

INSTITUTO UNIVERSITÁRIO EGAS MONIZ

MESTRADO INTEGRADO EM MEDICINA DENTÁRIA

ADAPTAÇÃO TRANSCULTURAL E VALIDAÇÃO DO SMAQ-12 NA POPULAÇÃO PORTUGUESA

Trabalho submetido por
Eloïse Isabelle Gobin
para a obtenção do grau de Mestre em Medicina Dentária

julho de 2023

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Trabalho orientado por
Prof.^a Doutora Vanessa Machado

e coorientado por
Mestre Catarina Izidoro

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“Some of the most successful people in the world, are the ones who’ve had the most failures (...) these people succeeded because they understood that you can’t let your failures define you. You have to let your failures teach you. You have to let them show you what to do differently the next time.” Barack Obama, 2009

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RESUMO

Introdução: A manutenção periodontal (MP) previne a progressão da periodontite e a perda de dentes. Ao longo de todo o processo, a adesão do paciente desempenha um papel fundamental, pelo que medir a capacidade do indivíduo para gerir a sua doença periodontal pode melhorar a saúde periodontal a longo prazo. O *Self-Management Aptitude Questionnaire* (SMAQ) é considerado uma ferramenta que pode potencialmente avaliar a auto-gestão da periodontite.

Objetivos: O nosso objetivo era adaptar e validar o impacto psicométrico do SMAQ-12 para a população portuguesa.

Materiais e Métodos: O SMAQ-12 foi traduzido e adaptado de acordo com diretrizes internacionais. Neste estudo transversal, inscrevemos 280 participantes com periodontite crónica do Departamento de Periodontologia da Clínica Dentária Egas Moniz. Os participantes completaram a versão portuguesa do SMAQ-12 (SMAQ-12-PT), uma escala de 12 itens com três domínios conceptuais (gestão de papéis, gestão médica, e gestão emocional). A validade do conteúdo, a validade da construção, a consistência internacional e a fiabilidade do teste-re-teste foram utilizadas para estimar as propriedades biométricas.

Resultados: O SMAQ-12-PT mostrou um coeficiente de correlação intra classe de 0.90, e um intervalo de confiança de 95% (0.79; 0.95, $p < 0.001$), com valores para o coeficiente alfa do Cronbach dos sub-construções variando entre 0.78 e 0.94. A análise do fator de confirmação revelou um ajuste adequado do modelo, com os índices de ajuste comparativo de 0.853, o *goodness-of-fit* de 0.947 e o erro quadrático médio de aproximação de 0.052.

Conclusões: O SMAQ-12-PT foi considerado como um instrumento válido e fiável na população portuguesa. A representação da gestão de doenças para a especialidade de Periodontologia e o seu impacto nos procedimentos periodontais deve ser avaliada em estudos futuros.

Palavras-chave: Periodontite, autogestão, gestão médica, resultados relatados pelos pacientes.

ABSTRACT

Background: Periodontal maintenance (PM) prevents the progression of periodontitis and tooth loss. Throughout the process, patient compliance plays a critical role, and therefore measuring the self-individual's ability to manage their periodontal disease may improve periodontal health in the long term. The Self-Management Aptitude Questionnaire (SMAQ) is considered a tool that can potentially assess periodontitis self-management.

Objectives: We aimed to cross-culturally adapt and validate the psychometric impact of the SMAQ short-form (SMAQ-12) to Portuguese population.

Materials and Methods: The SMAQ-12 was translated and adapted according to international guidelines. In this cross-sectional study, we enrolled 280 participants with chronic periodontitis from the Department of Periodontology of the Egas Moniz Dental Clinic. Participants completed the Portuguese version of the SMAQ- 12 (SMAQ-12-PT), a 12-item scale with three conceptual domains (role management, medical management, and emotional management). Content validity, construct validity, international consistency and test-retest reliability were used to estimate biometric proprieties.

Results: The SMAQ-12-PT showed an intraclass correlation coefficient (ICC) values of 0.90, and a 95% confidence interval (0.79; 0.95, $p < 0.001$), with values for the Cronbach's alpha coefficient of the subconstructs ranging from 0.78 to 0.94. Confirmatory factor analysis (CFA) revealed adequate model fit, with the comparative fit indexes (CFI) of 0.853, the goodness-of-fit of 0.947 and the root mean squared error of approximation (RMSEA) of 0.052.

