begins to develop. When this sensation is maintained in time, a state of exhaustion can be reached, with possible functional and organic alterations (WHO, 2010; García-Morán, 2016).

Muñoz (2003) indicates that stressful situations in studies have a negative impact on student health and performance. In the case of Perception of stress, stressful academic experiences and coping in health studies, stress negatively affects the immune system. Students may experience short-term changes in their emotional states. In terms of academic performance, when students experience high levels of stress it negatively affects their motivation, test performance, class attendance, class participation, among others.

In Ecuador, very few studies have been found on the prevalence of both determinants of poor mental health, and much less in this important population of university students that could allow a correct diagnosis, prevention and treatment in both cases. Therefore, the **objective** of the study was to determine the levels of Burnout Syndrome and Perceived Stress in university students in Ecuador.

4.2.2 Methods

A cross-sectional descriptive study was performed. The levels of Burnout Syndrome and Perceived Stress in Ecuadorian university students were determined. The methodological process known as STROBE (Strengthening the Reporting of Observational Studies in Epidemiology, see figure 1) was used to improve the quality of the observational study report (Vandenbroucke et al., 2007) (see figure 7).

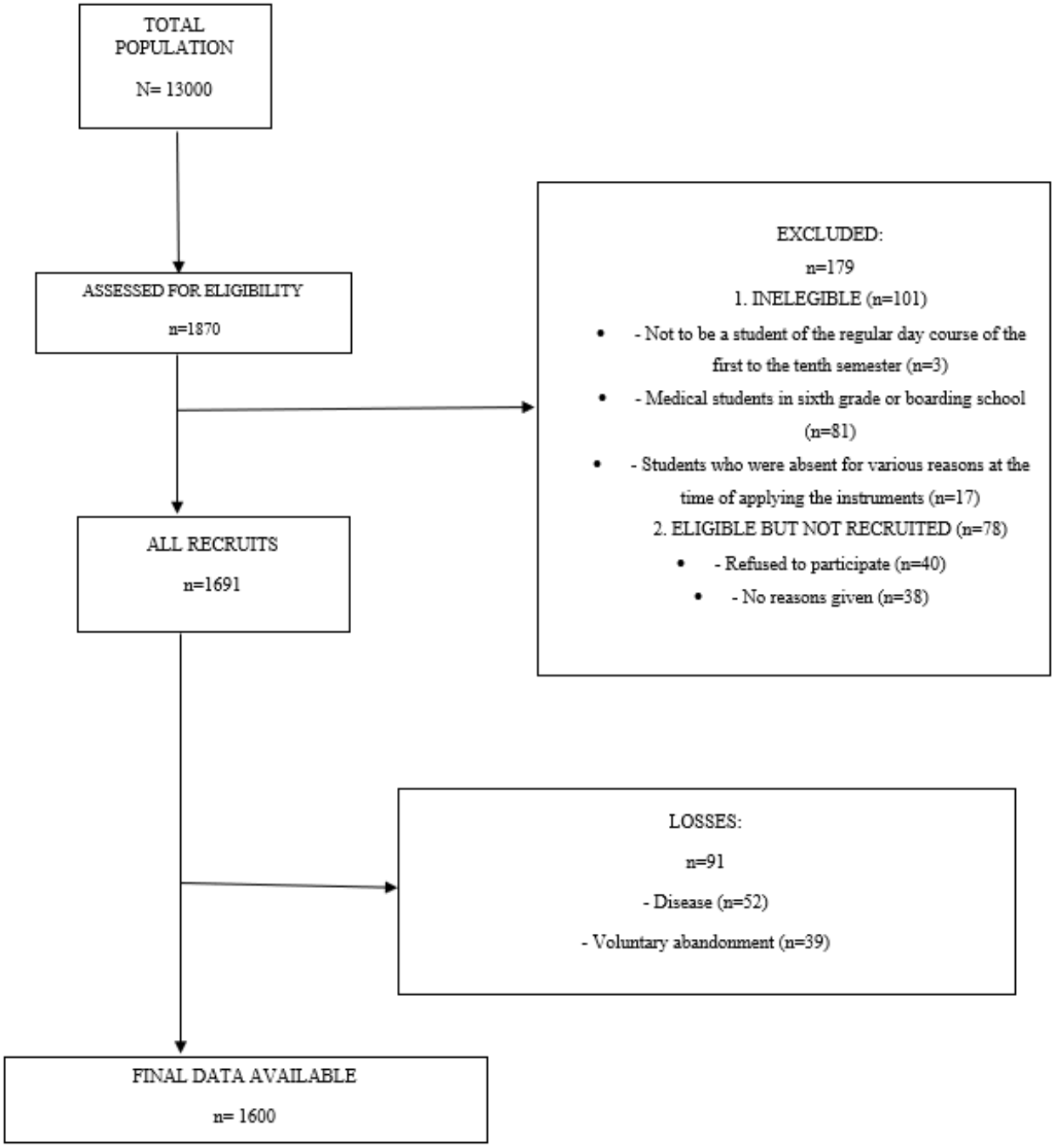

Figure 7. STROBE flowchart of the Study

Sample

The sample was identified in October 2018. It was based on the student population of the Technical University of Ambato, Ecuador's public university, where the greatest variety of university degrees are studied in its different faculties (Health Sciences, Engineering Sciences, Human and Educational Sciences, Jurisprudence and Social Sciences, Economic and Accounting Sciences, Agricultural Sciences) and students from all over the country. The sample was probabilistic and a stratified sample with proportional participation was used. Simple randomly representative samples of each stratum of all years and of both sexes of all careers of all faculties were subtracted.

The sample size was obtained from the standard error of the sample distribution of proportions and the critical value K, corresponding to the chosen confidence level. The most accurate sampling method is the stratified random sampling, which allows a representation of the population and the calculated sample: for N=13000; the minimum sample calculated is n=374 for a 95% Confidence level, 5% margin of error. This value was multiplied by 5 giving n=1870. From there 179 were excluded for different reasons. To get an n=1691. Finally, there was a loss of 91 and the final sample for the available data was n=1600 students (see figure 1).

Selection criteria

The sample of this study was selected according to the following selection criteria: - To be a student of the regular daytime course from the first to the tenth semester of the Technical University of Ambato during the academic period 2018 - 2019 at the time of starting the study. - Signature of the informed consent about the knowledge and agreement with the procedures and objectives of the research of the selected sample. - Students who were absent for various reasons at the time of applying the instruments and who did not wish to participate in the study were excluded. - In the case of medical students, the sixth year or boarding school is excluded because here the students are considered more workers than students due to the characteristics of this year.

Variables and study instruments:

Burnout syndrome in students: the Maslach Burnout Inventory Students Survey (MBI-SS) was used (Schaufeli et al. 2002). It is structured in 3 dimensions divided into 15 items: Emotional exhaustion (With items 1, 2, 3, 4 and 6. For example, "I am tired when I get up in the morning ˜ and have to face another day at the university"), Cynicism (With items

8, 9, 13 and 14. For example, "I doubt the transcendence and value of my studies") and Academic Effectiveness (With items 5, 7, 10, 11, 12 and 15. For example, "I think I contribute effectively during classes at the university"). The response scale is Likert type and ranges from 0 ("never") to 6 ("always"). For the evaluation of the results, the scale proposed by the National Institute of Safety and Hygiene at Work (200?) and used for students by Hederich-Martínez, C et al. (2016) was adapted:

Exhaustion: No BS: less than 1.2; Low: 1.3 - 2.0; Moderate: 2.1 - 2.8; High 2.9 or more. Cynicism: No BS: less than 0.5; Low: 0.6 - 1.24; Moderate: 1.25 - 2.25; High: 2.26 or more. Effectiveness: No BS: less than 2.83; Low: 2.83 - 3.83; Moderate: 3.84 - 5.16; High: 5.17 or more. In the study the instrument had a reliability by Cronbach alpha of .779; .805; .794 and .737 in global, exhaustion, cynicism and efficacy respectively. The validity was .756; .810; .570 and .505 in global, exhaustion, cynicism and efficacy respectively. KMO results: .752; .771; .723 and .762 in global, exhaustion, cynicism and efficacy respectively and that of B was 282,740; 330,786; 278,701 and 238,733 in global, exhaustion, cynicism and efficacy.

Stress: The Perceived Stress Scale (PSS) was used (Cohen et al. 1983) in its Spanish version (González y Landero, 2007). It has 14 items evaluated by means of a Likert scale of 5 points (from 0 to 4), valuing the level of stress perceived during the last month. The scale scores between 0-56, with higher scores indicating greater perceived stress. It uses a Likert type response format of five alternatives ranging from 0 ("Never") to 4 ("Very often"). For the evaluation of the results it was established as indicated by some authors (Parvan, Roshangar, Seyedrasooli, Nikanfar and Sargazi, 2014; Diaz-Corchuelo et al., 2015), three levels of perceived stress, according to the scores in this scale the cut-off points: no perception: 0-18; moderate level of perception: 19-37; high level: 38-5; in the overall instrument. And by items from 0 to 1.33; from 1.34 to 2.66; and from 2.67 to 4 respectively. In the study the instrument had a reliability of ,928 by means of Cronbach's Alpha and a validity of ,920 by means of the Intraclass correlation coefficient and of ,796 by means of the retest test.

Procedures and intervention

After knowing the study sample, MBI-SS and PSS were applied to students after informed consent. The participants were guaranteed anonymity and confidentiality of the information provided following the guidelines of the American Psychological

Association (2002). The informed consent form indicated whether or not to participate, ticking the appropriate option, and was signed. The questionnaire, delivered later, did not request personal identification data, thus maintaining the anonymity of the participant. In the database, each case was identified with a number.

The questionnaires were distributed throughout September and October 2018. They were delivered individually, with a brief explanation of the objective of the research being carried out, and the guarantee of anonymity and confidentiality of the responses. Its exclusive accessibility to team members for research purposes was highlighted.

Statistical treatment of data

All the data collected were analyzed using the SPSS software "Statistical Package for the Social Sciences, version 25.0 for Windows". Descriptive statistics (mean, standard deviation, P Value and percentage calculation).

4.2.3 Results

Baseline characteristics

As can be seen in table 13, there were more female than male students. The vast majority of the sample was single. Their average academic index is moderately high and their socioeconomic situation could be classified as medium-high.

Table 13. General characteristics of the sample (n= 1600).

	Mean (SD)	P Value
Sex (M/F)	637 / 963	-
Chronological age	22.74 ± 3,05	0.101
Marital Status (M/S)	223 / 1377	-
AI	4.02 ± 0.77	0.000
ISE	3.20 ± 1.12	0.000

AI (academic index between 1 y 5), ISE (socio-economic identification between 1 y 5), PC (body weight)
$p < .05$

In the case of Burnout Syndrome in its Exhaustion dimension, the items with the highest value in their mean were item 2 (I am physically exhausted at the end of a university day) and the item with the lowest mean was item 4 (Studying or going to class all day is a stress for me). In the Cynicism dimension the highest average item was 14 (I have distanced myself from my studies because I think they will not be really useful) and the lowest was 8 (I have lost interest in the career since I started university). And finally, in

the Academic Effectiveness dimension the one with the highest average value was item 12 (I have learned many interesting things during my career) and the one with the lowest average was item 7 (I think I contribute effectively with the classes in my university) (See table 14).

In the perception of stress, the items with the highest averages were 12 (In the last month, how often have you thought about the things you still have to do?) and 3 (In the last month, how often have you felt nervous or stressed?). And the lowest-average were evidently items 6 (In the last month, how often have you been sure about your ability to handle personal problems?) and 5 (In the last month, how often have you felt that you have effectively dealt with the major changes that have been occurring in your life?) (See table 14).

Table 14. Analysis by dimension and items of Burnout Syndrome and Perceived Stress

	X	SD	P Value
Exhaustion BS Global	**2,87**	**1,68**	**0.116**
ITEM 1	2,99	1,80	0.124
ITEM 2	3,68	1,65	0.114
ITEM 3	2,91	1,73	0.119
ITEM 4	2,24	1,58	0.109
ITEM 6	2.52	1,64	0.113
Cynicism BS Global	**1.39**	**1.51**	**0.307**
ITEM 8	1,13	1,53	0,106
ITEM 9	1,18	1,56	0.108
ITEM 13	1,39	1,64	0.114
ITEM 14	1,87	1,31	0.900
Efficacy BS Global	**4.16**	**1,41**	**0,098**
ITEM 5	4,00	1,46	0.101
ITEM 7	3,70	1,46	0.101
ITEM 10	4,06	1,38	0.095
ITEM 11	4,44	1,44	0.100
ITEM 12	4,89	1,29	0.090
ITEM 15	3,89	1,45	0,100
Perceived Stress Global	**1,88**	**1,02**	**0.058**
ITEM 1	2,00	1,01	0.059
ITEM 2	1,83	1,06	0.062
ITEM 3	2,21	1,01	0.060

ITEM 4	1,68	1,04	0.062
ITEM 5	1,60	0,99	0.059
ITEM 6	1,59	1,00	0.059
ITEM 7	1,70	0,97	0.057
ITEM 8	2,01	0,97	0.057
ITEM 9	1,73	1,01	0.060
ITEM 10	1,70	1,04	0.061
ITEM 11	2,15	1,03	0.061
ITEM 12	2,52	1,08	0.064
ITEM 13	1,68	0,93	0.055
ITEM 14	1,94	1,09	0.064
			$p < .05$

In the general results, more than 28 % of the students were diagnosed with high and moderate levels of emotional exhaustion, and almost 19 % in the same levels of Cynicism, the main dimension of the BS. Exhaustion was of all the dimensions of the BS that gave the highest levels, over 10%, although most of the students were diagnosed with low and moderate levels of this Syndrome. In the Cynicism dimension almost half had no BS and 32% had low levels. While the perception of stress significantly prevailed the absence of perceived stress over moderate and high levels of perception, since these two together reached a little more than 11% of the total (see table 15).

Table 15. Overall results by dimension and variable (n= 1600)

	Without BS (%)	**Low (%)**	**Moderate (%)**	**High (%)**
Exhaustion BS	731 (45.69 %)	408 (25.50 %)	298 (18.63 %)	163 (10.19 %)
Cynicism BS	787 (49.19%)	511 (31,94%)	188 (11.75 %)	114 (7.13 %)
Efficacy BS	905 (56.56 %)	501 (31.31%)	109 (6.81 %)	85 (5.31)

	Without EP (%)	**Moderate EP (%)**	**High EP (%)**	
Perceived Stress	1415 (88.43 %)	115 (7.19 %)	70 (4.38 %)	
				p < .05

In the result by faculties, the faculties of Human Sciences and Education and Health Sciences were the ones with the highest number of students with high levels of BS. In contrast, the fewest students with the BS and the lowest levels of it were in the Faculties of Jurisprudence and Social Sciences and in Agriculture. The female sex was the most affected, as there was a higher percentage of women with high and moderate levels of BS

than men. On the other hand, in the perception of stress there was a great parity in terms of percentages (see table 16).

Table 16. Results by Faculty (n= 1600)

FACULTY (m/f)	BS HIGH (m/f)	% (m/f)	BS MOD (m/f)	% (m/f)	STRESS HIGH (m/f)	% (m/f)	STRESS MOD (m/f)	% (m/f)
Health Science (n=395) (103/292)	69 (10/59)	9.7/20.2	152 (31/121)	30.1/41.4	4 (1/3)	0.9/1.0	10 (3/7)	1.02/2.40
Human Sciences and Education (n=*412) (149/263)*	95 (31/64)	20.81/24.33	138 (48/90)	32.2/34.2	19 (7/12)	4.7/4.6	21 (8/14)	5.4/5.3
Science Engineerings (n= 201) (111/90)	71 (36/35)	32.4/38.9	115 (55/60)	49.5/66.7	17 (6/11)	5.4/12.2	28 (11/17)	9.9/18.9
Jurisprudence and Social Sciences (n=*198) (91/107)*	37 (17/20)	18.7/18.7	70 (31/39)	34.1/36.4	5 (2/3)	2.2/2.8	16 (6/10)	6.6/9.3
Economic and Accounting Sciences (n=*189) (84/105)*	49 (11/38)	13.1/36.2	59 (19/40)	22.6/38.1	16 (7/9)	8.3/8.6	23 (10/13)	11.9/12.4
Agricultural Sciences (n= 205) (99/106)	41 (18/23)	18.2/21.7	61 (30/31)	30.3/29.2	9 (4/5)	4.0/4.7	17 (7/10)	7.1/9.4
Total	**362**	**22.63 19.3/24.8**	**595**	**37.2 33.6/39.6**	**70**	**4.4 4.2/4.5**	**115**	**7.2 7.1/7.3**

$p < .05$

4.2.4 Discussion

The objective of this study was to determine the levels of Burnout Syndrome and Perceived Stress in university students in Ecuador. In general, this examination of the responses of a large sample of Ecuadorian university students provided a broader view of the levels of these two elements so important in the knowledge of mental health levels in this student population. Specifically, in this study, there are coincidences with some results of other similar and other situations that were not very coincident, quite the contrary.

Such as the study conducted by Rojas-Melgarejo et al. (2017) where they determined the frequency of Burnout syndrome in medical students of the Santa Rosa del Aguaray

Branch, Faculty of Medical Sciences, National University of Asunción. High levels of depersonalization (cynicism) were found in 9.8%, high levels of emotional exhaustion in 9.8% and low levels of personal fulfillment in 16.4% of the sample. The frequency of Burnout syndrome found in the medical students interviewed was 28%. Overall, there was a significant similarity with the results.

In a study carried out on students of the degree in Nursing at the School of Nursing of the University of Costa Rica, 18.8% of the studied population presents the BS, levels a little lower than those found in this study (22.63% and 37.2% in high and moderate respectively) it is evident that the syndrome is more present in the first-year population (32.2%), followed by the fifth year (29, 1%).it is women who present the syndrome most (22.7%) (Reyes & Blanco, 2016).

In students from the University of Almeria (Spain), in relation to the sex of the participants, similar to the results found in this study, women scored higher on both the three burnout scales (exhaustion, cynicism and academic effectiveness) than men. However, these differences are not statistically significant (Africa et al., 2018). Glária et al. (2016) also compared the burnout levels in 220 students of the different phonoaudiology courses of a Chilean university. Fourth semester students did not present a significantly higher level of emotional exhaustion compared to other courses. In the depersonalization (cynicism) again the fourth semester did not report a significantly higher level than the second.

In 56 medical students at the Autonomous University of Mexico, 27% showed inefficiency, 11% cynicism, and 7% exhaustion. The prevalence of two dimensions was 5%. Significant differences ($p<0.05$) were found for the relationship with the group, playing an instrument, singing or acting, place of residence and violence in the transfer. The most frequent dimension was ineffectiveness (27%), followed by cynicism (11%) and exhaustion (7%), in this study there were some coincidences regarding their results (Plett-Torres et al., 2018).

Arias & Gutiérrez (2018) determined the prevalence and factors associated with burnout syndrome in medical interns in Lima, Peru. And they found a prevalence of burnout syndrome in only five inmates (5.2%). It was evidenced that 27.1% (26 inmates) presented high levels of emotional exhaustion. In 13 of them (13.5%) there were high levels of depersonalization and in 20 (20.8%), a low personal performance was identified.

The participants were students attending a medical school in Fortaleza, Brazil. Burnout was detected in 14.9% of the students, and 57.7% showed a risk of developing the syndrome. Logistic regressions showed an association between burnout and "have failed examinations" and "have considered abandoning the course", $p = 0.047$ and $p < 0.0001$, respectively. The main findings indicate a high overall prevalence of BS (14.9%). Of the remaining 85.1% of participants who did not meet the criteria for BS, 24.7% had a high risk of developing it because their scores had reached critical values for two of the three components of the syndrome. BS did not seem to worsen as students approached graduation, as has been reported in the literature (Almeida et al., 2016).