Conclusions: The SMAQ-12-PT was found to be a valid and reliable instrument in the Portuguese population. Disease management representation for the specialty of Periodontology and its impact on periodontal appointments and should be evaluated in future studies.

Keywords: Periodontitis, self-management, medical management, patients reported outcomes.

RÉSUMÉ

Introduction : La maintenance parodontale (PM) prévient la progression de la parodontite et la perte de dents. Tout au long du processus, l'observance du patient joue un rôle essentiel et, par conséquent, mesurer la capacité de l'individu à gérer sa maladie parodontale peut améliorer la santé parodontale à long terme. Le questionnaire d'aptitude à l'autogestion (SMAQ) est considéré comme un outil permettant d'évaluer l'autogestion de la parodontite.

Objectifs : Nous avons cherché à adapter et à valider l'impact psychométrique de la version courte du SMAQ-12 à la population portugaise.

Matériels et méthodes : Le SMAQ-12 a été traduit et adapté conformément aux directives internationales. Dans cette étude transversale, nous avons recruté 280 participants atteints de parodontite chronique dans le département de parodontologie de la clinique dentaire Egas Moniz. Les participants ont rempli la version portugaise du SMAQ-12 (SMAQ-12-PT), une échelle de 12 items comprenant trois domaines conceptuels (gestion du rôle, gestion médicale et gestion émotionnelle). La validité de contenu, la validité de construction, la cohérence internationale et la fiabilité test-retest ont été utilisées pour estimer les propriétés biométriques.

Résultats : Le SMAQ-12-PT a montré un coefficient de corrélation intraclasse (CCI) de 0,90 et un intervalle de confiance à 95 % (0,79 ; 0,95, $p < 0,001$), avec des valeurs pour le coefficient alpha de Cronbach des sous-construits allant de 0,78 à 0,94. L'analyse factorielle confirmatoire (AFC) a révélé un ajustement adéquat du modèle, avec un indice d'ajustement comparatif (CFI) de 0,853, une qualité d'ajustement de 0,947 et une erreur quadratique moyenne d'approximation (RMSEA) de 0,052.

Conclusions : Le SMAQ-12-PT s'est avéré être un instrument valide et fiable dans la population portugaise. La représentation de la gestion des maladies pour la spécialité de la parodontologie et son impact sur les rendez-vous et les procédures parodontales devraient être évalués dans de futures études.

Mots clés : Parodontite, autogestion, gestion médicale, résultats rapportés par les patients.

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Figure 2. Periodontitis is a disease of multifactorial nature and results from the presence of pathogenic bacteria, inflammatory and immune responses of the host and other identified environmental and systemic risk factors.(Kwon et al., 2021)

ABBREVIATIONS

AAP- American Academy of Periodontology
BOP - Bleeding on probing
CAL - Clinical attachment loss
CEJ - Cementoenamel junction
CFA - Confirmatory factor analysis
CFI - Confirmatory fit index
CI - Confidence interval
DNA - Deoxyribonucleic acid
EFP - European Federation of Periodontology
EMDC - Egas Moniz Dental Clinic
FI – Furcation involvement
GFI - Goodness-of-fit
ICC - Intraclass correlation coefficient
IL - Interleukin
IQR - Medians and interquartile ranges
MMP- Matrix metalloproteinase
NFI - Normed-fit index
PM - Periodontal maintenance
PPD - Periodontal pocket depth
REC - Pocket and recession
RMSEA - Root Mean Squared Error of Approximation
SD - Standard deviations
SMAQ – Self Management Ability Questionnaire
TNF- Tumor necrosis factor
WHO – World Health Organization

I- INTRODUCTION

PERIODONTAL HEALTH

Health was defined by the World Health Organization (WHO) in 1946 as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (International Health Conference, 2002). The formulation of the WHO definition of health was revolutionary at the time in its scope and ambition. Unlike the traditional definition of health as simply the absence of disease, this new definition added information regarding mental, and social dimensions. Although it has been criticized over the past 60 years, the WHO has not changed it. However, criticism has increased (Jadad & O'Grady, 2008; "What Is Health?," 2009) especially in light of aging population and changing patterns of disease ("What Is Health?," 2009). The demand for complete health would "leave us in bad health most of the time". Nowadays, it is suggested that this definition may even be counterproductive, so many authors are trying to come up with a more relevant and useful definition (Boers & Cruz Jentoft, 2015).

According to experts, health should ideally be defined as a more dynamic approach, based on resilience or the ability to cope and maintain and restore integrity, balance and well-being (Hardell, 2021). In line with this idea, among the most influential, Huber et al proposed a positive definition of health in 2011, this perspective emphasizes the individual's ability to adapt, self-manage and realize their full potential. Health is seen as a dynamic state of well-being that allows people to fulfill their potential in all aspects of their lives (Huber et al., 2011).

In the field of Dentistry, in 2017, the European Federation of Periodontology (EFP) / American Academy of Periodontology (AAP) characterized periodontal health as the clinically detectable state without inflammation in an intact or reduced periodontium that allows normal function and without mental or physical consequences due to current or past disease (Chapple et al., 2018). Clinically, a healthy periodontium also implies levels of biological and inflammatory markers compatible with homeostasis (Lang & Bartold, 2018).

Etymologically, 'peri' means around and 'odonto' means tooth. The periodontium is composed of a number of tissues, where we find the gum, which, in healthy periodontal conditions, is the only clinically visible and superficial tissue, forming an integral part of the superficial periodontium. The deeper tissues of the periodontium are the cementum, the periodontal ligament and the alveolar bone, The dissociation of the two entities (superficial and deep

periodontium) is justified from a didactic point of view, but biologically the periodontium corresponds to a functional unit, which is why the periodontium corresponds to all the tissues that support the tooth (Wilson & Kornman, 2003) (Figure 1).

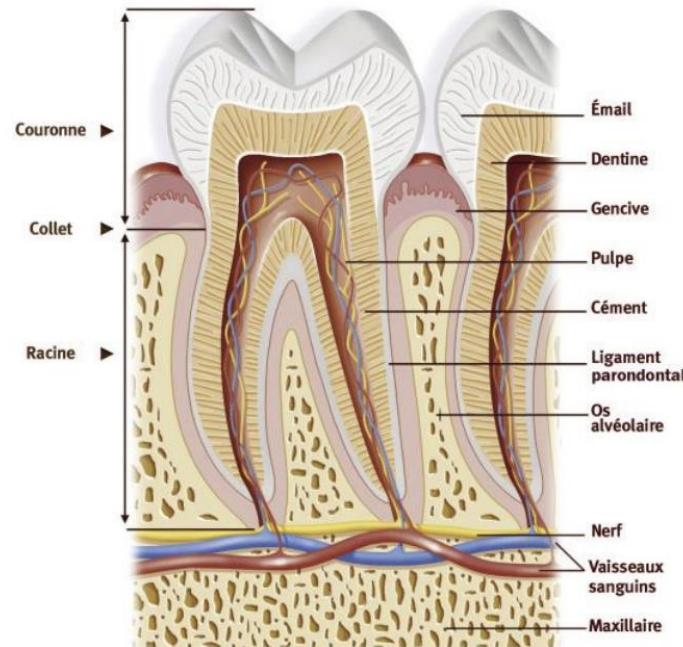


Figure 1. Sagittal view of a mandibular molar and its periodontium (Huck & Buxeraud, 2016).

The periodontium is an organ that allows the teeth to be anchored in a continuously adapting apparatus for their support and function (Nanci & Bosshardt, 2006). Under physiological conditions, the periodontal tissues surround and support the teeth, maintain tooth stability of and distribute masticatory forces (Vrijens et al., 2017). Each of the periodontal components has a highly specialized structure and its structural characteristics directly define its function (Nanci & Bosshardt, 2006). Proper function of the periodontium is achieved only when there is structural integrity and interaction between its components (Nanci & Bosshardt, 2006).

Determining an appropriate definition of periodontal health is very important so that we can define what the therapeutic goals are (Li et al., 2020). It can also serve as an essential common reference point for assessing disease and determining meaningful treatment outcomes (Lang & Bartold, 2018). Periodontal health exists before the onset of periodontal disease, but it can also be regained when there are no longer clinical and histologic signs of the disease, although the periodontal anatomy is reduced (Lang & Bartold, 2018).

PERIODONTAL DISEASE

Periodontal disease and its treatment have been found in ancient Egyptian and Chinese writings, suggesting that periodontal disease was recognized approximately 5000 years ago (Gold, 1985). The term 'periodontal disease' encompasses a wide variety of chronic inflammatory conditions of the gums, alveolar bone and periodontal ligament (the collagen fibers of the connective tissue that attach the tooth to the alveolar bone) (Kinane et al., 2017). It is a multifactorial inflammatory disease of polymicrobial origin that develops in the host and is maintained by an imbalance between microbial aggression and the host's immune system (Gasner & Schure, 2022). This imbalance is the result of complex etiopathogenic mechanisms that will be discussed later.