Merchán-Galvis et al. (2018) determined the prevalence of Burnout Syndrome in medical students at the Icesi University in Cali, Colombia. This was 4.3%, much lower than that found in this research, highlighting that 47.8% of the students presented reduced personal achievement. The X semester was associated with significant alterations in all the valued dimensions. Burnout Syndrome was present in 4.3% (n=7) of the students, according to the interpretation of the instrument when obtaining a high score in the dimensions of EO and PD together with a low score in the dimension of PR. Additionally, the research group considered as borderline or probable the students who presented two of the three affected dimensions, finding that 21.1% (n=34) were in this situation.

Stress levels, mental health and their association with psychological, physiological and educational variables were characterized in Colombian medical students. With 217 students selected randomly, stratifying according to the academic cycle. There were high levels of stress (64%), depression (56.2%) and anxiety (48.3%) unlike this study where high levels of stress were found in just over 4 percent of the students (Hoyos et al., 2018).

Another study determined the magnitude of the dimensions of the academic burnout present in the 54 fifth year Stomatology students belonging to the University of Medical Sciences of Cienfuegos, Cuba. Their results do not coincide with those of this study because high levels of emotional exhaustion and low levels of depersonalization in the burnout dimensions were observed. 62.50% of the students presented a high level of emotional exhaustion. In consideration of the authors, when arriving at the last year of the career, 81.26% presented a low level of Depersonalization, those who present low scores in this subscale have more positive attitudes to identify and sensitize themselves with the patient's oral problem and develop an empathy that allows them to find clinical solutions more effectively. In the subscale Personal Realization, it was observed that

34.37% and 62.50% of those surveyed presented scores in the high and medium categories respectively (Álvarez and Cruz, 2018).

In students residing in medical specialties of a public university in the department of Cauca-Colombia, the prevalence rate of Burnout syndrome was 0.9 and was present in 47.5% of the participants. 42.5% presented emotional fatigue, 55% presented low depersonalization and only half reported a high level of personal fulfillment, and present the scores assigned to the variables resulting from the Burnout test, observing that for emotional fatigue in two extremes (low and high) the highest percentages are found with 42.5% respectively, while in depersonalization 55% presents it in low grade, 50% is qualified in high for personal fulfillment and 47.5% presents risk of Burnout. It does not coincide with this study's results (Jácome et al., 2019).

A total of 158 human medicine students from 9 Peruvian scientific societies were surveyed. 24.1% had a high level of emotional exhaustion, unlike this study which was about 10%, 45.6% a high level of depersonalization (cynicism) (over 7% in the case of this study), 25.3% a low level of personal fulfillment and 57.6% had BS. 60.8% of the students were carrying out some research work and 49.4% held some position in their scientific society. An important frequency of BS was identified in medical students belonging to the scientific societies studied (Nakandakari et al., 2015).

The population of 155 students of Psychology of the Universidad Veracruzana and 101 of the Degree in Administration of the Instituto Tecnológico de Veracruz, a total of 256 were found with high level of student burnout 1.29% in women of the degree in administration, and 0% in men, as for the degree in psychology neither men nor women presented high level of student burnout contrary to this study. (Barradas et al., 2017).

Among the possible **strengths** of this study are the correct use of Burnout Syndrome and Perception of Stress assessment instruments, both of which specifically target the type of student population. Two of the most used and validated in the international literature to determine prevalence. On the other hand, in terms of **limitations**, it can be stated that it was not possible to take a sample of all the university students in the country within the framework of the Ecuadorian sierra. Although in this university there are students from different regions of the country, those from the central highlands predominate.

According to the results of this study, it can be concluded that more than 28 % of the students were diagnosed with high and moderate levels of emotional exhaustion, and almost 19 % in the same levels of Cynicism, the main dimension of the BS. Exhaustion

was of all the dimensions of the BS the one that gave the highest levels, over 10%. In the Cynicism dimension almost half had no BS and 32 % had low levels. The faculties with the highest number of students with high levels of BS were the Faculties of Human Sciences and Education and Health Sciences. On the other hand, those with fewer students with the BS and lower levels of the latter were in the Faculties of Jurisprudence and Social Sciences and in Agriculture. The female sex was the most affected, as there was a higher percentage of women with high and moderate levels of BS than men. On the other hand, in the perception of stress there was a great parity in terms of percentages.

4.3 RELATIONSHIP OF BURNOUT SYNDROME WITH SOME DETERMINANTS OF MENTAL HEALTH IN ECUADORIAN UNIVERSITY STUDENTS.

4.3.1 Introduction

"Mental health is an integral and essential component of health. It can be defined as a state of well-being in which a person is able to cope with the normal stresses of life, to work productively and to contribute to his or her community. It is determined by multiple social, psychological and biological factors. Persistent socio-economic pressures constitute a well-known risk to the mental health of individuals and communities" (WHO, 2013).

Specifically, in university students, good mental health is essential for optimal development at this stage of their lives. The study of a professional career can be a source of tension that threatens psychological well-being, which can be compromised in academic achievement, physical health or mental health. It is necessary that those who initiate a profession, are mentally healthy so that they have a greater capacity to face the situations that arise throughout this period (Cano, 2008).

University students are increasingly experiencing mental health problems that affect their performance, well-being and lives in general, as the period between the ages of 18 and 25 is associated with a number of risk factors that can affect the mental health of a young person. Academic demands, ostensibly more pronounced than those faced in previous school life, could be among the tensest factors, in addition to the academic pressure inherent in university life, arising from a considerable change in relation to the school education system (Cova et al., 2007; Rioseco et al., 1996).

Some of the main determinants of mental health in university students are academic motivation, self-esteem and well-being, and among those of poor mental health are the high levels of Burnout Syndrome and Perceived Stress. Burnout Syndrome (BS) in students is defined as a negative, persistent, student-related emotional response, consisting of a feeling of being exhausted, of no longer being able to perform tasks as a student (exhaustion); a cynical or distancing attitude to the meaning and usefulness of the studies being conducted (cynicism); and a feeling of academic incompetence as a student

(effectiveness) (Shaufeli, Salanova, etc.), 2002). exhaustion from study demands, in addition to attitudes of disinterest, self-sabotage from academic activities, and doubts about the value of study, as well as feelings of incompetence as a student (Liu et al, 2018; Boni et al, 2018; Erschens et al, 2018; Liébana-Presa et al, 2017; Erbil et al, 2016; Hederich-Martínez et al, 2016; Rostami et al, 2014; Tomaschewski et al.)

Stress is "the set of physiological reactions that the body prepares for action" (WHO, 2013). In global terms, it is a biological alert system necessary for survival. Any change or different circumstance that occurs in our lives can generate stress. A certain degree of stress stimulates the organism and allows it to reach its objective, returning to the basal state when the stimulus has ceased. The problem arises when the pressure is maintained and a state of resistance is entered. When this sensation is maintained over time, a state of exhaustion can be reached, with possible functional and organic alterations. Specifically, academic stress is defined through the impact that educational institutions can have on their students (Muñoz 2003; Polo, Hernández and Pozo 1996).

Muñoz (2003) indicates that among the stressful academic situations are: evaluation, overload of tasks, lack of free time, difficulties in combining academic and personal life, difficulties in maintaining concentration, the demand for practical activities and disapproved courses among others. According to Vallerand and Thill (1993), motivation is a hypothetical concept used to describe the result of internal and external forces that produce initiation, direction, intensity and persistence of behavior. Motivation is the cause of a behavior, that is to say, the factors that, operating on the psychological plane of the individual, determine the execution or not of an activity. It is, in short, the reason for behavior (Ramajo, 1992).

Intrinsic motivation is generally defined as practicing an activity by itself, for the pleasure of participating in the activity in the absence of external contingencies (Deci, 1971; Vallerand & Halliwell, 1983). Extrinsic motivation is based on the three main concepts of reward, punishment and incentive. A reward is an attractive environmental object that occurs at the end of the behavior sequence and increases the likelihood that that behavior will recur; a punishment is an unattractive environmental object that occurs at the end of the behavior sequence and reduces the likelihood that the behavior will recur (López, 2000; Reeve, 1994).

On the other hand, self-esteem is a concept closely related to general well-being (Rojas-Barahona et al., 2009; Lightsey et al., 2006; Chen et al., 2004), suggesting that it could

be a good indicator of mental health (Garaigordobil, 2008; Robis, 2001). Therefore, their knowledge is a valuable information that would enable the prediction of possible psychopathological disorders and their prevention (Rojas-Barahona et al., 2009; Fan, 2001).

Subjective well-being can be defined as "a broad category of phenomena that includes people's emotional responses, satisfaction with domains, and global judgments about satisfaction with life" (Diener, Suh, Lucas & Smith, 1999). This definition contains the two main components of subjective well-being: affection, and satisfaction with life (Romero et al., 2007).

Knowledge of these variables may be essential in determining what level of mental health any college student population has. And no less important is to know the degree of relationship between them, specifically between the BS and the others, because in this way better decisions could be made regarding prevention and treatment. In Ecuador, very few studies have been found in this regard, where it is possible to determine the relationship of this complex and dangerous Syndrome with some determinants of mental health, and much less in this important student population. Therefore, the **objective** of the study was to determine the relationship between the levels of Burnout Syndrome with some determinants of mental health in Ecuadorian university students.

4.3.2 Methods

A cross-sectional correlational descriptive study was performed. Various instruments were applied to determine the relationship between levels of Burnout Syndrome with Perceived Stress, Academic Motivation, Self-esteem, Well-being and other indicators in Ecuadorian university students.

Sample

The sample was identified in October 2018. It was based on the student population of the Technical University of Ambato, Ecuador's public university, where the greatest variety of university degrees are studied in its different faculties (Health Sciences, Engineering Sciences, Human and Educational Sciences, Jurisprudence and Social Sciences, Economic and Accounting Sciences, Agricultural Sciences) and students from all over the country. The sample was probabilistic and a stratified sample with proportional participation was used. Simple randomly representative samples of each stratum of all years and of both sexes of all careers of all faculties were subtracted.

The sample size was obtained from the standard error of the sample distribution of proportions and the critical value K, corresponding to the chosen confidence level. The most accurate sampling method is the stratified random sampling, which allows a representation of the population and the calculated sample: for N=13000; the minimum sample calculated is n=374 for a 95% Confidence level, 5% margin of error. This value was multiplied by 5 giving n=1870. From there 179 were excluded for different reasons. To get an n=1691. Finally, there was a loss of 91 and the final sample for the available data was n=1600 students.

Selection criteria

The sample of this study was selected according to the following selection criteria: - To be a student of the regular daytime course from the first to the tenth semester of the Technical University of Ambato during the academic period 2018 - 2019 at the time of starting the study. - Signature of the informed consent about the knowledge and agreement with the procedures and objectives of the research of the selected sample. - Students who were absent for various reasons at the time of applying the instruments and who did not wish to participate in the study were excluded. - In the case of medical students, the sixth year or boarding school is excluded because here the students are considered more workers than students due to the characteristics of this year.

Variables and study instruments:

Burnout syndrome in students: the Maslach Burnout Inventory Students Survey (MBI-SS) was used (Schaufeli et al. 2002). It is structured in 3 dimensions divided into 15 items: Emotional exhaustion (With items 1, 2, 3, 4 and 6. For example, "I am tired when I get up in the morning ˜ and have to face another day at the university"), Cynicism (With items 8, 9, 13 and 14. For example, "I doubt the transcendence and value of my studies") and Academic Effectiveness (With items 5, 7, 10, 11, 12 and 15. For example, "I think I contribute effectively during classes at the university"). The response scale is Likert type and ranges from 0 ("never") to 6 ("always"). The burnout is identified with high scores in the dimensions of fatigue and cynicism and low scores in the dimension of effectiveness. *Stress:* The Perceived Stress Scale (PSS) was used (Cohen et al. 1983) in its Spanish version (González & Landero, 2007). It has 14 items evaluated by means of a Likert scale of 5 points (from 0 to 4), valuing the level of stress perceived during the last month. The scale scores between 0-56, with higher scores indicating greater perceived stress. It uses

a Likert type response format of five alternatives ranging from 0 ("Never") to 4 ("Very often").

Self-esteem: the Rosenberg RSES Self-esteem Scale (Rosenberg, 1965) will be used. It consists of 10 statements of the feelings the person has about him/her, 5 positively directed (items 1, 2, 4, 6 and 7) and 5 negatively (items 3, 5, 8, 9 and 10). The graduation of answers has 4 points (1 = very disagree, 2 = disagree, 3 = agree and 4 = very agree) and the inverse score is assigned to the negatively directed statements; the theoretical values fluctuate between 10 (low self-esteem) and 40 (high self-esteem). It is a self-applied scale where participants mark with an "X" the alternatives that most identify it.

Academic Motivation: the EMA Academic Motivation Scale will be used (Vallerand et al, 1992), (translated and validated into Spanish by Manassero and Vázquez, 1997). The scale is composed of 28 items distributed in seven subscales of four items each evaluating amotivation, three types of ME (external regulation, introjected regulation and identified regulation) and three types of MI (MI to knowledge, MI to achievement and MI to stimulating experiences). Both the original version and the adaptations of the scale have presented satisfactory levels of internal consistency measured with Cronbach alpha and high indices of temporal stability.

Welfare: WHO Welfare Index (WHO-5). It is a scale consisting of five interrogatively expressed reagents that investigate the presence of aspects related to emotional well-being measured in a single factor such as Have I felt happy and in good spirits? and Has my daily life had interesting things for me? The total time for the application of this scale requires between one and three minutes. The score of the Likert type answers allows us to know the frequency of appearance of the aspects studied and varies on a scale from 0 (never) to 3 (always). Therefore, the final scores can vary from 0 to 15; the higher the score the greater the well-being or the lower the score the more clinically important depressive symptoms.

Academic index: The average of the academic records of the students' grades up to that time in the University was taken with the help of the teaching secretariats of each Faculty. And the average was taken, leading to values from 0 (very bad academic index) to 5 (excellent academic index).

Economic situation: it will be based on the classification criteria used by the Ministry of Economic and Social Inclusion (MIES) of the Republic of Ecuador and it was taken to quantitative values from 0 (very bad situation) to 5 (excellent situation).

Procedures and intervention

After reviewing the study sample, the MBI-SS, PSS, RSES, EMA and WHO-5 Index were applied to the students, and their average academic index and general economic situation were analyzed after receiving their informed consent. The participants were guaranteed anonymity and confidentiality of the information provided following the guidelines of the American Psychological Association (2002). The informed consent form indicated whether or not to participate, ticking the appropriate option, and was signed. The questionnaire, delivered later, did not request personal identification data, thus maintaining the anonymity of the participant. In the database, each case was identified with a number.

The tests were carried out throughout September and October 2018. They were applied individually, with a brief explanation of the objective of the research being carried out, and the guarantee of anonymity and confidentiality of the responses. Its exclusive accessibility for team members for research purposes was highlighted. All the results were then digitized directly to the database created for this purpose and the corresponding statistical analysis was carried out.

Statistical Data Processing

All the data collected were analysed using the SPSS software "Statistical Package for the Social Sciences, version 25.0 for Windows". Descriptive statistics (mean, standard deviation, P Value, Chi-square, minimum, maximum and percentiles). We compared medians with the Kruskall-Wallis Test and then to examine the relationship between the variables of interest we performed correlation analysis using the correlation coefficient of Spearman (Rho) (monotonous relationship) since the study variables are ordinal, which values between -1 and +1. A value close to 0 indicates that the variables are barely related and close to 1, a very strong relationship. Multiple linear regression was also used between dependent variables (the 3 dimensions of the BS) and independent variables (all the others) in order to estimate the possible relationship between both types of variables and to be able to determine the independent variables that best predict the value of the dependent variables.

4.3.3 Results

Table 17 shows the main descriptive characteristics of the results of each instrument applied in terms of its means, standard deviation, Chi-square, minimum and maximum values and percentiles.

Table 17. Characteristic and contrast data of the study variables by means of Kruskall-Wallis Test.

Variables	Mean	SD	Chi-square	P Value	Min	Max	Percentiles	Percentiles	Percentiles
							25	50	75
Exhaustion	3,349398	,4141914	10,924	,012	2,4000	4,4000	3,000000	3,400000	3,600000
Cynicism	1,9578	,81881	5,092	,078	,00	3,75	1,2500	2,0000	2,5000
Efficacy	4,289157	,8325542	2,497	,287	1,8333	5,6667	3,666667	4,166667	5,166667
Self-esteem	3,053012	,5017864	3,874	,144	2,1000	4,0000	2,700000	3,000000	3,400000
Stress	2,687435	,5530545	7,820	,020	,9286	3,8571	2,285714	2,500000	3,142857
Motivation	5,100929	,7610877	2,834	,242	3,0000	6,8214	4,678571	5,250000	5,669643
Academic index	3,99	,374	,000	1,000	3	5	4,00	4,00	4,00
Wellness	3,640506	,7702013	1,208	,547	1,8000	5,0000	3,000000	3,400000	4,000000
Econ Cond	2,92	,694	1,009	,604	2	5	2,00	3,00	3,00

$p \leq 0.05$

According to the general validation of the 5 applied instruments (the MBI-SS has three dimensions that were validated separately) the reliability according to the measurement of its internal consistencies by means of the Cronbach A could be evaluated between acceptable (α between 0.7 and 0.8: PSS, Self-esteem, Cynicism-MBI, Effectiveness MBI, and good (α between 0.8 and 0.9: Agotam-MBI, Motivation, Well-being). Its validity was evaluated by factorial analysis using the Kaiser-Meyer-Olkin test. All were considered as feasible (KMO > 0.7) as can be seen in table 18.

Table 18. Overall results of the validity and reliability of the instruments applied

	Cronbach Alpha	Kaiser-Meyer-Olkin
Exhaustion MBI-SS	.805	.771
Cynicism MBI-SS	.794	.723
Efficacy MBI-SS	.737	.762
RSES	,785	,807
PSS	,701	,819
EMA	,899	,856
WHO-5	,802	,649

$p \leq 0.05$

The correlation between the variables using Spearman's Rho had different results and levels of relationship. A low positive correlation was shown between BS exhaustion, self-esteem, academic index and motivation; and a weak negative correlation with effectiveness and well-being. The highest positive relationships were obtained with perceived stress and the cynicism dimension, which were moderately weak. The cynicism dimension of the BS had weak negative correlations with effectiveness, self-esteem and academic index, while its moderately weak positive correlations were with levels of well-being and exhaustion. Finally, the effectiveness dimension of the BS had weak negative correlations with all variables except the perception of stress with which it had a very insignificant weak positive correlation (see table 19).

Table 19. Correlation of variables using Spearman's Rho

		Exhaustion	Cynicism	Efficacy	Self-esteem	Stress	Acad Index	Motivation	Wellness	Econ Cond
Exhaustion	Rho	1,000	,158	-,072	,019	,289	,043	,083	-,239	,153
	P Value	-	,154	,516	,865	,008	,702	,466	,034	,178
Cynicism	Rho	,158	1,000	-,064	-,119	,061	-,039	,083	,209	,054
	P Value	,154	-	,568	,286	,585	,727	,466	,064	,638
Efficacy	Rho	-,072	-,064	1,000	-,075	,042	-,003	-,052	-,028	-,069
	P Value	,516	,568	-	,501	,705	,977	,646	,807	,544
Self-esteem	Rho	,019	-,119	-,075	1,000	,088	,095	,015	-,009	-,222
	P Value	,865	,286	,501	-	,429	,391	,898	,936	,049
Stress	Rho	,289**	,061	,042	,088**	1,000	,035**	-,020	-,064**	,027
	P Value	,008	,585	,705	,429	-	,751	,864	,574	,810
Acad Index	Rho	,043	-,039	-,003	,095	,035	1,000	-,108	-,043	,052
	P Value	,702	,727	,977	,391	,751	-	,342	,710	,646
Motivation	Rho	,083	,083	-,052	,015	-,020	-,108	1,000	-,233	-,207
	P Value	,466	,466	,646	,898	,864	,342	-	,039	,067
Wellness	Rho	-,239*	,209	-,028	-,009*	-,064	-,043*	-,233	1,000*	,237
	P Value	,034	,064	,807	,936	,574	,710	,039	-	,035
Econ Cond	Rho	,153	,054	-,069	-,222	,027	,052	-,207	,237	1,000
	P Value	,178	,638	,544	,049	,810	,646	,067	,035	-

* The correlation is significant at level 0.05 (bilateral).
**. The correlation is significant at level 0.01 (bilateral).