Gingivitis is the mildest form of periodontal disease and can affect up to 90% of the population (Gasner & Schure, 2022). It is a term used to describe inflammation of the superficial periodontium, mainly due to the accumulation of bacteria and debris between the gum margin and the tooth, also known as plaque (Gasner & Schure, 2022). Gingivitis is a condition that is reversible with improved oral hygiene (Gasner & Schure, 2022).

Periodontitis, which corresponds to an inflammation of the deep periodontium, occurs when the periodontal condition has progressed beyond gingivitis to a chronic, destructive and irreversible inflammatory condition (Kinane et al., 2017). The progressive loss of gingiva, alveolar bone and periodontal ligament increases the periodontal sulcus space, resulting in the appearance of periodontal pockets, which are the hallmark of periodontitis and can lead to tooth loss (Carvalho et al., 2021; Chambrone et al., 2010; Kinane et al., 2017), as bacteria are able to penetrate deeper into the surrounding tissue and periodontium (Kinane et al., 2017). This bacterial invasion triggers a host immune response resulting in the destruction of the periodontium (Gasner & Schure, 2022). Chronic periodontitis can destroy the stomatognathic system, affect masticatory and phonatory functions, and damage other systems (Highfield, 2009).

Etiology, etiopathogenic mechanisms

Etiology is the science that studies the origin of disease. Etiologic factors in related to periodontal disease are agents that cause, modify, or contribute to the development of periodontal tissue damage or destruction. The concept of etiology is important because both

prevention and treatment depend on an understanding of the relationship between etiologic factors and the pathogenesis of periodontal disease (Hoag & Pawlak, 1990).

In healthy gingival conditions, the bacterial load is predominantly Gram positive, whereas in gingivitis and periodontitis, this trend is reversed and a majority of Gram negative is found (Houle & Grenier, 2003). The primary fact in the etiology of periodontal disease inflammation is the accumulation and maturation of bacterial plaque on the tooth surface, near the gingival margin and/or in the free gingival sulcus. For inflammation to occur, a sufficient concentration of periodontopathogenic bacteria must be present (Houle & Grenier, 2003). However, the presence of this plaque is not sufficient; it is quite possible to find an individual who is infected with these microorganisms but who does not show any clinical symptoms (Houle & Grenier, 2003). This is because symptoms only appear if the host's defense mechanisms can no longer maintain homeostasis (Houle & Grenier, 2003). The imbalance in homeostasis results from complex etiopathogenic mechanisms in which microbial plaque, the immune system and risk factors play an important role in the initiation and development of periodontal disease (Kwon et al., 2021) (Figure 2).

Biofilm formation occurs through cohesive group behavior of bacteria adhering to a surface within a self-produced exopolymer matrix (Ben Jacob et al., 2004). It is the bacterial associations that will allow the survival of the flora, some bacteria that will have a great power of adhesion will allow the attachment of other bacteria that would not have been able to adhere to the dental surface (Ben Jacob et al., 2004). These cells will then continue to grow and communicate through "quorum sensing", a process of intercellular communication within bacteria that involves the synthesis, diffusion and/or detection of small signaling molecules, self-inducers, in response to changes in cell density. It also allows the control of the expression of certain genes and the adoption of synchronous and/or population-specific behaviors. This phenomenon allows bacteria to act as a single multicellular entity, making them even more virulent (Ben Jacob et al., 2004).

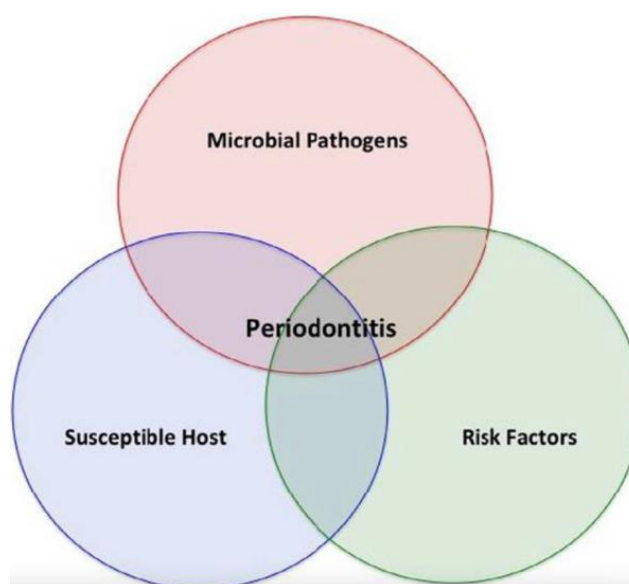


Figure 2: Periodontitis is a disease of multifactorial nature and results from the presence of pathogenic bacteria, inflammatory and immune responses of the host and other identified environmental and systemic risk factors (Kwon et al., 2021).

Risk factors for periodontal disease

A risk factor for periodontal disease can be defined as a behavioral variable, lifestyle variable, environment exposure, congenital or acquired condition that is associated with periodontal disease based on epidemiologic evidence (Genco, 1996). The presence of this risk factor leads to an increase in the prevalence and/or severity of the disease. A risk indicator is a variable that is associated with the disease, without any involvement in its etiopathogenesis (e.g. age, gender, ethnicity and socioeconomic status)(Genco, 1996). Although plaque is the main etiological factor for the development of periodontal disease, it is not sufficient in itself to develop the disease, which has a complex etiology where, in addition to the presence of a dysbiotic microbial community with destructive inflammatory potential (Hajishengallis, 2015). The host is an element capable of tipping the balance for or against disease development, through certain modifiable or non-modifiable risk factors (Hajishengallis, 2015). This is why periodontal disease does not develop in some individuals in whom dysbiosis is present, but may develop in another context in the presence of certain risk factors (Hajishengallis, 2015).

Risk factors play a role in the onset of the disease, the rate of progression, and the aggressiveness of the disease (Jourde, 2014). Periodontal disease will appear earlier, progress

more rapidly and be more complex to treat/stabilize in the presence of a combination of plaque and risk factors (Jourde, 2014). The literature shows that not all individuals are the same when it comes to periodontal disease and the identification of these risk factors allowed us to alert subjects to the prevention and early detection of periodontal disease (Genco & Borgnakke, 2013).

Modifiable risk factors

a) Smoking

Tobacco is the most feared modifiable risk factor associated with the development and severity of periodontal disease, increasing the prevalence and severity of periodontal disease (Preber & Bergström, 1985; Underner et al., 2009). The potential mechanisms of action of tobacco are not yet well defined (Underner et al., 2009). However, it has been shown that the inflammatory response is altered in smokers compared to nonsmokers (Nair et al., 2003). Inhibition of bleeding reactivity may mask the periodontal condition by delaying the appearance of inflammatory symptoms (redness, bleeding, edema), and this inhibition is reversible when smoking is stopped (Bergström & Boström, 2001; Bergström & Floderus-Myrhed, 1983; Lie et al., 1998; Nair et al., 2003; Preber & Bergström, 1985).

Smoking is associated with excessive destruction of the periodontium, leading to bone loss, periodontal pockets, and consequently tooth loss. According to the literature, there is no doubt that these signs of disease are more pronounced in smokers than in non-smokers (Bergström et al., 1991; Grossi et al., 1994; Jansson & Lavstedt, 2002). Furthermore, a dose-response relationship has also been demonstrated, i.e. the greater the tobacco consumption and/or the longer the duration of smoking, the more severe the disease (Bergström et al., 2000; Bolin et al., 1993).

In terms of relative risk, smokers are 2.5 to 6 times more likely to have periodontitis than nonsmokers. Nicotine in tobacco alters certain immune cell functions that promote periodontitis (Pabst et al., 1995).

In the treatment of periodontal disease, smokers show poor or no results for both for surgical and non-surgical treatments. It is therefore important to make patients aware of the consequences of smoking, in order to improve the prognosis of periodontal treatment, and to

make them understand that the results of the proposed treatments will be very little effective in the presence of this habit (Renvert et al., 1998)·(Preber & Bergström, 1986).

b) Stress

Recent studies have shown that chronic psychological stress can increase the onset and severity of periodontitis (Hilgert et al., 2006; Peruzzo et al., 2007) by altering the host immune response and periodontal tissue inflammation (Lie et al., 1998). Several biological mechanisms have been proposed to explain this association. First, chronic stress may affect the immune system by increasing the production of inflammatory cytokines and inhibiting the adaptive immune response (Akcali et al., 2013). In addition, it may disrupt the bacterial balance in the oral cavity by altering the composition of plaque (Li et al., 2000). Studies on the association between psychological stress and periodontal health in healthy adults show that participants with high levels of stress are more likely to develop periodontal disease than those with low levels of stress (Tanveer et al., 2021; Agarwal et al., 2022). Next, the relationship between stress and disease progression was examined in patients with chronic periodontitis, and again stress was a factor that led to an increase in the rate of periodontal disease progression (Linden et al., 1996).