As for Multiple Linear Regression, in the three variables dependent on the BS, 19.6% of the Exhaustion levels can be explained by independent variables (levels of Cynicism and Effectiveness of the BS, economic situation, perception of stress, academic index, levels of self-esteem, motivation and well-being). With a typical error of the estimation considered as a means. Therefore, the influence of the latter on Exhaustion levels can be considered as moderate. The variability observed may also be due to the moderately low influence of these variables, the model having an explanatory power from medium to low, as can also be seen in the scatter plots (see table 20 and Figure 8).

In the dimension Cynicism as a dependent variable, 14.9% of the Cynicism levels of the BS can be explained by the levels of the independent variables. With a typical error of the estimation considered as mean. The influence of the latter on the levels of Cynicism can be considered as low. The observed variability may be the cause of chance due to the very low influence of these variables, and the model has a low explanatory power (see table 4 and Figure 2).

Finally, in the Effectiveness dimension of the BS, 6.3% of its levels can be explained by independent variables, with a typical error of the estimate considered as mean. In this case, the influence of the latter on efficiency levels can be considered as low. The observed variability may be the cause of chance due to the very low influence of these variables, and the model has a low explanatory power (see table 4 and Figure 2).

Table 20. Multiple Linear Regression: Model Summary.

Model	R	R square	R corrected square	Typ. estimation error	Change statistics		Change statistics	
					Change in square R	gl1	gl2	Sig. Change in F
Exhau [b]	,443 [a]	,196	,104	,3966195	,196	8 [a]	70	,044
Cynic [c]	,385 [a]	,149	,051	,79392	,149	8 [a]	70	,164
Effic [d]	,250 [a]	,063	-,045	,8185173	,063	8 [a]	70	,788

$p \leq 0.05$

a: Predictor variables: (Constant), Econ Cond, Cynicism, Stress, Acad Index, Efficacy, Motivation, Wellness, Self-esteem
b. c d: Dependent variable: Exhaustion, Cynicism, Efficacy

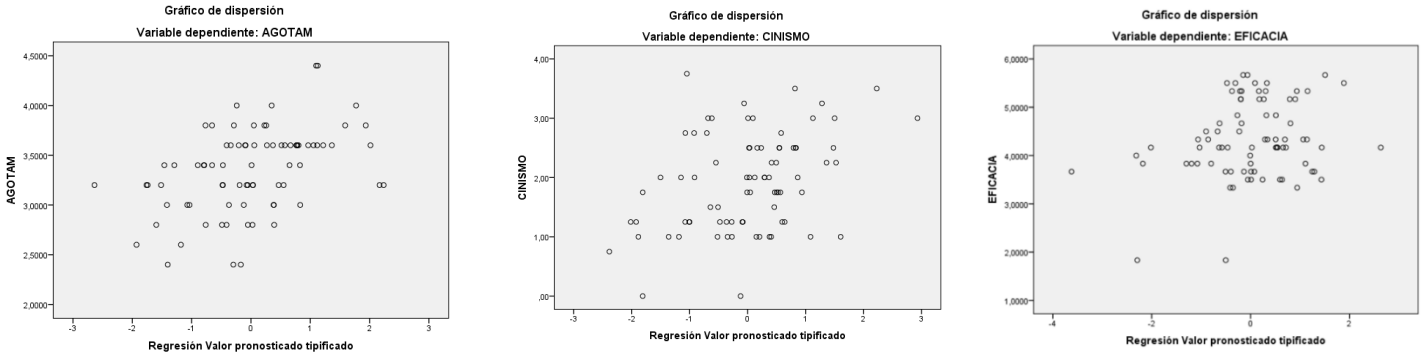

Figure 8. Scatter plot of the multiple linear regression in the three dimensions of the BS.

In the dimension Exhaustion, according to the result of the variance analysis the regression model is statistically significant (p=.044), therefore, the level of association between Exhaustion and the other variables is moderate for $p \leq 0.05$. In the dimensions Cynicism and Effectiveness, the results of the analysis of the variance the model is not significant in any of the cases (p=.164 and p=.788 respectively), therefore, the level of association between both dimensions and the other variables is low and very low respectively (see table 21).

Table 21. ANOVA[a]

Model		Sum of squares	gl	Quadratic mean	F	Sig.
Exh [a]	Regression	2,686	8	,336	2,134	,044[d]
	Residual	11,011	70	,157		
	Total	13,697	78			
Cyn [b]	Regression	7,697	8	,962	1,526	,164[d]
	Residual	44,121	70	,630		
	Total	51,818	78			
Eff [c]	Regression	3,129	8	,391	,584	,788[d]
	Residual	46,898	70	,670		
	Total	50,027	78			

a, b, c. Dependent variables: $p \leq 0.05$
d. Predicting Variables

In the Exhaustion dimension the terms for independent variables are not significant in most cases (for $p \leq 0.05$), only for the variable Cynicism ($p = 0.035$), Stress ($p = 0.022$) and Welfare ($p = 0.044$) are low. In the case of the Cynicism dimension, these terms are also not significant in most cases (for $p \leq 0.05$), only for the variable exhaustion ($p = 0.035$) and Welfare ($p = 0.016$). And finally, in Effectiveness the terms are even less significant because it is in all cases (for $p \leq 0.05$), Valen very low or negative (see table 22).

Table 22. Coefficients [a]

Model	Non-standardized coefficients		Typified coefficients	t	Sig.
	B	Standard error	Beta		
(Exhaustion) [a]	1,969	,882	-	2,234	,029
Cynicism [b]	,124	,058	,242	2,147	,035
Self-esteem [b]	,124	,097	,145	1,274	,207
Efficacy [b]	,033	,058	,063	,575	,567
Stress [b]	,192	,082	,254	2,344	,022
Acad Index [b]	,062	,132	,051	,469	,640
Motivation [b]	,010	,065	,017	,153	,879
Wellness [b]	-,132	,064	-,242	-2,054	,044
Econ Cond [b]	,097	,071	,161	1,366	,176
(Cynicism) [a]	-,077	1,827	-	-,042	,966
Exhaustion [b]	,498	,232	,256	2,147	,035
Efficacy [b]	-,062	,116	-,061	-,537	,593
Self-esteem [b]	-,303	,194	-,182	-1,564	,122
Stress [b]	-,048	,170	-,032	-,280	,780
Acad Index [b]	-,058	,265	-,025	-,220	,827
Motivation [b]	,193	,128	,176	1,514	,135
Wellness [b]	,314	,127	,297	2,479	,016
Econ Cond [b]	-,081	,144	-,069	-,561	,576
(Efficacy) [a]	6,773	1,700	-	3,983	,000
Exhaustion [b]	,142	,246	,074	,575	,567
Cynicism [b]	-,066	,123	-,067	-,537	,593
Self-esteem [b]	-,247	,201	-,151	-1,230	,223
Stress [b]	-,017	,176	-,012	-,097	,923
Acad Index [b]	-,326	,270	-,142	-1,208	,231
Motivation [b]	-,016	,134	-,015	-,121	,904
Wellness [b]	-,038	,136	-,036	-,278	,782
Econ Cond [b]	-,155	,148	-,134	-1,046	,299

Dependent variable; b. Independent variables $p \leq 0.05$

4.3.4 Discussion

The objective of this study was to determine the relationship between the levels of Burnout Syndrome with some determinants of mental health in Ecuadorian university students. In general, this analysis of the responses to a large sample of Ecuadorian university students provided a broader view of the levels of each construct, the relationship between the variables studied and the determination of the independent variables that best predict the values of the dependents (the 3 dimensions of the BS).

Specifically, in our study there are coincidences with some results of other similar and other situations that were not very coincident, quite the opposite. As the one carried out by Paredes et al. (2008) the statistical analysis evidenced a negative association between Burnout and psychological well-being (-0.279) in resident medical students, very similar to our study (-.239).

In students at the Simón Bolívar University in Barranquilla, Colombia (Palacio et al, 2012) a negative association was observed between Exhaustion and Cynicism with the academic average (respectively -0.121 and -0.164); while a positive association was found between Effectiveness and the academic average (0.359), which evidenced a negative relationship between the burnout and the academic average, in our case the relationship exhaustion, cynicism, effectiveness with this variable was .043; -.039 and -.003 respectively with a minimal negative relationship in global sense.

Another study carried out on university students in Spain and Portugal showed multiple relationships between burnout and academic variables. Burnout dimensions are negatively related to performance and expectations of success and positively to the tendency to drop out. The correlation Exhaustion and cynicism was 0.49, with some similarity to our case (,158); Exhaustion and Effectiveness 0.23, in our case the relationship was negative (-,072) (Martínez & Marques, 2005). In another study carried out by Preciado et al. (2010), they surveyed 60 Mexican dental students who perform clinical practices in charitable institutions. 46% (28) were women and 53% (32) were men, with an average age of 20.65 (± 2.07) years. The correlation of Exhaustion with stress situations was 0.25 ($p = 0.02$) similar to our results (.289).

Muñoz et al., (2016) described the relationship between the burnout levels of Chilean dental students and their socio-demographic characteristics and academic background. When comparing the burnout levels by sex and in relation to the formative level, it was

observed that there were significant differences only in the level of emotional exhaustion. In relation to sex, women presented higher scores than men ($p < 0.001$). Regarding the formative level, differences were found between first year students and second- and third-year students, where first year students presented lower levels of Emotional Exhaustion ($p < 0.01$). When evaluating the correlation of burnout levels with academic background, a statistically significant weak correlation was found between Emotional Exhaustion and this background, coinciding with our study (.043).

Barraza (2009), conducted a transectional and correctional study on a sample of 243 undergraduate students from the Universidad Pedagógica de Durango (Mexico). The results obtained allowed us to affirm that academic stress influences student burnout. The results obtained in this way indicate that the correlation between academic stress and student burnout is .477 with a significance level of .000 difference from our study where the relationship was a little less significant (.289 and a significance level of .008). The square R for this regression model is .228, indicating that academic stress accounts for 22.8% (in our case square R = 19.6%) of the total student burnout variation; the statistical significance for this regression model is .000. This does not coincide with our results where influence levels are lower.

In a study carried out by Extremera and Durán (2007) in 371 university students from two Andalusian universities, the results showed a linear correlation of 0.336 between Exhaustion and Perceived Stress (.289 in our case) and between Cynicism and Perceived Stress; on the other hand, Effectiveness and Stress the correlation was 0.292 (.042 in our case). Another study carried out by Cabanach et al. (2016) analysed the possible existence of significant differences in the burnout experienced by physiotherapy students from various Spanish universities depending on their level of self-esteem. The results of this work show that when students have low self-esteem, clearer manifestations of burnout appear. On the other hand, the higher the self-esteem, the lower the symptoms of exhaustion and depersonalization, and the higher the levels of personal fulfilment shown by the students. The relation Self-esteem, with the dimensions Exhaustion, Cynicism and Effectiveness were: -0.478, -0.188 and 0.275 respectively. In our case those relations were of .019; -.119 and -.075 respectively with a similarity only in the cynicism dimension.

Among the 566 U.S. resident surgical students who participated in a survey conducted by Lebares et al., (2018). Highest burnout was associated with high stress (OR 7.8; $p < 0.0001$). One report reported levels of burnout, perceived stress, and facilitation of direct

student service activities. The findings indicated a relationship between Exhaustion and Perceived Stress of 0.61, much higher than those found in our research (Mullen & Gutiérrez, 2016). In a study carried out in 465 Physiotherapy students from several Spanish universities (Cabanach et al., 2014) the relationship of self-esteem with academic stressors such as student overload was -.311 unlike our study which was .088.

The purpose of another research (Usan et al., 2019) was to analyze the relationships between the constructs of emotional intelligence, burnout, academic engagement and school performance in 1756 Spanish students. Regulation and emotional clarity negatively related to exhaustion, as well as cynicism, variables of BS. School performance showed negative correlations with exhaustion (r=-.150) in our case .043 and cynicism (r= -.386) in our case -.039.

Preciado et al., (2010) found, in Mexican dental students, a significant association between situations of stress and exhaustion; feeling little psychological well-being with depersonalization and low psychological well-being with the lack of professional realization of the burnout syndrome. Contrary to the results of our study (.289) the relationship was moderately low. Statistical regression analyses determined that stress situations are predictive of burnout syndrome, while psychological well-being is inversely correlated with this condition. Association analyses established that situations of stress (X2=4.275, p=.039) and low cognitive strength (X 2=6.06 p=.014) are significantly related to Exhaustion. Type A behaviors (X 2=4.12, p=.042) and poor psychological well-being (X 2=6.89, p=.009) are associated with depersonalization (MBI). Lack of threat minimization (X 2=4.04, p=.044) and perceived low psychological well-being (X 2=4.44, p=0.035) are associated with lack of professional fulfillment (MBI).

According to González-Cabanach et al., (2012) there is a significant relationship between perceived self-efficacy and the six dimensions that make up psychological well-being (self-acceptance, positive relationships with others, autonomy, mastery of the environment, purpose in life and personal growth): .501; .177; .228; .509; .361 and .306 respectively, in our case this relationship was slightly negative overall (-.028).

Among the possible **strengths** of this study are the correct use of the instruments and tests of reliability (internal consistency using Cronbach's alpha) and validity (by factor analysis using the Kaiser Meyer Olkim index). The most used in the international bibliography to validate similar instruments. Also, the correct use of correlation coefficients to measure

the degree of relationship or association between the variables studied. One of the most used coefficients in these cases since the variables used in this study are ordinals. And the use of multiple linear regression between the dimensions of the BS and the other variables used and thus it was possible to estimate the relationship between both types of variables and the variables that best predict the value of the dimensions of the BS. On the other hand, regarding the **limitations**, it can be stated that it was not possible to take a sample of all the university students in the country within the framework of the Ecuadorian sierra. Although in this university there are students from different regions of the country, those from the central highlands predominate.

According to the results of this study, it can be concluded that there were moderate correlations between BS exhaustion and perceived stress and cynicism, and between cynicism and well-being. There was a low correlation between burnout, self-esteem, academic index and motivation. And negative correlations between burnout with efficacy and well-being; and the efficacy dimension had negative correlations with all variables except perception of stress. A moderate percent of Exhaustion can be explained by the other variables: Cynicism and Effectiveness, the economic situation, the perception of stress, the academic index, the levels of self-esteem, motivation and well-being. The influence of the latter can be considered as moderate, with the model having a medium to low explanatory power. The level of association between this and the other variables is moderate. In the case of Cynicism, the influence of the latter on the levels of can be considered as low. The observed variability may be the cause of chance due to the very low influence of these variables, and the model has a low explanatory power. Very low percentages of the efficiency levels can be explained by the independent variables, being the variability observed the cause of chance, having the model a low explanatory power. In cynicism and efficiency, the level of association between both dimensions and the other variables is low and very low respectively.

4.4 EFFECTS OF PHYSICAL EXERCISES ON BURNOUT SYNDROME IN UNIVERSITY STUDENTS: A QUASI-EXPERIMENTAL STUDY

4.4.1 Introducción

Burnout Syndrome (BS) is a health problem of great social repercussion nowadays. The interest currently aroused by the BS has facilitated an expansion of its field of study—which was initially exclusively the domain of health professionals—as research began in many other professional fields and even in university students (Segura, 2014).

Currently, most of the studies are framed within the three-dimensional approach that the syndrome is composed of emotional exhaustion, depersonalization and loss of self-fulfillment in the workplace (Li, Cheng & Zhu, 2018; Mikalauskas et al., 2018; Kavanagh & Spiro, 2018; Armenta-Hernández et al., 2018; Bruschini, Carli & Burla, 2018; Kawamura et al, 2017) and in the case of students the three dimensions are: emotional exhaustion, cynicism and academic effectiveness or self-efficacy (Liu et al., 2018; Boni et al., 2018; Erschens et al., 2018; Liébana-Presa, Fernández-Martínez & Morán Astorga, 2017; Reynaga-Estrada, Robles, Jiménez, Villalobos & Hernández, 2017). University students, like any professional, are faced with the pressures and overloads of academic work.

To date, very few intervention studies with physical exercise have been conducted in college students with BS. Intervention programs to prevent or treat burnout syndrome are essential to improving the health of workers and students. In the absence of an effective program, employees or students are likely to suffer from a job or related mental health deficiency where risk factors prevail. Review studies (Wendy, Awa & Walter, 2010; Colin, Liselotte, Patricia & Tait, 2016) have shown that the vast majority of research conducted and found is psychological and cognitive interventions. This is not so with a variety of studies showing the possible benefits of physical exercise in any of its different variants. In addition, whether the most effective type of exercise for treating and preventing this syndrome in the college student population is aerobic or anaerobic (strength) has not been determined.

The practice of regular physical exercise has beneficial effects for the integral health of the human being, in the physical sphere (Comin et al., 2018; Liu, Yansane, Zhang, Fu, Hong & Kalenderian, 2018; Foright et al., 2018), mental (Colledge et al., 2018;

Fernandes, 2018; Ledezma, Vega, Pérez & Luján, 2017) and socio-affective (Baillot et al., 2018; Rammant, Decaestecker & Bultijnck, 2017). If demonstrated, regular physical exercise could be an effective intervention to reduce burnout levels in workers and students with this harmful syndrome. This study describes an exercise intervention in college students with burnout syndrome. It recommends a controlled study designed to treat and prevent BS in this important and growing academic population worldwide. The **aims** of this study were to determine the effectiveness of physical exercise in reducing levels of burnout syndrome in Ecuadorian college students.

4.4.2 Material and methods

Study design

An experimental study was conducted with pretest and post-test, with two intervention groups (aerobic exercise group and strength exercise group) and a control group (no exercise). Participants in each group were randomly distributed, using simple random sampling.

Participants

The sample started from the population of students diagnosed with burnout syndrome at the University of Ambato in Ecuador, where a wide variety of university degrees (in health sciences, engineering, education sciences, economics and business, agronomy, law, tourism and social sciences) will be studied. It was probabilistic and a stratified sample with proportional participation was used.

The sample size was obtained from the standard error of the proportional sample distribution and the critical value K, corresponding to the chosen confidence level. The sampling method considered most appropriate is the stratified random sampling method, which allows for a representative population and the calculated sample. First, a stratified random sample was selected from the student population of the Technical University of Ambato, Ecuador, to which the exposed diagnostic instruments were applied (n1). After the students who are diagnosed with moderate or high levels of BS a sample was selected by simple random sampling (n2). Finally, from this last sample, the following was selected: a sample randomly assigned to the 3 groups of the quasi-experiment study (n3) (see figure 8).

The total sample was 81 participants who were randomly selected. There were no differences between the conditions at the beginning of the study and they were divided

into three groups of similar composition, using simple random sampling. The aerobic exercise group consisted of 28 students (age: 22.74 ± 3.05), all received the intervention, although for statistical analysis only 26 were taken into account since 2 did not perform a regular practice of at least 3 days per week. The group of strength exercises consisted of 26 students (22.97 ± 3,31), all also received regular intervention, although only 25 were taken into account for statistical analysis as one did not regularly perform the practices. On the other hand, the control group, which did not receive any intervention but was followed up, consisted of 27 students (23.13 ± 3.77) (see table 17).

Instruments

- **Burnout syndrome in students:** the Maslach Burnout Inventory Students Survey (MBI-SS) will be used (Schaufeli, Martínez, Marques-Pinto, Salanova and Bakker. 2002).

- **Heart Rate Variability (HRV):** Using a transmitter band and the Elite HVR android application and calculating RR mean (Mean of the RR intervals), SDNN (standard deviation of the periods NN), y RMSSD (square root of the mean value of the sum of the squared differences of all successive RR intervals).

Procedures and Intervention

After knowing the number of students diagnosed with burnout with MBI-SS, the heart rate variability (HRV) was measured using a transmitter band and the Elite HVR android application. From there begins the application of the physical exercise programs. According to some studies, HVR is the main cardiovascular biomarker for the prevention and early detection of BS (Gómez-Alcaina, Montero-Marín, Demarzo, Pereira & García-Campayo, 2013). They were divided into three groups of similar composition to determine the most effective type of exercise to treat and prevent this syndrome: whether it is aerobic or anaerobic (strength). Before the training sessions, the initial MBI-SS and HRV test was applied. In week 17 the same both measurement instruments will again be applied to the 3 groups and longitudinal and cross-sectional comparisons was made. See flow chart (Figure 9).

Participants in all three groups were monitored throughout the program to ensure that they did not consume stimulant beverages and/or any type of medication that might affect the results. A control group to which no activity was applied, an experimental group 1 to which aerobic exercise (jogging, walking and/or stationary bicycle for approximately 30 to 50 minutes, divided into an initial part of warm-up and stretching, a main part with

planned aerobic exercise and a final part of recovery.) will be applied and an experimental group 2 to which anaerobic (strength) exercise (hands-free exercises such as push-ups, sit-ups, fixed bar, leg squats, with 30 to 50 minute sessions divided into warm-up and stretching parts, main part with planned strength exercises and final part of recovery) will be applied.

In both intervention groups, physical exercise was governed by the latest guidelines for prescribing exercise: Quantity and quality of exercise to develop and maintain cardiorespiratory, musculoskeletal and neuromotor fitness in apparently healthy adults: A Guide to Prescribing Exercise, of the American College of Sports Medicine (ACSM) and 3 weekly sessions will be applied for one hour, on alternating days, for 16 weeks (ACSM, 2017). The physical exercises were applied in the sports areas of the University, by a single instructor qualified and trained for that purpose, with a bachelor's degree in physical activity and sports.

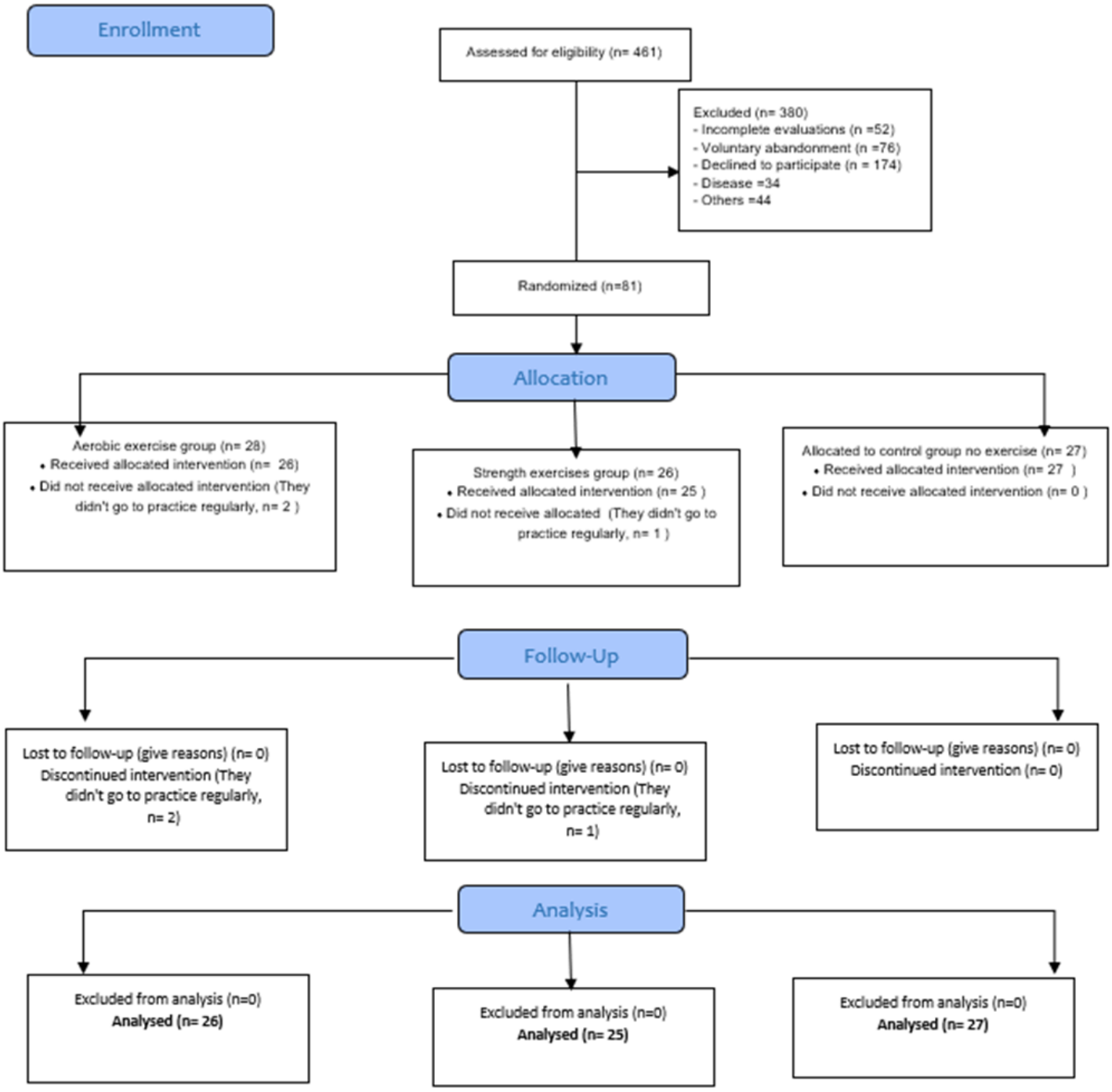

Figure 9. CONSORT flowchart of the study protocol.

Statistical processing of data

All the data collected was analyzed using the SPSS "Statistical Package for the Social Sciences, version 25.0 for Windows" software.

Descriptive statistics are presented using the mean (*X*) and standard deviation (*SD*). The normal distribution was tested using the Shapiro-Wilk test. Initial comparisons between groups were made using Kruskal-Wallis tests. Within-group comparisons between the previous and subsequent moments were made using Wilcoxon's signed classification test for Likert scale instruments and physiological (HRV) tests. A t-test for paired samples was used to verify changes in fitness parameters after interventions. The percentage change ([job value/previous value] - 1) was calculated and presented for each variable. To report the magnitude of the changes, the size of the effect of the biserial point correlation (*rpb*) was calculated and converted to the standardized Cohen's d. The effect of the biserial point correlation (rpb) was calculated. The reference points used were: trivial ($d < 0.2$), small ($d = 0.2$ to 0.5), moderate ($d = 0.5$ to 0.8), large ($d = 0.8$ to 1.2), very large ($d > 1.2$) (Cohen, 1988). The level of statistical significance for $p < 0.05$ was assumed. The Social Sciences Statistical Program (SPSS), version 25.0 for Windows, was used.

Ethics in research

The planning of this research was carried out taking into account the guidelines of the Declaration of Helsinki of 1973, revised in 1986 and amended in October 2013, and was also governed by the standard regulations in force in the Republic of Ecuador for the conduct of biological studies. Students will be explained what the research consists of in order to obtain informed consent to participate in the research and a document will be signed by both the patients and the research author for the record. The study was approved by the corresponding ethics committee, with the code: CEISHSOLCAQ.OBS.19.129.

4.4.3 Results

Descriptive statistics

The basic characteristics of the participants in each of the two conditions are found in Table 1 and the flow chart of the participants is shown in Table 23.

Table 23. Characteristics of experimentals and control groups at baseline and comparison between groups by Kruskall-Wallis Test.

	GE AEROB (n =28	GE ANAEROB (n =26	GC (n =27)	
	M (SD)	M (SD)	M (SD)	P VALUE
Sex (M/F)	11 / 17	10 / 16	12 / 15	-
Chronological age	22.74 ± 3,05	22.97 ± 3,31	23,13 ± 3,77	.101
IA	4.02 ± 0.77	3.72 ± 0.51	3.87 ± 0.62	.000
ISE	3.20 ± 1.12	3.66 ± 1.19	3.82 ± 1.39	.000
BW (kg)	65.4 ± 13.7	67.9 ± 14.20	68.7 ± 13.1	.217

Note: IA (academic index between 1 y 5), ISE (socio-economic identification between 1 y 5), PC (body weight), $p < .05$

The effectiveness of the intervention was verified by the initial and final measurements in the participants of the three groups using mainly two tests: the MBI-SS (in its three dimensions; exhaustion, cynicism and academic efficacy) of psychological cut, and the HRV measurement (by measuring the mean of the RR intervals, the standard deviation of the NN or RR periods and the square root of the mean value of the sum of the squared differences of all successive RR intervals) of physiological cut. In this case the means of both measurements, their percent change and the effect size change were compared using Cohen's d (see table 2).

As can be seen in table 2, in the results of these comparisons of the percent change in the experimental group of aerobic exercises with respect to the MBI-SS in the dimension exhaustion there was a greater percentage, reducing its levels by 26.4%, on cynicism (-21.06), and academic effectiveness (-13.11). Unlike the experimental group of force exercises where there was a greater percentage of change in the cynicism dimension (-27.38), on efficacy (-21.69), exhaustion was the least change (-19.55). In the control group the average levels of exhaustion increased unfavorably by 10.26 %, also the effectiveness increased, although not significantly (4.26), whereas the levels of cynicism were reduced by 7.26 %.

In the aerobic exercise intervention group, the dimension that improved was exhaustion (d = .532) with a moderate effect size, but not cynicism and efficacy that had small change effects in this group (d = .252 and .397 respectively). In the intervention group of force exercises, on the other hand, the dimension that had the greatest improvement according to the size of the effect was efficiency, considered moderately high (d =.704), here the change in the levels of exhaustion was considered trivial and in cynicism it was small (d =.299 and .315 respectively). In the control group, the effect size on exhaustion, cynicism and efficacy was considered trivial (d = .128, .062 and .129 respectively) (see table 24). As for the most evident results of the HRV tests, in the experimental group of aerobic exercises the SDNN had the highest percentage change, with an increase of 24.82 %, over the RR mean and RMSSD (14.40 % and 16.45 % respectively). In a similar way it happened in the force group and in the control group in the three previous variables with only slightly lower levels of increase in both groups (21.77%, 14.24%, 12.60 %; and 12.59 %, 4.97 % and 4.99 % respectively).

The results of the effect size change showed a very large change in the RR mean in the aerobics and strength groups (d =1.281 and 1.328 respectively), unlike the SDNN which was large and the RMSSD which was small in both groups (d =.943 and .833; and .425 and .318 respectively). In contrast, in the control group they were small and trivial (.449, .457 and .120 respectively).

Table 24. Comparison between pre and post exercise interventions and control group (no exercise intervention).

	GE AEROBICS (n =27)				GE STRENGTH (n =26)				GC (n =27)			
	PRE MEAN (SD)	POST MEAN (SD)	PERCENT CHANGE	EFFECT SIZE (d)	PRE MEAN (SD)	POST MEAN (SD)	PERCENT CHANGE	EFFECT SIZE (d)	PRE MEAN (SD)	POST MEAN (SD)	PERCENT CHANGE	EFFECT SIZE (d)
Mean Exhaustion	2.00 ± 1.24	1.38 ± .99	-26.4	.532	1.80 ± 1.19	1.45 ± 1.11	-19.55	.299	1.68 ± 1.27	1.85 ± 1.31	10.26	.128
Mean Cynicism	1.18 ± 1.03	.93 ± .97	- 21.06	.252	1.32 ± 1.12	.96 ± 1.22	-27.38	.315	1.24 ± 1.22	1.15 ± 1.69	-7.26	.062
Mean Efficacy	4.27 ± 1.38	3.71 ± 1.49	-13.11	.397	4.24 ± 1.37	3.32 ± 1.29	-21.69	.704	4.27 ± 1.34	4.46 ± 1.65	4.26	.129
RR mean (ms):	865.69 ± 102.08	1011.37 ± 128.32	14.40	1.281	859.92 ± 100.76	1002.77 ± 117.92	14.24	1.328	862.53 ± 101.24	907.72 ± 104.05	4.97	.449
SDNN	71.32 ± 20.11	94.87 ± 29.86	24.82	.943	70.34 (20.18)	89.92 ± 27.24	21.77	.833	70.91 ± 21.24	81.13 ± 24.27	12.59	.457
RMSSD	68.71 ± 31.10	82.24 ± 33.78	16.45	.425	69.75 (31.76)	79.81 ± 32.73	12.60	.318	70.01 ± 30.97	73.69 ± 31.39	4.99	.120

Note: $p < .05$; comparison using compared using Wilcoxon signed rank test.

RR mean= mean of the RR intervals; SDNN=standard deviation of the NN (or RR) periods; RMSSD= square root of the mean value of the sum of the square differences of all successive RR intervals

Discussion

The aims of this study were to determine the effectiveness of physical exercise in reducing levels of burnout syndrome in Ecuadorian college students. The results show that by means of the intervention with physical exercise, it could reduce the levels of intensity of burnout syndrome, although sometimes this reduction could not be very considerable. In general, this examination of the responses of a large sample of Ecuadorian college students provided a broader view of the levels of this element so important in the knowledge of mental health levels in this student population.

Aerobic physical exercise appears to be more effective in reducing BS levels in college students. At least, in the participants we worked with. Strength physical exercise also reduces BS levels but slightly less than aerobic, although with very little difference between the two results. This could be interpreted given the determined physiological and psychological benefits of exercise on similar mental health determinants. Specifically, in this study, there are coincidences with some results of other similar and other situations that were not very coincident, quite the contrary.

Some previous studies show similar results. As can be seen in the following by Han, Ching, Chien, Chiou, Shu & Ruey (2013), that explored the effectiveness of an exercise program for bank and insurance workers with BS. In the process of the study, a practical program of exercises was developed in the workplace within bank and insurance companies, during three months. After the exercise program BS levels showed a significant improvement in the intervention groups. The comparison of the pre-post difference between the groups showed that the post-effect differences of BS decreased significantly with the high intensity intervention group than with the control group that did not perform another activity.

De Vries et al. (2017), evaluated the effectiveness of an intervention with exercises to reduce BS at work in patients who had various professions, using a set of exercises for 6 weeks. All the participants' height was measured before (T0) and after (T1) the intervention. EI participants were also measured at weeks 6 (T2) and 12 (T3) after the end of the intervention. The analysis of covariance results (ANCOVA) revealed that, in T1, the intervention group reported a lower BS level than the WLC group. This study demonstrates that, in the case of BS related to work, exercise may be seen as a powerful therapeutic tool for those who follow the treatment. The ANCOVA analysis revealed that

the EI group obtained a significantly lower score in T1 on BS, and over the BS mean in comparison with the WLC group.

Eskilsson, Slunga, Malmberg, Stigsdotter & Boraxbekk (2017), applied a 12-week aerobic training program performed at a moderate-vigorous intensity for BS patients. In a randomized controlled study, 88 patients diagnosed with BS participated. The patients were randomized into two groups, one intervention group with 12-week aerobic exercise and a control group without additional training. In the final evaluation, a decrease in BS levels was reported in the intervention group, while in the control group the decrease in the BS level was much lower. Since the averages of these results are higher than those found in our study, even though in general the three results are similar in the reduction of BS levels through exercise, also similar to ours. Gerber, Ingibj€org, Jonsdottir, Lindwall & Lindegard (2015), concluded in their study that the patients in the trained exercise group increased the duration of their exercise more than the patients in general group of instruction. This study has shown that substantially increasing exercise levels can reduce BS levels in patients through comprehensive and regular general treatment. Very similar to our results.

Among the possible **strengths** of this study are the correct methodology used in the investigation to determine its results when carried out in three groups, one of them control, made at random of very similar structure with initial test and final test. In addition, the exercises were applied in the intervention groups following the latest recommendations of the ACSM (2017). On the other hand, regarding **limitations** it could be stated that it was not possible to apply other tests related to the hypothalamus-hypophysis-suprarenal and sympathetic-medulus-suprarenal axes, related to the immune system and those related to inflammation (Gómez-Alcaina, et al., 2013). In order to determine the effectiveness of the application of physical exercises, psychological cut test and cardiovascular cut test were used instead. Despite the fact that the latter are validated nationally and internationally, and have a well-proven efficacy, it would have been interesting to be able to also apply the former for a better evaluation and strength of the results.

There were differences between the initial and final tests in the three groups, but in the two intervention groups with aerobic and anaerobic exercises the difference was greater than in the control group in terms of the results of the application of MBI-SS and HRV in terms of the reduction of BS levels. There were no significant differences between the

results of the intervention in the aerobic and strength groups according to MBI-SS and HRV. There may have been a moderately small overall improvement among members of the intervention group with aerobic exercise over those in the control group. There was a difference between the two groups, although relatively small according to MBI-SS and moderate in terms of HRV. The differences between aerobic and anaerobic exercise intervention could be insignificant, although with a very slight improvement with the latter type of intervention.

4.5 THE MOST EFFECTIVE PHYSICAL EXERCISE IN TREATING BURNOUT SYNDROME IN UNIVERSITY STUDENTS

4.5.1 Introduction

Burnout Syndrome (BS) is a health problem of great social repercussion nowadays. The interest currently aroused by the BS has facilitated an expansion of its field of study—which was initially exclusively the domain of health professionals—as research began in many other professional fields and even in university students (Segura, 2014).

Intervention programs to prevent or treat burnout syndrome are essential to improving the health of workers and students. In the absence of an effective program, employees or students are likely to suffer from a job or related mental health deficiency where risk factors prevail. Review studies (Colin et al., 2016; Wendy et al., 2010) have shown that the vast majority of research conducted and found is psychological and cognitive interventions. This is not so with a variety of studies showing the possible benefits of physical exercise in any of its different variants. In addition, whether the most effective type of exercise for treating and preventing this syndrome in the college student population is aerobic or anaerobic (strength) has not been determined.

To date, very few intervention studies with physical exercise have been conducted in college students with BS. Regular physical exercise may be an effective intervention to reduce burnout levels in workers and students with this harmful syndrome, but it has not been correctly defined what type of exercise is most effective in treating and preventing BS, whether it is aerobic or anaerobic (strength). Therefore, the **objective** of this study was to determine the most effective physical exercise in reducing burnout syndrome levels in university students.

4.5.2 Materials and methods

Study design

An experimental study was carried out with pre-test and post-test, with 2 intervention groups (aerobic exercise group of 26 and strength exercise group of 25) and one control group

(without exercise of 27). The participants in each group were randomly distributed, using a simple random sampling.

Participants

The sample was identified from the population of students diagnosed with burnout syndrome at the University of Ambato in Ecuador, where a wide variety of university degrees (in health sciences, engineering, education sciences, economics and business, agronomy, law, tourism and social sciences) will be studied. The sample was probabilistic and a stratified sample with proportional participation was used. In the case of medical students, the sixth year or internship is excluded, since at this stage students are considered more workers than students because of the characteristics of this academic year.

First, a stratified random sample was selected from the student population of the University of Ambato, Ecuador, to which the exposed diagnostic instruments were applied (n1). After the students who are diagnosed with moderate or high levels of BS a sample was selected by simple random sampling (n2). Finally, from this last sample, the following was selected: a sample randomly assigned to the 3 groups of the quasi-experiment study (n3) (see figure 8).

Measures

- Burnout syndrome in students: the Maslach Burnout Inventory Students Survey (MBI-SS) (Schaufeli et al., 2002). will be used. It is structured in 3 dimensions divided into 15 items: Emotional exhaustion, Cynicism and Academic Effectiveness. The response scale is Likert type and ranges from 0 ("never") to 6 ("always").
- Heart Rate Variability (HRV): Using a transmitter band and the Elite HVR android application and calculating RR mean (media de los intervalos RR), SDNN (desviación estándar de los periodos NN), y RMSSD (square root of the mean value of the sum of the squared differences of all successive RR intervals).

Procedures and intervention

After knowing the number of students diagnosed with burnout with the MBI-SS, the heart rate variability (HRV) was measured using a transmitter band and the Elite HVR android application. From there begins the application of the physical exercise programs. They were divided into three groups of similar composition. A control group to which no activity was applied, an experimental group 1 to which aerobic exercise (jogging, walking and/or

stationary bicycle for approximately 30 to 50 minutes, divided into an initial part of warm-up and stretching, a main part with planned aerobic exercise and a final part of recovery.) will be applied and an experimental group 2 to which anaerobic (strength) exercise (hands-free exercises such as push-ups, sit-ups, fixed bar, leg squats, with 30 to 50 minute sessions divided into warm-up and stretching parts, main part with planned strength exercises and final part of recovery) will be applied.

According to some studies, HVR is the main cardiovascular biomarker for the prevention and early detection of BS (Maya et al., 2016; Gómez-Alcaina et al., 2013), a non-invasive measure of autonomic influence on heart rate, which has been successfully used to estimate autonomic tone modulation. HVR has become an important risk assessment tool: reduced HVR is associated with poorer prognosis for a wide range of clinical conditions, whereas robust periodic changes in the R-R range are often a health-associated characteristic. In general, lower HVR is seen in participants with occupational stress compared to participants in control groups. In particular, studies appear to confirm that burnout is associated with lower HVR compared to healthy participants (Díaz-Rodríguez et al., 2011; Chandola et al., 2010).

In both intervention groups, physical exercise was governed by the latest guidelines for prescribing exercise (Quantity and quality of exercise to develop and maintain cardiorespiratory, musculoskeletal and neuromotor fitness in apparently healthy adults: A Guide to Prescribing Exercise of the American College of Sports Medicine (ACSM, 2017) and 3 weekly sessions will be applied for one hour, on alternating days, for 16 weeks. The physical exercises were applied in the sports areas of the University, by a single instructor qualified and trained for that purpose, with a bachelor's degree in physical activity and sports. In week 17 the same MBI-SS and HRV measurement instruments will again be applied to the 3 groups and longitudinal and cross-sectional comparisons was made. See flow chart (see figure 8).

Aerobic exercises

A frequency of 3 or more days was applied for the week of moderate exercise. Moderate and/or vigorous intensity for most students. In a time of 30 to 60 minutes per day (150 minutes x week) of intentional moderate exercise. Involving the major muscle groups and

continuously and rhythmically in their nature. Increasing the number of steps by 2000 steps per day to achieve and maintain a daily 7000 step number (ACSM, 2017). In our study, aerobic exercises were performed (jogging, walking and/or stationary bicycling for approximately 30 to 50 minutes, divided into an initial warm-up and stretching part, a main part with planned aerobic exercises and a final recovery part.

Strength exercises

Each muscle group was trained 2 to 3 days a week. With an intensity of 60%-70% of 1RM (moderate to hard intensity) for beginners to intermediate to improve strength. With exercises involving each of the major muscle groups. Using a variety of exercise equipment and/or body weight to perform these exercises. 8 to 12 repetitions to improve strength and power. With 2-3-minute rest intervals between each set of repetitions. And a 48-hour rest between sessions for each muscle group. With a gradual progression of greater endurance, and/or more repetitions per cast, and/or an increasing frequency (ACSM, 2017). In our study, strength exercises were applied (hands-free exercises such as push-ups, abdominals, sit-ups, fixed bar, leg squats, with 30 to 50-minute sessions divided into warm-up and stretching parts, the main part with planned strength exercises and the final part of recovery).

Statistical analysis

All the data collected was analyzed using the SPSS "Statistical Package for the Social Sciences, version 25.0 for Windows" software. Descriptive statistics include mean, standard deviation, effect size (d), P value (p) and percentage calculation. Using different statistical methods.

Descriptive statistics are presented using the mean (X) and standard deviation (SD). The normal distribution was tested using the Shapiro-Wilk test. Initial comparisons between groups were made using Kruskal-Wallis tests. Within-group comparisons between the previous and subsequent moments were made using Wilcoxon's signed classification test for Likert scale instruments and physiological (HRV) tests. A t-test for paired samples was used to verify changes in fitness parameters after interventions. The percentage change ([job value/previous value] - 1) was calculated and presented for each variable. To report the magnitude of the changes, the size of the effect of the biserial point correlation (rpb) was calculated and converted to the standardized Cohen's d. The effect of the biserial point

correlation (rpb) was calculated. The reference points used were: trivial (d < 0.2), small (d = 0.2 to 0.5), moderate (d = 0.5 to 0.8), large (d = 0.8 to 1.2), very large (d > 1.2) (Cohen, 1988). The level of statistical significance for p < 0.05 was assumed. The Social Sciences Statistical Program (SPSS), version 23.0 for Windows, was used.

Ethics in research

The planning of this research was carried out taking into account the guidelines of the Declaration of Helsinki of 1973, revised in 1986 and amended in October 2013, and was also governed by the standard regulations in force in the Republic of Ecuador for the conduct of biological studies. Students will be explained what the research consists of in order to obtain informed consent to participate in the research and a document will be signed by both the patients and the research author for the record. The study was approved by the corresponding ethics committee, with the code: CEISHSOLCAQ.OBS.19.129.

4.5.3 Results

Baseline characteristics

The basic characteristics of the participants in each of the two conditions are found in Table 19. There were no differences between the conditions at the beginning of the study. The participants were recruited to make up the three groups according to the initial diagnosis using the MBI-SS, with a majority of the female sex (11 / 17, 10 / 16 and 12 / 15) and in both sexes an average between 22 and 23 years.

The flow chart of the participants is shown in Figure 1. The aerobic exercise group consisted of 28 students (age: 22.74 ± 3.05), all received the intervention, although for statistical analysis only 26 were taken into account since 2 did not perform a regular practice of at least 3 days per week. The group of strength exercises consisted of 26 students (22.97 ± 3,31), all also received regular intervention, although only 25 were taken into account for statistical analysis as one did not regularly perform the practices. On the other hand, the control group, which did not receive any intervention but was followed up, consisted of 27 students (23.13 ± 3.77). In the latter, there was no statistical loss.

The most effective type of exercise to treat BS

In the comparison between the final tests of the groups of aerobics and strength in terms of their size of effect it was possible to prove that except for the dimension effectiveness that was low (d =0.284, percent difference between both groups PD = 10.51 %), in the other two dimensions exhaustion and cynicism were trivial (d =0.068, PD = 4.83 %; and 0.030, 3.39 %). In the case of HRV its three variables were rated with a trivial effect size (d =0.071, 0.85%; 0.177, 5.22% and 0.075, 2.95%) (see table 2). As for the comparison between the final tests of the control groups and the aerobics the dimensions exhaustion and efficacy showed a small difference (d =0.374, 25.43% and 0.486, 16.82%) and in cynicism it was trivial (0.165, 19.35%). HRV behaved differently: In RR mean the difference was remarkably large (d =0.905, 10.24%), in SDNN it was moderate (d =0.515, 14.48%), whereas in RMSSD it was small. There was only a small difference between the results of the intervention in both groups according to the MBI-SS. On the other hand, according to the HRV in general, the difference was much greater and could be qualitatively qualified as moderately large (see table 2). In the comparison between the control group and the strength group, the differences to the previous group were different. The efficiency dimension had moderately high differences (d=0.783, 25.56%), on exhaustion and cynicism where they were small and trivial respectively (d =0.306, 21.65% and 0.131, 16.52%). According to HRV the differences were large, small and trivial according to RR MEAN, SDNN and RMSSD (d =0.872, 9.48%; 0.347, 9.77% and 0.195, 7.67% respectively). There was a difference between both groups, although relatively small according to the MBI-SS and moderate in terms of HRV (see table 25).

Table 25. Comparison between experimental groups and the control group between them

	A					B				C		
	POST GE AEROB MEAN (SD)	POST GE STRENGTH MEAN (SD)	PERCENT DIF	EFFECT SIZE (d)	POST GC MEAN (SD)	POST GE AERO MEAN (SD)	PERCENTAGE DIFFERENCE	EFFECT SIZE (d)	POST GC MEAN (SD)	POST GE STRENGTH MEAN (SD)	PERCENT DIFF	EFFECT SIZE (d)
Exhaustion	1.38 ± .99	1.45 ±1.11	4.83	.068	1.85 ± 1.31	1.38 ± 0.99	25.43	.374	1.85 ±1.31	1.45 ± 1.11	21.65	.306
Cynicism	.93 ± .97	.96 ±1.22	3.39	.030	1.15 ± 1.69	0.93 ± 0.97	19.35	.165	1.15 ±1.69	.96 ± 1.22	16.52	.131
Efficacy	3.71 ± 1.49	3.32 ±1.29	10.51	.284	4.46 ± 1.65	3.71 ± 1.49	16.82	.486	4.46 ±1.65	3.32 ± 1.29	25.56	.783
RR Mean (ms):	1011.37 ± 128.32	1002.77 ± 117.92	.85	.071	907.72 ± 104.05	1011.37 ± 128.32	10.24	.905	907.72 ± 104.05	1002.77 ± 117.92	9.48	.872
SDNN	94.87 ± 29.86	89.92 ± 27.24	5.22	.177	81.13 ± 24.27	94.87 ± 29.86	14.48	.515	81.13 ± 24.27	89.92 ± 27.24	9.77	.347
RMSSD	82.24 ± 33.78	79.81 ± 32.73	2.95	.075	73.69 ± 31.39	82.24 ± 33.78	10.39	.267	73.69 ± 31.39	79.81 ± 32.73	7.67	.195

p < .05; comparison using compared using Wilcoxon signed rank test. A: Comparison between aerobic and strengths group posttests; B: Comparison between control and aerobic group posttests; C: Comparison between control group and strengths group posttestsRR mean= mean of the RR intervals; SDNN=standard deviation of the NN (or RR) periods; RMSSD= square root of the mean value of the sum of the square differences of all successive RR intervals

The differences found between the pre-test and post-test groups can also be seen in Table 26. In the exhaustion dimension there was the greatest percentage of change in the aerobics group with a reduction of 26 %, followed by the force group (19.5 %). In the cynicism dimension it was the force group that had the greatest reduction (27%) over the aerobics group (21%). Something similar happened in the effectiveness dimension, the force group in this case the difference was 21% against 13% of the aerobics group.

Table 26. Comparison between pre and post exercise interventions and control group (no exercise intervention) with MBI-SS results.

	GE AEROBICS (n =26)			GE STRENGTH (n =25)			GC (n =27)		
BS DIMENSIONS	PRE MEAN (SD)	POST MEAN (SD)	PERCENT CHANGE	PRE MEAN (SD)	POST MEAN (SD)	PERCENT CHANGE	PRE MEAN (SD)	POST MEAN (SD)	PERCENT CHANGE
Exhaustion	2.00 ± 1.24	1.38 ± .99	-26.4	1.80 ± 1.19	1.45 ± 1.11	-19.55	1.68 ± 1.27	1.85 ± 1.31	10.26
Cynicism	1.18 ± 1.03	.93 ± .97	- 21.06	1.32 ± 1.12	.96 ± 1.22	-27.38	1.24 ± 1.22	1.15 ± 1.69	-7.26
Efficacy	4.27 ± 1.38	3.71 ± 1.49	-13.11	4.24 ± 1.37	3.32 ± 1.29	-21.69	4.27 ± 1.34	4.46 ± 1.65	4.26

$p < .05$; comparison using compared using Wilcoxon signed rank test.

4.5.4 Discussion

The objective of this study was to determine the most effective physical exercise in reducing burnout syndrome levels in university students: whether it is aerobic or anaerobic (strength). The results show that there is no significant difference between the intervention with both types of exercise, according to MBI-SS and HRV. In our study we were able to define that depending on the dimension in which we intervene, the type of exercise to be applied could be more or less effective. That is, at least according to our results, aerobic exercises were more effective in reducing levels of exhaustion, while strength exercises reduced levels of the cynicism and effectiveness dimensions of BS by a greater percentage. So, we have to see the BS as a complex and in this case three-dimensional construct.

That is to say, there could be a moderately small improvement in general among the members of the intervention groups with aerobic and strength exercises over those of the control group. These results coincide with those found in the previous comparison. In other words, the differences between aerobic and strength exercise intervention could be insignificant, and this may depend on which dimension of the BS has higher levels. This study could have an important practical significance since, from its results, more personalized physical exercise programs could be elaborated, proposed and validated according to the general levels of BS, also the specific levels of each dimension that composes the syndrome in the case of university students.

Some previous studies show similar results and others not so much, or even different results. As can be seen in the following by Han et al. (2013), that explored the effectiveness of an exercise program for bank and insurance workers with BS. High intensity group had greater improvements of pre-and post-exercise difference for the indicators of personal burnout and work-related burnout. Exercise intensity was considered as a factor that effects the variations of job strain indicators. The exercise program releases the tension of personal and work-related burnout decreased significantly with exercise intensity. Exercise intensity modified the effect of work-related burnout difference. Therefore, and it have suggested that exercise intensity has a significant effect in the relationship between burnouts and systolic blood pressure in short-term exercise program. In this study, the effects of the exercise program are shown significant in several areas, with improvements in burnouts.

In other study conducted by Bretland & Thorsteinsson (2015), with participants from the Tamworth and Armidale locality of New England workers and students, Australia. The cardiovascular and resistance conditions both showed significantly greater positive well-being than the control condition, but were comparable to each other. The cardiovascular condition tended to reduce emotional exhaustion as compared to the control condition. Cardiovascular and resistance conditions were comparable in measured decrease in perceived stress, and emotional exhaustion. Additional exercise in excess of the minimum recommended standards may lead to further gains in positive well-being, perceived stress, and emotional exhaustion, based on correlational analysis of the change over four weeks and hours of exercise conducted.

De Vries et al. (2016) study, analyzed the extent to which an exercise intervention is effective in reducing BS indicators in students. The participants in the intervention group showed a greater decrease in BS levels in a general way. These results highlight the value of low intensity exercise for college students with a high level of BS related to the study.

Participants in the intervention group showed a greater BS decrease (t (48) = 6,82; p = < 0,001; Cohen's d= 0,90) than those of the control group (t (47) = 3.08, p =,003; Cohen's d= 0,46). A little higher than our case where the intervention group with aerobic exercises through the main dimension exhaustion the size of the effect was slightly lower (d=0.532), and even lower the group with strength exercises. (d=0,299) and the control group (d=0,128). These results underline the value of low-intensity exercise for university students with high levels of study-related fatigue. As well as the one made by Eskilsson et al. (2017), applied an aerobic training program performed at a moderate-vigorous intensity for BS patients. The patients were randomized into two groups, one intervention group with 12-week aerobic exercise and a control group without additional training. In the final evaluation, a decrease in BS levels was reported in the intervention group (pretest: 4.75 (0.98), posttest: 3.92 (1.10)), while in the control group the decrease in the BS level was much lower (pretest: 4.84 (1.01), (posttest: 4.40 (1.08)); F (1.54) = 2.82, p-value = 0.10; ηp2 = 0.05. Since the averages of these results are higher than those found in our study, even though in general the three results are similar in the reduction of BS levels through exercise.

Among the possible **strengths** of this study are the correct methodology used in the investigation to determine its results when carried out in three groups, one of them control, made at random of very similar structure with initial test and final test. In addition, the exercises were applied in the intervention groups following the latest recommendations of the ACSM. On the other hand, regarding **limitations** it could be stated that it was not possible to apply other tests related to the hypothalamus-hypophysis-suprarenal and sympathetic-medulus-suprarenal axes, related to the immune system and those related to inflammation (Gómez-Alcaina et al., 2013). In order to determine the effectiveness of the application of physical exercises, psychological cut test and cardiovascular cut test were used instead. Despite the fact that the latter are validated nationally and internationally, and have a well-proven efficacy, it would have been interesting to be able to also apply the former for a better evaluation and strength of the results.

According to the results shown above of this study there were differences between the initial and final tests in the three groups, but in the two intervention groups with aerobic and strength exercises the difference was greater than in the control group in terms of the results of the application of MBI-SS and HRV in terms of the reduction of BS levels. For future studies, more specific exercise programs for the reduction of BS levels in university students could be developed, proposed and validated, depending on the dimension of the

syndrome that really needs to be treated the most, and this could be the type of exercise that would be applied or at least that would prevail in these programs.

In our studio, in general, there were no significant differences between the results of the intervention in the aerobic and strength groups according to MBI-SS and HRV. The differences between aerobic and strength exercise intervention could be insignificant. It could depend on the dimension in which we intervene, the type of exercise to be applied could be more or less effective. And aerobic exercises were more effective in reducing levels of exhaustion, while strength exercises reduced levels of the cynicism and effectiveness dimensions of BS by a greater percentage.

CHAPTER V

GENERAL DISCUSSION

The main strength of this global study was the quality of its methodology: the use of controlled design, since the sample will be probabilistic and a stratified sample with proportional and representative participation of the university student population diagnosed with BS will be used. Representative samples shall be taken on a simple random basis from each stratum of all years and from both sexes of all careers. Therefore, the current intervention could add to the existing scientific literature on the effect of physical exercise on levels of burnout syndrome in pure university students. In addition, this study validated the MBI-SS in Ecuadorian students and thus be able to diagnose this syndrome in time.

This study was relevant because Burnout Syndrome is now a social and health problem for university students. Therefore, it is essential to know the prevalence levels of burnout syndrome in international university students and the effectiveness of physical exercise interventions in patients with burnout syndrome. In addition, it validated the use of the MBI-SS in Ecuador, creating the possibility of making a better diagnosis, evaluation and study of the burnout in university students in this country. In so doing, this study was determine the effectiveness of physical exercise in reducing BS levels in Ecuadorian university students in this important academic population. Finally, the most effective type of exercise to treat and prevent this syndrome was determined: whether it is aerobic or anaerobic (strength). This suggested that there is a simple, cost-effective and accessible strategy for reducing BS in this important and large academic population. The results could be used to provide better evidence-based policy and practice to university students in different careers and to health policy makers in relation to the exercise effect on the well-being of them.

This led to the first study, of a large global study, with the objective of to synthesize evidence from previous research over the past five years on the prevalence of BS levels in its three-dimensional approach (only the use of the MBI-SS instrument, specifically for undergraduate university students) by conducting a systematic review of university students worldwide. This study assumes that BS may occur in any university population, and not only in medical students, as demonstrated by the results of this systematic review. There are examples of other similar quality reviews, but framed only for populations of

medical students (Dyrbye & Shanafelt, 2016; Erschens et al. 2018; Chunming et al. 2017). In our case, the spectrum was extended to all types of undergraduate university students, since it might be considered a mistake to think that the university burnout occurs only in medical students, even though it has been more studied in them. In addition, the MBI-SS instrument is considered to be the most suitable and specific instrument for diagnosing burnout in these student populations. The use of other instruments is considered to not really assess the syndrome in this population as they are not specific for this population, therefore, only the studies that used this instrument were considered in this review.

The strength of this study is to consider it as one of the first reviews that takes into account all undergraduate university student populations, regardless of the degree they study, and not just health and specifically medical students as is the case with most similar reviews to date. In addition, it only includes studies that use MBI-SS as it is the most specific and validated instrument for this population. In contrast, the limitations are that, while a comprehensive systematic review was conducted in the main international databases, the quantitative level of meta-analysis was not reached. Only a search of materials published in the last five years was carried out: this may be a strength in really presenting the latest research on the subject, but it could also be a limitation for not going further in time. What is more, the prevalence values by career and age group of students are not specified.

Moderate levels of BS generally prevail in the different populations of university students of various degrees worldwide. In only a few studies the prevalence was low and could be due to multiple evaluative variables that are not the case in our study. The prevalence of each dimension of the syndrome was estimated at 55.4% for emotional exhaustion, 31.6% for cynicism and 30.9% for academic efficacy. Consequentially, showing a considerable high prevalence globally and also individually in each study. The female gender (62.7%) was most affected by the syndrome over men (37.3%).

Already knowing the high levels of prevalence of BS in university students found in several studies worldwide, we set out to synthesize the evidence from previous research on the effectiveness of interventions with physical exercise in patients with burnout syndrome by conducting a systematic review with meta-analysis. Because this could be an effective treatment for this syndrome. The results show that by means of the intervention with physical exercise, in any of its varieties, it could reduce the levels of intensity of burnout syndrome, although sometimes this reduction could not be very considerable. From the eleven studies evaluated in the meta-analysis, those with the highest relative weight (RW) were selected in the results presented in the forest plot for discussion. In the review, no

similar meta-analysis was found to be able to be analyzed and used for discussion. As evidenced from the previous studies, there is a trend for the reduction of burnout syndrome levels of intensity in patients exposed to physical exercise intervention when compared with those not doing any type of exercise (controls). In other words, and according to the results of the present RSM, those not doing any type of physical exercise tend to present an increase of 0.4 in the levels of intensity of BS than those doing exercise.

One of the major limitations of this SRM is that, due to the small number of studies using interventions with exercise, we had to analyzed studies applying different types of physical exercise (aerobic exercises in different variants, strength, Qigong Asian gymnastics and yoga postures) to different populations and different evaluative instruments to assess the Burnout Syndrome. Due to this complexity, it was sometimes difficult analyze and discuss the results however, and in spite of this diversity, the intervention with exercise was mostly effective. Future intervention studies are needed to strengthen the evidence for the effectiveness of physical exercises in the treatment and prevention of BS, specifically in the university population where it is important to determine which type of exercise (aerobic or strength) is more effective in this specific group.

Already knowing that BS is prevalent in university students worldwide and that exercise could be a moderately effective treatment, we set out to begin our research. In order to do this, we first had to validate the diagnostic instrument of BS in university students in Ecuador. Because the prevalence of BS is increasing among university students; however, no validated and reliable measure is yet available to evaluate the BS of this important population in Ecuador. Thanks to this latest version of the MBI, it has been possible to carry out a correct evaluation both elements in university student populations worldwide. On the other hand, in Ecuador this instrument had not yet been validated in spite of its international use. Therefore, the main objective of this study was to validate the MBI-SS (Schaufeli, Leiter & Maslach, 2009). instrument in university students in Ecuador. That is the most commonly used instrument to identify the BS in students.

In results, structural equation analysis results interpretation suggests that structural equation models (SEMs) whose GFIs indices exceed .90 indicate a good model fit (Bentler, 1990; Lindwall et al., 2011). The tested MBI-SS model of three correlated latent variables showed poor, however the model also showed some potential level of improvement (Bentler & Bonett, 1980) and should not be immediately refused. The GIFs obtained for the model were tested with a small sample of university students from Ecuador and that may have had some interference in the results. CFA results should not be interpreted

isolated from other psychometric parameters for internal consistency and reliability reported in this study, reinforcing the idea that potential increments in the model are very much possible and desirable and that a developmental process should be the following step. Among the possible strengths of this study are the correct use of the both instruments and reliability tests (internal consistency using Cronbach's alpha and stability using the retest test) and validity (through factor analysis using Bartlett's test and Kaiser Meyer Olkim's index) and the confirmatory factor analysis. The most used in the international bibliography found to validate the MBI-SS and PSS-14 in its different versions and even similar instruments. On the other hand, regarding limitations it could be stated that it was not possible to take a sample of all the university students of the country within the framework of the sierra region of Ecuador. Although there are students in this university from different regions of the country, those from the central sierra predominate. According to the results of this study, the MBI-SS and the PSS-14 had favorable results in terms of validity and reliability in this preliminary study, but the confirmatory factor analysis in the case of MBI-SS was not so because the tested model of three correlated latent variables was poor, however the model also showed some potential level of improvement.

Having validated the necessary instrument we decided to determine the levels of Burnout Syndrome in university students in Ecuador. In general, this examination of the responses of a large sample of Ecuadorian university students provided a broader view of the levels of these two elements so important in the knowledge of mental health levels in this student population.

According to the results of this study, more than 28 % of the students were diagnosed with high and moderate levels of emotional exhaustion, and almost 19 % in the same levels of Cynicism, the main dimension of the BS. Exhaustion was of all the dimensions of the BS the one that gave the highest levels, over 10%. In the Cynicism dimension almost half had no BS and 32 % had low levels. The faculties with the highest number of students with high levels of BS were the Faculties of Human Sciences and Education and Health Sciences. On the other hand, those with fewer students with the BS and lower levels of the latter were in the Faculties of Jurisprudence and Social Sciences and in Agriculture. The female sex was the most affected, as there was a higher percentage of women with high and moderate levels of BS than men. On the other hand, in the perception of stress there was a great parity in terms of percentages.

Among the possible strengths of this study was the correct use of Burnout Syndrome assessment instrument, which is specifically aimed at the type of student population. The

most used and validated in the international literature to determine prevalence. On the other hand, in terms of limitations, it can be stated that it was not possible to take a sample of all the university students in the country within the framework of the Ecuadorian sierra. Although in this university there are students from different regions of the country, those from the central highlands predominate.

Having already the concrete results of the prevalence levels of BS in a representation of the university student population of Ecuador, we proposed to determine the relationship between the levels of Burnout Syndrome with some determinants of mental health in Ecuadorian university students. Because the knowledge of Burnout syndrome in students (the Maslach Burnout Inventory Students Survey was used by Schaufeli et al., 2002), Stress (the Perceived Stress Scale was used by Cohen et al., 1983; in its Spanish version by González and Landero, 2007), Self-esteem (the Rosenberg RSES Self-esteem Scale was used by Rosenberg, 1965), Academic Motivation (the EMA Academic Motivation Scale was used by Vallerand et al, 1992; translated and validated into Spanish by Manassero and Vázquez, 1997) and Welfare (the WHO-5 Welfare Index was used); may be essential in determining what level of mental health any college student population has. And no less important is to know the degree of relationship between them, specifically between the BS and the others, because in this way better decisions could be made regarding prevention and treatment. In Ecuador, very few studies have been found in this regard, where it is possible to determine the relationship of this complex and dangerous Syndrome with some determinants of mental health, and much less in this important student population.

According to the results of this study, it can be concluded that there were moderate correlations between BS exhaustion and perceived stress and cynicism, and between cynicism and well-being. There was a low correlation between burnout, self-esteem, academic index and motivation. And negative correlations between burnout with efficacy and well-being; and the efficacy dimension had negative correlations with all variables except perception of stress. A moderate percent of Exhaustion can be explained by the other variables: Cynicism and Effectiveness, the economic situation, the perception of stress, the academic index, the levels of self-esteem, motivation and well-being. The influence of the latter can be considered as moderate, with the model having a medium to low explanatory power. The level of association between this and the other variables is moderate. In the case of Cynicism, the influence of the latter on the levels of can be considered as low. The observed variability may be the cause of chance due to the very low influence of these variables, and the model has a low explanatory power. Very low

percentages of the efficiency levels can be explained by the independent variables, being the variability observed the cause of chance, having the model a low explanatory power. In cynicism and efficiency, the level of association between both dimensions and the other variables is low and very low respectively.

Among the possible strengths of this study are the correct use of the instruments and tests of reliability (internal consistency using Cronbach's alpha) and validity (by factor analysis using the Kaiser Meyer Olkim index). The most used in the international bibliography to validate similar instruments. Also, the correct use of correlation coefficients to measure the degree of relationship or association between the variables studied. One of the most used coefficients in these cases since the variables used in this study are ordinals. And the use of multiple linear regression between the dimensions of the BS and the other variables used and thus it was possible to estimate the relationship between both types of variables and the variables that best predict the value of the dimensions of the BS.

Based on the above results we set out to initiate an intervention study, which was the focus of our global research and gave us the main answers to the origin of our scientific questions posed at the beginning of our study. Two main objectives were set for the intervention. The first was to determine the effectiveness of physical exercise in reducing levels of burnout syndrome in Ecuadorian college students. The results show that by means of the intervention with physical exercise, it could reduce the levels of intensity of burnout syndrome, although sometimes this reduction could not be very considerable. In general, this examination of the responses of a large sample of Ecuadorian college students provided a broader view of the levels of this element so important in the knowledge of mental health levels in this student population.

There were differences between the initial and final tests in the three groups, but in the two intervention groups with aerobic and anaerobic exercises the difference was greater than in the control group in terms of the results of the application of MBI-SS and HRV in terms of the reduction of BS levels. The results show that by intervening with physical exercise, the intensity levels of burnout syndrome could be reduced, although sometimes this reduction may not be very substantial. In general, the sample studied provided a broader picture for the knowledge of mental health levels in this student population. Specifically, in this study there are coincidences with some results from other similar situations and others that were not very coincidental. In general, the results suggest that the reduction of burnout syndrome levels in students was greater in the physical exercise intervention groups than in the control group.

Among the possible strengths of this study is the correct methodology used in the research to determine its results when conducted in three groups, one of them control, randomized, very similar in structure with initial and final test. In addition, the exercises were applied in the intervention groups following the latest recommendations of the ACSM (2017).

On the other hand, as regards limitations, it can be stated that it was not possible to apply other tests such as those of the hypothalamus-pituitary-adrenal and sympathetic-medulla-adrenal axes, related to the immune system and inflammation. To determine the effectiveness of the application of physical exercises, the psychological (MBI-SS) and physiological (HRV) tests were used instead. Despite the fact that the latter are nationally and internationally validated and have a well proven efficacy, it would have been interesting to be able to apply the former also for a better evaluation and robustness of the results.

And finally, after learning that in Ecuador's university student population there is a significant prevalence of BS, that it has a moderately low relationship with other mental health determinants and that physical exercise can be effective in reducing levels of this syndrome. We set out the second objective of the intervention study that was to determine the most effective physical exercise in reducing burnout syndrome levels in university students: whether it is aerobic or anaerobic (strength). The results showed that there was no significant difference between the intervention with both types of exercise, according to MBI-SS and HRV. Depending on the dimension in which we intervene, the type of exercise to be applied could be more or less effective. That is, at least according to our results, aerobic exercises were more effective in reducing levels of exhaustion, while strength exercises reduced levels of the cynicism and effectiveness dimensions of BS by a greater percentage. So, we have to see the BS as a complex and in this case three-dimensional construct. The differences between aerobic and strength exercise intervention could be insignificant, and this may depend on which dimension of the BS has higher levels.

This study could have an important practical significance since, from its results, more personalized physical exercise programs could be elaborated, proposed and validated according to the general levels of BS, also the specific levels of each dimension that composes the syndrome in the case of university students. More specific exercise programs for the reduction of BS levels in university students could be developed, proposed and validated, depending on the dimension of the syndrome that really needs to be treated the most, and this could be the type of exercise that would be applied.

CHAPTER V

GENERAL CONCLUSIONS

According to the results of this study, the MBI-SS and the PSS-14 had favorable results in terms of validity and reliability in this preliminary study, but the confirmatory factor analysis in the case of MBI-SS was not so because the tested model of three correlated latent variables was poor, however the model also showed some potential level of improvement.

More than 28 % of the students were diagnosed with high and moderate levels of emotional exhaustion, and almost 19 % in the same levels of Cynicism, the main dimension of the BS. Exhaustion was of all the dimensions of the BS the one that gave the highest levels, over 10%. In the Cynicism dimension almost half had no BS and 32 % had low levels. While the perception of stress significantly prevailed the absence of perceived stress over moderate and high levels of perception, as these two together reached just over 11% of the total.

The faculties with the highest number of students with high levels of BS were the Faculties of Human Sciences and Education and Health Sciences. On the other hand, those with fewer students with the BS and lower levels of the latter were in the Faculties of Jurisprudence and Social Sciences and in Agriculture. The female sex was the most affected, as there was a higher percentage of women with high and moderate levels of BS than men. On the other hand, in the perception of stress there was a great parity in terms of percentages.

There were differences between the initial and final tests in the three groups, but in the two intervention groups with aerobic and anaerobic exercises the difference was greater than in the control group in terms of the results of the application of MBI-SS and HRV in terms of the reduction of BS levels. There were no significant differences between the results of the intervention in the aerobic and strength groups according to MBI-SS and HRV. There may have been a moderately small overall improvement among members of the intervention group with aerobic exercise over those in the control group. There was a difference between the two groups, although relatively small according to MBI-SS and moderate in terms of

HRV. The differences between aerobic and anaerobic exercise intervention could be insignificant, although with a very slight improvement with the latter type of intervention. There were no significant differences between the results of the intervention in the aerobic and strength groups according to MBI-SS and HRV. The differences between aerobic and strength exercise intervention could be insignificant. It could depend on the dimension in which we intervene, the type of exercise to be applied could be more or less effective. And aerobic exercises were more effective in reducing levels of exhaustion, while strength exercises reduced levels of the cynicism and effectiveness dimensions of BS by a greater percentage.

There were moderate correlations between BS exhaustion and perceived stress and cynicism, and between cynicism and well-being. There was a low correlation between burnout, self-esteem, academic index and motivation. And negative correlations between burnout with efficacy and well-being; and the efficacy dimension had negative correlations with all variables except perception of stress.

A moderate percent of Exhaustion can be explained by the other variables: Cynicism and Effectiveness, the economic situation, the perception of stress, the academic index, the levels of self-esteem, motivation and well-being. The influence of the latter can be considered as moderate, with the model having a medium to low explanatory power. The level of association between this and the other variables is moderate.

In the case of Cynicism, the influence of the latter on the levels of can be considered as low. The observed variability may be the cause of chance due to the very low influence of these variables, and the model has a low explanatory power. Very low percentages of the efficiency levels can be explained by the independent variables, being the variability observed the cause of chance, having the model a low explanatory power. In cynicism and efficiency, the level of association between both dimensions and the other variables is low and very low respectively.

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ANEXXES

ANEXXE 1a

ARTICLES PUBLISHED IN INDEXED SCIENTIFIC JOURNALS

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Prevalence of burnout syndrome in university students: A systematic review

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ABSTRACT

Introdution. Burnout syndrome is a social and health problem in college students. **Objective.** To synthesize evidence from previous studies on the prevalence of burnout syndrome in university students in their three-dimensional approach. **Method.** The search strategies followed the PRISMA guidelines and were based on the following descriptive terms: "burnout," "studies," "prevalence," "students." Pubmed, Web of Science Core Collection, PsicINFO, and Scielo were consulted. An evaluation of the quality of the information was carried out applying the STROBE positioning guidelines. **Results.** We found 1,406 studies that were reduced to 46 studies for final analysis using the STROBE statement, eventually leaving 20 studies. One study (5%) was conducted in North America, five (25%) in Asia, nine (45%) in Latin America, and five (25%) in Europe. Of the 20 studies evaluated in the systematic review, those that had the best overall evaluation in the STROBE analysis were selected for discussion, corresponding to 10 (out of 75% of STROBE). Overall prevalence of each dimension of the syndrome was estimated at 55.4% for emotional exhaustion, 31.6% for cynicism, and 30.9% for academic efficacy. **Discussion and conclusion.** Moderate levels of burnout syndrome prevail in the different populations of university students of different careers worldwide. In only a few studies is the prevalence low and this could be due to multiple evaluative variables.

Keywords: Burnout, studies, prevalence, students, mental health.

RESUMEN

Introducción. El síndrome de burnout es un problema social y de salud en los estudiantes universitarios. **Objetivo.** Sintetizar las pruebas de estudios anteriores sobre la prevalencia del síndrome de burnout en estudiantes universitarios en su enfoque tridimensional. **Método.** Las estrategias de búsqueda siguieron las pautas de PRISMA y se basaron en los siguientes términos descriptivos: "burnout", "estudios", "prevalencia", "estudiantes". Se consultaron Pubmed, Web of Science Core Collection, PsicINFO y Scielo. Se llevó a cabo una evaluación de la calidad de la información aplicando las directrices de posicionamiento de STROBE. **Resultados.** Se encontraron 1,406 estudios que se redujeron a 46 estudios para el análisis final utilizando la declaración STROBE, con lo que quedaron finalmente 20 estudios. Un estudio (5%) se llevó a cabo en América del Norte, cinco (25%) en Asia, nueve (45%) en América Latina y cinco (25%) en Europa. De los 20 estudios evaluados en la revisión sistemática, se seleccionaron para su discusión aquellos que tuvieron la mejor evaluación general en el análisis de la STROBE, correspondientes a 10 (de un 75% de la STROBE). La prevalencia general de cada dimensión del síndrome se estimó en un 55.4% para el agotamiento emocional, un 31.6% para el cinismo y un 30.9% para la eficacia académica. **Discusión y conclusión.** Los niveles moderados del síndrome de burnout prevalecen en las diferentes poblaciones de estudiantes universitarios de distintas carreras en todo el mundo. En sólo unos pocos estudios la prevalencia es baja y esto podría deberse a múltiples variables evaluativas.

Palabras clave: Burnout, estudios, prevalencia, estudiantes, salud mental.

INSTITUTO NACIONAL DE PSIQUIATRÍA
RAMÓN DE LA FUENTE MUÑIZ

salud mental

Yury Rosales-Ricardo
Florentino Rizzo-Chunga
Julio Mocha-Bonilla
José Pedro Ferreira

Presente.

Julio 03 de 2020

Estimados Doctores:

Nos complace informarles que su artículo **"Prevalence of burnout syndrome in university students: a systematic review"** fue **ACEPTADO** para su publicación en nuestra Revista. Tan pronto se concluya el proceso editorial, su manuscrito será publicado en alguno de nuestros números de 2021.

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Reciban un cordial saludo.

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The most effective physical exercise to reduce burnout syndrome in university students

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ABSTRACT

The objective of this study was to determine the most effective physical exercise in reducing burnout syndrome levels in university students. Methods: An experimental study was carried with 2 intervention groups with aerobic and strength exercise and one control group without exercise. Instruments: Maslach Burnout Inventory Students Survey and Heart Rate Variability (HRV): RR mean, SDNN, and RMSSD. Results: In exhaustion there was the greatest percentage of change in the aerobics group with a reduction of 26 %, followed by the strength group (19.5 %). In the cynicism it was the strength group that had the greatest reduction (27%) over the aerobics group (21%). Comparison between groups of aerobics and strength: dimension effectiveness low (d = 0.284, PD = 10.51 %), in exhaustion and cynicism trivial (d = 0.068, PD = 4.83 %; and 0.030, 3.39 %). In HRV three variables with trivial effect size (d = 0.071, 0.85%; 0.177, 5.22% and 0.075, 2.95%). HRV behaved differently: RR mean, the difference was large (d = 0.905, 10.24%), in SDNN it was moderate (d = 0.515, 14.48%), whereas in RMSSD it was small. Conclusions: Aerobic exercises were more effective in reducing levels of exhaustion, while strength exercises reduced levels of the cynicism and effectiveness dimensions.

Keywords: Physical exercises; Sports health; Mental health; Burnout syndrome.

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Revisión sistemática sobre intervenciones con ejercicio físico en pacientes con síndrome de burnout

Systematic review on physical exercise interventions in patients with burnout syndrome

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Resumen: El Síndrome de Burnout (SB) es un problema de salud mental de gran repercusión social. El objetivo fue sintetizar la evidencia de estudios sobre la efectividad de intervenciones con ejercicio físico en pacientes con síndrome de burnout mediante una revisión sistemática. Para ello se revisaron artículos publicados en bases de datos: Pubmed, Web of Science, Scielo, ScienceDirect y PsycoINFO. Como términos de búsqueda: ejercicio, actividad física, burnout. En español, inglés y portugués. Se encontraron 4768 estudios que fueron reducido primeramente a 13 estudios con una media de 64,0 %, siguiendo el método TREND. En la mayoría de los estudios los pacientes de los grupos de intervención con diferentes ejercicios físicos tuvieron una reducción mayor de sus niveles de SB que los que no se les aplicó intervención.
Palabras clave: Síndrome de Burnout, Salud mental, Ejercicio físico, Actividad física.

Abstract: Burnout Syndrome (SB) is a mental health problem with a high social impact. The objective was to synthesize evidence from studies on the effectiveness of physical exercise interventions in patients with burnout syndrome through a systematic review. This was done by reviewing articles published in databases: Pubmed, Web of Science, Scielo, ScienceDirect and PsycoINFO. As search terms: exercise, physical activity, burnout. In Spanish, English and Portuguese. We found 4768 studies that were first reduced to 13 studies with an average of 64.0 %, following the TREND method. In most of the studies patients in the intervention groups with different physical exercises had a greater reduction in their SB levels than those who did not receive intervention.
Keywords: Burnout syndrome, Mental health, Physical exercise, Physical activity.

Introducción

El Síndrome de Burnout (SB), constituye un problema de salud de gran repercusión social en nuestros días. El interés que en la actualidad despierta el SB ha facilitado una ampliación de su campo de estudio que en un inicio fue en profesionales de la salud, pues se empezaron investigaciones en muchos otros ámbitos profesionales e incluso en estudiantes universitarios (Segura, 2014; Rosales y Rosales, 2013).

Uno de los aspectos esenciales tratado en el estudio del SB ha sido su definición. Discusión que ha sido muy polémica desde las diferentes perspectivas que abordan la explicación de aparición del SB.

Freudenberger (1974) describe el SB como una sensación de fracaso y una existencia agotada o gastada que resultaba de una sobrecarga por exigencias de energías, recursos personales o fuerza espiritual del trabajador.

Cherniss (1980) es uno de los primeros autores que enfatiza la importancia del trabajo, como antecedente, en la aparición del SB y lo define como "cambios personales negativos que ocurren a lo largo del tiempo en trabajadores con trabajos frustrantes o con excesivas demandas".

Maslach y Jackson entienden que el SB se configura como "un síndrome tridimensional caracterizado por agotamiento emocional, despersonalización y reducida realización personal». Esta definición, que no se aparta de la asunción de las variables del trabajo como condicionantes últimas de la aparición del Burnout, tiene la importancia de no ser teórica, sino la consecuencia empírica del estudio que las autoras desarrollaron (Maslach et al., 1981).

Cuando se intenta definir al SB se pueden encontrar una multiplicidad de definiciones al respecto (Garcés, 2003), sin embargo, ante este panorama, Barraza (2008) reconoce, en el estudio de este síndrome, la presencia hegemónica de dos enfoques conceptuales diferentes: el tridimensional y el unidimensional. El primer enfoque se origina en el trabajo de Maslach & Jackson (1981) y su difusión permitió definir este síndrome a través de un constructo tridimensional (agotamiento emocional, despersonalización y baja realización personal). El segundo enfoque se inicia con el trabajo de Pines, Aronson & Kafry (1981) y su desarrollo proporcionó una definición de este síndro-

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CERTIFICADO DE PUBLICACIÓN

Estimados autores: **Y. Rosales Ricardo, J. Pedro Ferreira.** Certificamos que su manuscrito con título **Revisión sistemática sobre intervenciones con ejercicio físico en pacientes con síndrome de burnout** fue publicado en la revista SPORT TK Revista Euroamericana de Ciencias del Deporte (ISSN: 2340-8812) en el Vol. 9 Núm. 2 (2020): Suplemento 1, en el siguiente enlace: https://revistas.um.es/sportk/article/view/454181. **SPORT TK** se encuentra indexada en las bases de datos: Web of Science (ESCI), Catálogo Latindex, Dialnet, REDIB (Red Iberoamericana de Innovación y Conocimiento Científico), MIAR (Matriz de Información para el Análisis de Revistas), ERIH PLUS (European Reference Index for the Humanities and the Social Sciences), CCHS (Centro de Ciencias Humanas y Sociales), Google Scholar.

Sin otro particular, y esperando nuevas contribuciones por su parte, reciba un cordial saludo.

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Guillermo Felipe López Sánchez
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Artículo original

Síndrome de Burnout en estudiantes de la Universidad Técnica de Ambato, Ecuador

Burnout Syndrome in students of Universidad Técnica de Ambato, Ecuador

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Palabras Claves: Salud mental, síndrome de burnout, estrés, correlación, estudiantes.

Keywords: Mental health, burnout syndrome, stress, correlation, students

Resumen

Introducción: El síndrome de burnout es un problema de salud mental de gran repercusión social en nuestros días en los estudiantes universitarios.
Objetivo: determinar los niveles de Síndrome de Burnout en estudiantes de la Universidad Técnica de Ambato, Ecuador.
Material y métodos: Estudio descriptivo transversal. La muestra fue probabilística con muestreo estratificado con participación proporcional. Se utilizó el Maslach Burnout Inventory Students Survey.
Resultados: agotamiento: ítem de mayor valor el 2(3,68±1,65), el más bajo el 4(2,24±1,58). Cinismo: el 14(1,87±1,31) y el 8(1,13±1,53) respectivamente. En eficacia el 12(4,89±1,29) y el 7(3,70±1,46). En estrés el 12(2,52±1,08) y el 6(1,59±1,00) respectivamente. Más del 28 % de los estudiantes diagnosticados con niveles altos y moderados de agotamiento, casi el 19 % en los mismos niveles de Cinismo. El Agotamiento dio niveles sobre el 10 %. Casi la mitad de no tenía cinismo y el 32 % tenía niveles bajos. Las Facultades con más prevalencia del SB fueron las Ciencias Humanas y de la Educación y la de Ciencias de la Salud. La de menor prevalencia de SB fue Jurisprudencia y Ciencias Sociales.
Conclusiones: El agotamiento fue la dimensión de mayor prevalencia. El sexo femenino fue el más afectado. La mayoría de los estudiantes fueron diagnosticados con niveles bajos y moderados.

Abstract

Introduction: Burnout syndrome is a mental health problem of great social impact on university students today.
Objective: to determine the levels of Burnout Syndrome in students of the Technical University of Ambato, Ecuador.
Material and methods: Cross-sectional descriptive study. The sample was probabilistic with stratified sampling with proportional participation. The Maslach Burnout Inventory Students Survey was used.
Results: exhaustion: highest value item 2(3,68±1,65), lowest value 4(2,24±1,58). Cynicism: 14(1,87±1,31) and 8(1,13±1,53) respectively. In efficiency 12(4,89±1,29) and 7(3,70±1,46). In stress 12(2,52±1,08) and 6(1,59±1,00) respectively. More than 28 % of the students diagnosed with high and moderate levels of exhaustion, almost 19 % in the same levels of Cynicism. Exhaustion gave levels above 10 %. Almost half had no cynicism and 32 % had low levels. The Faculties with the highest prevalence of SB were the Human and Education Sciences and Health Sciences. The lowest prevalence of SB was Jurisprudence and Social Sciences.
Conclusions Exhaustion was the dimension with the highest prevalence. The female sex was the most affected. Most students were diagnosed with low and moderate levels.

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Revista Dilemas Contemporáneos: Educación, Política y Valores.
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Año: VII Número: Edición Especial Artículo no.:19 Período: Abril, 2020

TÍTULO: Intervención con ejercicio físico en estudiantes universitarios con síndrome de burnout: un protocolo de estudio.

AUTOR:

1. Máster. Yury Rosales Ricardo.

RESUMEN: El Síndrome de Burnout representa un problema social y de salud en los estudiantes universitarios. Se describe el protocolo de estudio de una intervención con ejercicio físico en estudiantes universitarios con síndrome de burnout. El objetivo principal es determinar la efectividad de los ejercicios físicos en la disminución de los niveles de síndrome de burnout en estudiantes universitarios del Ecuador. Si la intervención se comprueba que es eficaz, esto sugeriría que existe una intervención simple, económica y accesible estrategia para reducir el Síndrome de Burnout en esta importante y numerosa población estudiantil universitaria.

PALABRAS CLAVES: ejercicio físico, burnout, estudiantes, protocolo de estudio.

TITLE: Physical exercise intervention in college students with burnout syndrome: a study protocol.

AUTHOR:

1. Máster. Yury Rosales Ricardo.

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Nos dirigimos a Usted para dar constancia de haber recibido su artículo titulado: ***Intervención con ejercicio físico en estudiantes universitarios con síndrome de burnout: un protocolo de estudio.,*** *el cual obtuvo la pertinencia y aprobación inicial del Consejo Editorial de la Revista, así como posteriormente los dictámenes positivos de los miembros designados del Consejo Científico Externo para su publicación. El artículo fue publicado en el* ***Año tfII, Edición Especial, Abril 2020, artículo no.: 19,*** *disponible en:* *https://www.dilemascontemporaneoseducacionpoliticayvalores.com/edici%e2%99%80n-2013/ano-vii-edicion-especial-abril-2020/*

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Saludos cordiales;

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Un meta-análisis de los efectos de las intervenciones de estudios con ejercicio en el síndrome de burnout

YURI ROSALES RICARDO[1] Y JOSÉ PEDRO FERREIRA[2]

RESUMEN

Antecedentes: Los altos niveles de estrés pueden provocar depresión, ansiedad, síndrome de burnout y, en casos extremos, trastorno de estrés postraumático. Hoy en día el síndrome de burnout se considera un problema de salud mental con gran repercusión social.

Propósito: estimar la eficacia de las intervenciones con ejercicio físico (el tamaño del efecto) en pacientes con síndrome de burnout.

Métodos: El diseño utilizado siguió las pautas de PRISMA, el perfeccionamiento de PICOS y la declaración TREND para evaluar la calidad de la información presentada en cada estudio. El estudio se llevó a cabo en las bases de datos Pubmed, Web of Science, Scielo, ScienceDirect y PsycoINFO. Las palabras "exercise", "physical activity" y "burnout" se utilizaron como términos de búsqueda en los idiomas inglés, español y portugués.

Resultados: La búsqueda inicial en todos los descriptores reveló un número global de 4768 estudios encontrados, sin embargo y después de la aplicación de los diferentes pasos de la revisión sistemática el número se redujo a 11 estudios de intervención. Estos once estudios de intervención incluyeron un total de 881 pacientes [Hombres (35.8±4.6 y Mujeres (33.4±4.1)].

Conclusiones: Los resultados proporcionan evidencia del papel del ejercicio físico como una herramienta efectiva para reducir los síntomas del síndrome de burnout en los pacientes. Los resultados mostraron que los pacientes del grupo de control mostraron en promedio 0,4 más probabilidad de presentar síntomas de agotamiento que los pacientes incluidos en el grupo de intervención de ejercicio.

Palabras clave: Síndrome de burnout, salud mental, ejercicio físico, actividad física.

1. Estudante de Doutoramento, Universidade de Coimbra, Faculdade de Ciências do Desporto e Educação Física. Portugal.

2. Professor e investigador, Universidade de Coimbra, Centro de Investigação do Desporto e da Actividade Física, Faculdade de Ciências do Desporto e Educação Física. Portugal.

Contacto: yuryrr82@gmail.com.

Declaração

Para os devidos efeitos, Ricardo Filipe da Silva Pocinho, Presidente da ANGES- Associação Nacional de Gerontologia Social e CHAIR do AGEINGCONGRESS2018, 2019 e 2020, declara que o artigo:

UN META-ANÁLISIS DE LOS EFECTOS DE LAS INTERVENCIONES DE ESTUDIOS CON EJERCICIO EN EL SÍNDROME DE BURNOUT, da autoria de YURY ROSALES-RICARDO E JOSÉ PEDRO FERREIRA da Faculdade de Ciências do Desporto e Educação Física da Universidade de Coimbra, Portugal, foi ACEITE para publicar como CAPÍTULO DE LIVRO indexado pela prestigiada EDITORA THOMSON REUTERS, como resultado de double- blind peer review pelo Comité Científico da Track 5 HEALTH AND AGEING do AGEINGCONGRESS2020, organizado pela ANGES - Associação Nacional de Gerontologia Social, em colaboração com o Instituto Politécnico de Leiria, Universidade de Valencia, Universidade Rey Juan Carlos, Universidade Politécnica de Valencia.

Coimbra, 15 de Maio de 2020

O Presidente da ANGES

Ricardo Filipe da
Silva Pocinho

Morada - Rua Dom João III, (Escola Superior de Educação de Coimbra) 3030 - 329 Coimbra
Email - info@associacaoanges.pt | Facebook- @associacaoanges | Delegação Açores- acores@associacaoanges.pt

ANNEXE 1b

ORAL COMMUNICATIONS IN INTERNATIONAL SCIENTIFIC CONGRESS


UNIVERSIDAD DE GRANADA
Facultad de Ciencias de la Educación
Universidad de Granada
UNIVERSIDAD DE JAÉN
V CONGRESO INTERNACIONAL EN INVESTIGACIÓN Y DIDÁCTICA DE LA EDUCACIÓN FÍSICA – ADDIJES
Certificado a,
ROSALES-RICARDO, YURY; PEDRO-FERREIRA, JOSÉ
Como autor/a de la COMUNICACIÓN presentada al Congreso el día 19 y 20 de marzo de 2020, titulada:
REVISIÓN SISTEMÁTICA SOBRE INTERVENCIONES CON EJERCICIO FÍSICO EN PACIENTES CON SÍNDROME DE BURNOUT
ADDIJES
Fdo.: Pedro Valdivia Moral
Director del IV Congreso Internacional en Investigación y Didáctica de la Educación Física – ADDIJES
Fdo.: Félix Zurita Ortega
Departamento de Didáctica de la Expresión Musical, Plástica y Corporal
Universidad de Granada
Fdo.: Javier Cachón Zagalaz
Departamento de Didáctica de la Expresión Musical, Plástica y Corporal
Universidad de Jaén
Dpto. Didáctica Expresión Musical, Plástica y Corporal
Campus de Cartuja, s/n - 18071 Granada
Tfnos.958 249623
958 249849
Correo electrónico: infoaddije@gmail.com
Journal of Sport and Health Research

COSTA BLANCA SPORTS SCIENCE

CERTIFICATE OF COMMUNICATION

BURNOUT SYNDROME IN UNIVERSITY STUDENTS AND ITS INTERVENTION WITH PHYSICAL EXERCISE

To: Yuri Rosales-Ricardo, Raynier Montoro-Bombú, José Pedro Ferreira

Prof. Dr. José Pérez Turpin

Alicante, June 29, 2020


V CONGRESO INTERNACIONAL
OPTIMIZACIÓN DEL ENTRENAMIENTO
Y READAPTACIÓN FÍSICO-DEPORTIVA
Certificado de Comunicaciones
- Autor 1: Yury Rosales Ricardo
- Autor 2: José Pedro Ferreira
Han expuesto su comunicación "Burnout syndrome in college students and its intervention with physical exercise" en el " V Congreso Internacional en Optimización del Entrenamiento y Readaptación Físico-Deportiva", celebrado los días 29 y 30 de mayo de 2020 por el Grupo Dogesport y la Fundación San Pablo Andalucía CEU.
Por lo que se expide el presente certificado a fecha de 8 de junio de 2020
Francisco Javier Muñoz Cintado
Fdo. Presidente del Comité Organizador
Grupo Dogesport
María Luisa Ríos Camacho
Fdo. Directora del Instituto de Posgrado
Fundación San Pablo Andalucía CEU
CEU
Instituto de Posgrado
DOGESPORT
CEU
Fundación San Pablo
Andalucía

b

XIV Congresso Internacional de Educação e Inovação

Coimbra Portugal 2020

Rumo a uma educação sustentável

9, 10 e 11 de Dezembro

O Dr. Pedro Balaus Custódio (responsável do Gabinete de Relações Internacionais da Escola Superior de Educação do Politécnico de Coimbra) **e o Dr. Juan Manuel Trujillo Torres** (director do Departamento de Didáctica e Organização Escolar da Universidade de Granada),

CERTIFICAM

Yury Rosales-Ricardo

como autor/a da **COMUNICAÇÃO ORAL** intitulada: **EFECTOS DE LOS EJERCICIOS FÍSICOS EN ESTUDIANTES CON SÍNDROME DE BURNOUT** apresentada ao **"XIV CONGRESSO INTERNACIONAL DE EDUCAÇÃO E INOVAÇÃO"**, organizado pela Associação para a promoção da educação na Sociedade Digital (PromoEDUCA), a Escola Superior de Educação do Politécnico de Coimbra e o Departamento de Didáctica e Organização Escolar da Universidade de Granada, com **30 horas de duração,** e realizado em Coimbra (Portugal), de 9 a 11 de dezembro de 2020

E para os devidos efeitos, emite-se o presente certificado, em Coimbra a 11 de dezembro de 2020.

ESCOLA SUPERIOR DE EDUCAÇÃO DE COIMBRA
GABINETE DE RELAÇÕES INTERNACIONAIS

UNIVERSIDAD DE GRANADA

Ass.: Dr. Pedro Balaus Custódio

Responsável do Gabinete de Relações Internacionais da Escola Superior de Educação do Politécnico de Coimbra

Ass.: Dr. Juan Manuel Trujillo Torres

Director do Departamento de Didáctica e Organização Escolar da Universidade de Granada

X CONGRESO IBÉRICO
III CONGRESO IBEROAMERICANO
DE BALONCESTO

Nuevas Tendencias en la Investigación sobre Formación, Rendimiento, Acondicionamiento Físico, Entrenamiento, Evaluación y Salud

CIB'2020

El Comité Científico del X Congreso Ibérico / III Congreso Iberoamericano de Baloncesto informa que la **COMUNICACIÓN** titulada:

EJERCICIO FÍSICOS EN ESTUDIANTES UNIVERSITARIOS CON SÍNDROME DE BURNOUT

Realizada por los autores: **Rosales-Ricardo, Y.; Ferreira, J. P.**

Ha sido presentada dentro del programa del X Congreso Ibérico / III Congreso Iberoamericano de Baloncesto, organizado por la Sociedad Científica de Investigación en Baloncesto y el Grupo de Optimización del Entrenamiento y el Rendimiento Deportivo de la Universidad de Extremadura, realizado del 9 al 12 de Diciembre de 2020.

En Cáceres, a 12 de Diciembre de 2020

Sergio José Ibáñez Godoy
Presidente de la Sociedad Científica de Investigación en Baloncesto

María de las Mercedes Macías García
Decana Facultad de Ciencias del Deporte

Sebastián Feu Molina
Secretario del Comité Científico

Organizan *Colaboran*


Uleam
UNIVERSIDAD LAICA
ELOY ALFARO DE MANABÍ
CECEIC
ASOCIACIÓN
LATINOAMERICANA
DE CIENCIAS
NEUTROSÓFICAS
XI CONGRESO INTERNACIONAL DE INVESTIGACIÓN CIENTÍFICA E INNOVACIÓN TECNOLÓGICA "CIICIT" ISSN 2631-2565
Certificado
OTORGADO A:
MSc. YURY ROSALES RICARDO
Por haber participado como ponente con el tema: INTERVENCIÓN CON EJERCICIO FÍSICO EN ESTUDIANTES UNIVERSITARIOS CON SÍNDROME DE BURNOUT: UN PROTOCOLO DE ESTUDIO, realizado en Manta-Ecuador los días 06, 07 y 08 de febrero de 2020.
Manta, 08 de febrero de 2020
Dr. José Leonardo Cedeño Torres
DECANO
DIRECCIÓN GENERAL
Dra. PHD Maura de la Caridad Salabarría Roig
DIRECTORA GENERAL DEL CECEIC Y DE LA REVISTA DILEMAS CONTEMPORÁNEOS
Dr. PHD José Sergio Puig Espinosa
DIRECTOR ACADÉMICO DEL CECEIC Y EDITOR JEFE DE LA REVISTA DILEMAS CONTEMPORÁNEOS
Dr.C Florentin Smarandache
PRESIDENT NEUTROSOPHIC SCIENCE INTERNATIONAL ASSOCIATION
Soy Uleam
Camino a la excelenci

UNIVERSIDAD NACIONAL DE LOJA UED
FEDERACIÓN NACIONAL DE PROFESIONALESDE CULTURA FÍSICA FENAPCUFI
COLEGIO DE PROFESIONALES DE RECREACIÓN, ACTIVIDAD FÍSICA Y DEPORTE COLPRAFYDCH

Otorgan el presente

CERTIFICADO

A: ***Msc. Yuri Rosales Ricardo***

Por haber participado como EXPOSITOR de la conferencia:
INTERVENCIONES CON EJERCICIO FISICO EN PACIENTES CON SINDROME BURNOUT.
en el **"VI CONGRESO INTERNACIONAL DE EDUCACIÓN FÍSICA, DEPORTES Y RECREACIÓN"** Online, del 1 al 5 de Junio de 2020, con una duración de 60 horas académicas; según Codificación: VI-I-EFD&R-N°114-D-UED-UNL-2020.

Riobamba, Junio 5 de 2020

Dr. Fernando Naderio PhD, CSCS, CISSN
ASSOCIATE PROFESSOR IN STRENGTH TRAINING AND SPORTS NUTRITION UNIVERSITY OF GREENWICH (UK)

Mgs. Milton Eduardo Mejía Balcázar
DIRECTOR DE LA UED- UNL

Mgs. Henry Gutiérrez Cayo
COMITÉ ORGANIZADOR

Dr. Andrés Arce Reyes
MÉDICO DEPORTÓLOGO
REG. SANIT. 12410 FOLIO 2396 LIBRO 1
Dr. Andrés Arce Reyes
PRESIDENTE DE LA SEMD

CONGRESO

FACULTAD DE CIENCIAS HUMANA Y DE LA EDUCACIÓN
CARRERA DE CULTURA FÍSICA
CARRERA DE PEDAGOGÍA DE LA ACTIVIDAD FÍSICA Y DEPORTE
CENTRO DE CULTURA FÍSICA

Confiere el presente

Certificado

A: **Yury Rosales Ricardo , Julio Alfonso Mocha Bonilla Rosana Acosta , Pedro Ferreira.**

Por su valiosa participación en el **SEGUNDO CONGRESO INTERNACIONAL EN CIENCIAS DE LA ACTIVIDAD FÍSICA Y EL DEPORTE**, en calidad de **PONENTES** con el tema:

"Validación del Maslach Burnout Inventory – Student Survey en estudiantes universitarios del Ecuador"

Ambato, 16 de junio de 2019

GALO NARANJO LÓPEZ P.H. D.
RECTOR
UNIVERSIDAD TÉCNICA DE AMBATO

DR. VÍCTOR HERNÁNDEZ
DECANO
FACULTAD DE CIENCIAS HUMANAS Y DE LA EDUCACIÓN

UNIVERSIDAD INTERNACIONAL SEK

Universidad Internacional SEK,
la Cátedra de Prevención de Riesgos Laborales
y Salud Pública de la Universidad de Córdoba
y el Centro de Educación Continua UISEK
otorgan el presente certificado a:

Ph.D (c) Yuri Rosales

Por la presentación del póster científico:

SÍNDROME DE BURNOUT EN ESTUDIANTES UNIVERSITARIOS

en las

3ras Jornadas Internacionales
SEGURIDAD Y SALUD OCUPACIONAL
"Construyendo Organizaciones Saludables"

realizado en Quito el 26 y 27 de abril de 2019
con una duración de 16 horas.

EDUCACIÓN CONTINUA
UISEK

Pablo Suasnavas	Sylvia Morejón	Xavier Ortiz Raza
Decano de Ciencias del Trabajo y Comportamiento Humano	Coordinadora Educación Continua	Secretario General

ANNEXE 2

GENERAL INFORMATION

Nombre y apellidos: _____ Edad: _____ Sexo: _____

Carrera: _____ Semestre: _____ Paralelo: _____

Lugar de procedencia: _____

Estado Civil: _____

¿Tiene hijos?: sí___ no___

Índice académico actual: 9-10___ 7-8___ 5-6___ -5___

¿Cómo considera UD. su situación económica actual?

E ___ MB ___ B ___ R ___ M ___

ANNEXE 3

Maslach Burnout Inventory – Student Survey (MBI-SS)

Señale la respuesta que crea oportuna sobre la frecuencia con que usted siente los enunciados:

0	1	2	3	4	5	6
Nunca / Ninguna vez	Casi nunca / Pocas veces al año	Algunas veces / una vez al mes o menos	Regularmente / Pocas veces al mes	Bastantes veces / Una vez por semana	Casi siempre / Pocas veces por semana	Siempre / Todos los días

1. Las actividades académicas de esta carrera me tienen emocionalmente agotado.
2. Me encuentro agotado físicamente al final de un día de universidad.
3. Estoy cansado en la mañana cuando me levanto y tengo que afrontar otro día en la universidad.
4. Estudiar o ir a clases todo el día es una tensión para mí.
5. Puedo resolver de manera eficaz los problemas relacionados con mis estudios.
6. Estoy agotado de tanto estudiar.
7. Creo que contribuyo efectivamente con las clases en mi universidad.
8. He perdido interés en la carrera desde que empecé la universidad.
9. He perdido entusiasmo por mi carrera.
10. En mi opinión, soy un buen estudiante.
11. Me estimula conseguir objetivos en mis estudios.
12. He aprendido muchas cosas interesantes durante mi carrera.
13. Dudo de la importancia y valor de mis estudios.
14. Me he distanciado de mis estudios porque pienso que no serán realmente útiles.
15. Durante las clases, tengo la seguridad de que soy eficaz en la finalización de las cosas.

ANNEXE 4

Escala de Estrés Percibido - *Perceived Stress Scale* (*PSS*)

Las preguntas en esta escala hacen referencia a sus sentimientos y pensamientos durante el **último mes**. En cada caso, por favor indique con una "X" cómo usted se ha sentido o ha pensado en cada situación.

	Nunca	Casi nunca	De vez en cuando	A menudo	Muy a menudo
1. En el último mes, ¿con qué frecuencia ha estado afectado por algo que ha ocurrido inesperadamente?	0	1	2	3	4
2. En el último mes, ¿con qué frecuencia se ha sentido incapaz de controlar las cosas importantes en su vida?	0	1	2	3	4
3. En el último mes, ¿con qué frecuencia se ha sentido nervioso o estresado?	0	1	2	3	4
4. En el último mes, ¿con qué frecuencia ha manejado con éxito los pequeños problemas irritantes de la vida?	0	1	2	3	4
5. En el último mes, ¿con qué frecuencia ha sentido que ha afrontado efectivamente los cambios importantes que han estado ocurriendo en su vida?	0	1	2	3	4
6. En el último mes, ¿con qué frecuencia ha estado seguro sobre su capacidad para manejar sus problemas personales?	0	1	2	3	4
7. En el último mes, ¿con qué frecuencia ha sentido que las cosas le van bien?	0	1	2	3	4
8. En el último mes, ¿con qué frecuencia ha sentido que no podía afrontar todas las cosas que tenía que hacer?	0	1	2	3	4
9. En el último mes, ¿con qué frecuencia ha podido controlar las dificultades de su vida?	0	1	2	3	4
10. En el último mes, ¿con que frecuencia se ha sentido que tenía todo bajo control?	0	1	2	3	4
11. En el último mes, ¿con qué frecuencia ha estado enfadado porque las cosas que le han ocurrido estaban fuera de su control?	0	1	2	3	4
12. En el último mes, ¿con qué frecuencia ha pensado sobre las cosas que le quedan por hacer?	0	1	2	3	4
13. En el último mes, ¿con qué frecuencia ha podido controlar la forma de pasar el tiempo?	0	1	2	3	4
14. En el último mes, ¿con qué frecuencia ha sentido que las dificultades se acumulan tanto que no puede superarlas?	0	1	2	3	4

ANNEXE 5

ESCALA DE AUTOESTIMA DE ROSENBERG – RSES

Instrucciones: A continuación, se muestra un test con 10 apartados. En cada pregunta ha de elegir una sola respuesta. Por favor, conteste con toda su sinceridad.

1. Siento que soy una persona digna, al menos tanto como las demás.

A. Muy de acuerdo ___ B. De acuerdo ___ C. En desacuerdo ___ D. Muy en desacuerdo ___

2. Estoy convencido de que tengo buenas cualidades.

A. Muy de acuerdo ___ B. De acuerdo ___ C. En desacuerdo ___ D. Muy en desacuerdo ___

3. Soy capaz de hacer las cosas tan bien como la mayoría de gente.

A. Muy de acuerdo ___ B. De acuerdo ___ C. En desacuerdo ___ D. Muy en desacuerdo ___

4. Tengo una actitud positiva hacia mí mismo/a.

A. Muy de acuerdo ___ B. De acuerdo ___ C. En desacuerdo ___ D. Muy en desacuerdo ___

5. En general, estoy satisfecho conmigo mismo/a.

A. Muy de acuerdo ___ B. De acuerdo ___ C. En desacuerdo ___ D. Muy en desacuerdo ___

6. Siento que no tengo mucho de lo que estar orgulloso.

A. Muy de acuerdo ___ B. De acuerdo ___ C. En desacuerdo ___ D. Muy en desacuerdo ___

7. En general, me inclino a pensar que soy un fracasado/a.

A. Muy de acuerdo ___ B. De acuerdo ___ C. En desacuerdo ___ D. Muy en desacuerdo ___

8. Me gustaría poder sentir más respeto por mí mismo.

A. Muy de acuerdo ___ B. De acuerdo ___ C. En desacuerdo ___ D. Muy en desacuerdo ___

9. Hay veces que realmente pienso que soy un inútil.

A. Muy de acuerdo ___ B. De acuerdo ___ C. En desacuerdo ___ D. Muy en desacuerdo ___

10. A menudo creo que no soy una buena persona.

A. Muy de acuerdo ___ B. De acuerdo ___ C. En desacuerdo ___ D. Muy en desacuerdo ___

Gracias por su colaboración

ANNEXE 6

Escala de motivación académica

Cada una de las cuestiones siguientes describe una razón que puede servir para explicar por qué asistes a clase en la universidad. Por favor, para cada una de ellas indica el grado en que corresponde con tus razones personales para venir a la universidad (señala el número apropiado).

Nada en absoluto	Muy poco	Poco	Medio	Bastante	Mucho	Totalmente
1	2	3	4	5	6	7

1	Porque sin el título de la universidad no encontraré un trabajo bien pagado.	1	2	3	4	5	6	7
2	Porque encuentro satisfacción y me gusta aprender cosas nuevas.	1	2	3	4	5	6	7
3	Porque la educación me prepara mejor para hacer carrera después.	1	2	3	4	5	6	7
4	Porque me permite comunicar mis ideas a los otros, y me gusta.	1	2	3	4	5	6	7
5	Sinceramente no lo sé; tengo la sensación de perder el tiempo aquí.	1	2	3	4	5	6	7
6	Porque me agrada ver que me supero a mí mismo en mis estudios.	1	2	3	4	5	6	7
7	Para demostrarme a mí mismo que puedo sacar el título del colegio.	1	2	3	4	5	6	7
8	Para tener después un trabajo de más prestigio y categoría.	1	2	3	4	5	6	7
9	Por el placer que tengo cuando descubro cosas nuevas desconocidas.	1	2	3	4	5	6	7
10	Porque me permitirá escoger un trabajo en la rama que me guste.	1	2	3	4	5	6	7
11	Por el placer que me produce leer escritores interesantes.	1	2	3	4	5	6	7
12	Antes estuve animado, pero ahora me pregunto si debo continuar.	1	2	3	4	5	6	7
13	Porque me permite sentir el placer de superarme en alguno de mis logros personales.	1	2	3	4	5	6	7
14	Porque tener éxito y aprobar en el instituto me hace sentirme importante.	1	2	3	4	5	6	7
15	Porque quiero llevar una vida cómoda más adelante.	1	2	3	4	5	6	7
16	Por el placer que me produce saber más sobre temas que me atraen.	1	2	3	4	5	6	7
17	Porque me ayudará a realizar mejor la elección de carrera o profesión.	1	2	3	4	5	6	7
18	Porque me gusta sentirme completamente absorbido por lo que han escrito algunos autores.	1	2	3	4	5	6	7
19	No sé bien porqué vengo al colegio, y sinceramente, me importa un rábano.	1	2	3	4	5	6	7
20	Por el gusto que me produce realizar las actividades escolares difíciles.	1	2	3	4	5	6	7
21	Para demostrarme a mí mismo que soy una persona inteligente.	1	2	3	4	5	6	7
22	Para ganar un salario mejor en el futuro.	1	2	3	4	5	6	7
23	Porque los estudios me permitirán continuar aprendiendo muchas cosas que me interesan.	1	2	3	4	5	6	7
24	Porque creo que más años de estudios aumentan mi preparación profesional.	1	2	3	4	5	6	7
25	Por la gran emoción que me produce la lectura de temas interesantes.	1	2	3	4	5	6	7
26	No lo sé; no llego a entender que estoy haciendo en la universidad.	1	2	3	4	5	6	7
27	Porque la universidad me da satisfacción personal cuando intento sacar buenas notas en mis estudios.	1	2	3	4	5	6	7
28	Porque quiero demostrar que puedo aprobar y tener éxito en mis estudios.	1	2	3	4	5	6	7

ANNEXE 7

Consentimiento informado

Título del estudio: Efectos de un programa de ejercicio físico en los estudiantes universitarios con Síndrome de Burnout.

Explicación: Antes de estar de acuerdo en participar en este estudio es importante que lea y comprenda toda la información del presente estudio que contiene una explicación detallada para el que está invitado a participar y deberá firmar si es que decide participar. Este estudio tendrá una duración de 17 semanas y todos los participantes serán sujetos a una evaluación inicial y otra final. Se intervendrá con un programa de ejercicios físicos durante 16 semanas. Las evaluaciones se basan en test psicológicos y fisiológicos: el Inventario de Burnout de Maslach (MBI-SS), la Escala de Estrés Percibido (PSS), la Escala de Autoestima (RSES), la Escala de Motivación Académica (EMA) y la Variabilidad de la frecuencia cardíaca.

Los datos son primarios pues serán recogidos sólo para este estudio. Estos datos serán propiedad del equipo de investigación y serán utilizados sólo por este equipo. Y sus resultados podrán ser publicados por razones científicas manteniendo en el anonimato a los participantes. Por tanto, pedimos su autorización para que participe voluntariamente en este estudio. Si decide colaborar debe firmar este documento. Puede decidir participar voluntariamente, decidir no participar o desistir en cualquier momento de participar en éste.

Por tanto, he escuchado atentamente la información proporcionada. He tenido la oportunidad de preguntar sobre ellos y se me ha contestado satisfactoriamente las preguntas que he realizado. Consiento voluntariamente participar en esta investigación como participante y entiendo que tengo el derecho a retirarme de la investigación en cualquier momento, sin perjuicio alguno.

Firma del Participante: _____

Nombre del Participante: _____

CI: _____

Fecha: _____ (Día/mes/año)

ANNEXE 8a. The study approved by the corresponding ethics committee

SOCIEDAD DE LUCHA CONTRA EL CANCER
SOLCA- Núcleo de Quito
Comité de Ética de Investigación en Seres Humanos
Aprobación MSP, Oficio N° MSP-VGVS-2017-00006-O, Enero 5, 2017

SOLCA ECUADOR NÚCLEO DE QUITO

Oficio N°025-2020 CEISH
Quito, 12 de febrero de 2020

Doctor
Yuri Rosales Ricardo
Investigador Principal
Presente

De mi consideración:

A través del presente, el Comité de Ética de Investigación en Seres Humanos SOLCA – Núcleo de Quito le informa que su propuesta de trabajo de investigación, titulado **"EJERCICIO FÍSICO Y SÍNDROME DE BURNOUT EN ESTUDIANTES UNIVERSITARIOS ECUATORIANOS",** en sesión ordinaria del 06 de febrero de 2020, se resolvió aprobar su trabajo.

La presente certificación tiene una duración de un año transcurrido, el cual se deberá solicitar una extensión conforme lo estipula el Reglamento del Comité de Ética de Investigación en Seres Humanos (CEISH) SOLCA – Quito vigente. En toda correspondencia con el CEISH favor referirse al siguiente código de aprobación: CEISHSOLCAQ.OBS.19.129

El investigador es responsable de la veracidad y autoría del estudio, además de emitir reportes de avance del mismo y al final una copia de la publicación del o los artículos científicos derivados de esta investigación.

Atentamente,

Dr. Henry Caballero N.
Presidente del Comité de Ética de Investigación en Seres Humanos
SOLCA – Núcleo de Quito

COMITÉ DE ÉTICA DE INVESTIGACIÓN EN SERES HUMANOS CEISH Solca-Quito

PD. El autor (es) reconocerán a la Universidad Técnica de Ambato, como la fuente que facilitó los datos para la presente investigación. Además, al finalizar, el o los autores deberán entregar una copia de los artículos derivados de su investigación, o su tesis, y en caso de requerir la presentación en SOLCA QUITO, se le notificará.

Elaborado por Ing. Evelin Uribe G.
SECRETARIA DEL CEISH SOLCA NUCLEO DE QUITO

ANNEXE 8b. The study approved by the corresponding ethis committee

SOCIEDAD DE LUCHA CONTRA EL CANCER
SOLCA NUCLEO DE QUITO

Comité de Ética de Investigación en Seres Humanos
(CEISH) SOLCA – Quito
Aprobación MSP. Oficio N° MSPVGVS-2017-00006. Enero, 5, 2017

ECUADOR
NÚCLEO DE QUITO

Oficio 026-2020 CEISH
Quito, 12 de febrero de 2020

Señor
Rector
Universidad Técnica de Ambato
Ciudad

De mi consideración:

Por la presente, pongo en su conocimiento qué, previo análisis en reunión extraordinaria del Comité, se aprobó la realización del trabajo de investigación titulado **"EJERCICIO FÍSICO Y SÍNDROME DE BURNOUT EN ESTUDIANTES UNIVERSITARIOS ECUATORIANOS",** al Dr. Yury Rosales Ricardo.

Para su ejecución solicito cordialmente se facilite para la realización del mismo, comprometiéndose el investigador una vez terminada la investigación presentar un original y hacer su respectiva presentación en las actividades científicas de su prestigiosa Institución.

Atentamente,

Dr. Henry Caballero N.
PRESIDENTE DEL CEISH
SOLCA, NUCLEO DE QUITO

COMITÉ DE ÉTICA EN INVESTIGACIÓN EN SERES HUMANOS
CEISH
Solca-Quito

C.C.: Director del Centro de Investigación UTA.
Dr. Yury Rosales

Elaborado por: Ing. Evelin Uribe G.