c) Oral care

Poor oral hygiene and polymicrobial plaque accumulation are known to be a major risk factors for periodontal disease (Trombelli et al., 2015). Primary prevention plays an important role in preventing the onset of periodontal disease and consists of learning to remove biofilm through good brushing and interdental cleaning (Trombelli et al., 2015). Secondary prevention is aimed at preventing the recurrence of periodontal disease in previously treated patients in order to avoid further loss of periodontal attachment (Sanz et al., 2015). It consists of mechanical plaque removal by oral health professionals, motivation for oral hygiene, and awareness of risk factors (Sanz et al., 2015). Poor oral hygiene increases the risk of periodontitis by 2 to 5 times, to reduce this risk, regular brushing and proper professional care is essential (Lertpimonchai et al., 2017).

d) Obesity

Obesity is a chronic metabolic disease that is common throughout the world and predisposes to various comorbidities, including hypertension, type II diabetes mellitus, cardiovascular disease, among others (Pischon et al., 2007), and is also considered a risk factor for periodontitis (Dahiya et al., 2012). The causal mechanisms of this association are unclear, but the development of insulin resistance as a result of a chronic inflammatory state, and oxidative stress is currently the most accepted biological mechanism to explain this association (Martinez-Herrera et al., 2017).

The literature shows that obese people are more affected by periodontal disease, and that there is even an association between the degree of obesity and the risk of developing periodontal disease or its worsening (Morita et al., 2011; Pataro et al., 2012).

In relation to obesity and the response to periodontal treatment (surgical or non-surgical) it is not yet well defined whether or not the disease has a negative effect on the response to treatment (Zuza et al., 2011).

Non-modifiable risk factors

a) Age/Sex/Ethnicity

The prevalence and severity of periodontal disease is often associated with age (Ebersole et al., 2016; Holtfreter et al., 2009). In fact, the immune system, which is an essential component of health, becomes more sensitive, undergoing qualitative and quantitative changes as the antigenic system has been in demand over longer periods of life, resulting in an overall decrease in its ability to respond to stimuli, which is known as immunosenescence (Ebersole et al., 2016). In a more localized manner, the periodontium is also exposed to bacterial agents for a prolonged period throughout the individual's life, which contributes to the ageing effects of these tissues (Ebersole et al., 2016; Pn et al., 1991). The level of severity varies according to other factors (smoking, socio-economic status, plaque, among others) but periodontal disease does not automatically develop in an individual with a healthy periodontium (Billings et al., 2018; Susin et al., 2011).

Male gender is also considered a risk factor for periodontal disease (Celeste et al., 2019; Genco & Borgnakke, 2013; Shiao & Reynolds, 2010). Male gender is also considered a risk factor for

periodontal disease (Haytac et al., 2013; Shiau & Reynolds, 2010). The exact reasons for this are not yet well defined, but may be hormonal differences, genetic predisposition, or differences in oral care habits (Lipsky et al., 2021). Men may also be more exposed to behavioral factors such as smoking, alcohol, poorer oral hygiene (where women have a more positive attitude, men tend to visit the dentist less) (Genco & Borgnakke, 2013; Lipsky et al., 2021).

Finally, ethnicity was recognized as a risk factor, although controversial (Celeste et al., 2019). There seems to be a correlation between periodontal disease and a low level of education. In one study, the Hispanic white population was found to have better periodontal health than Hispanic blacks or non-Hispanic Asians in the United States, although other minorities still had a higher prevalence. However, it could not be determined whether this was related to genetic, cultural or socioeconomic differences (Eke et al., 2015; Papapanou, 1999a). In addition, a higher prevalence of periodontal disease was also recorded among third world countries than in western countries (Papapanou, 1999a).

a) Socio-economic status

Socio-economic inequalities play an important role in the development of diseases such as periodontitis, partly due to poor oral hygiene, limited access to care, and many dietary deficiencies (Cohen, 1990).

A study conducted by the Global Burden of Disease Study 2019 has highlighted the fact that the risk of periodontitis varies considerably across the world (Chen et al., 2021). These differences are thought to be due to a variety of factors, but the most important is population growth and ageing population. The results of this study highlight the importance of socio-demographic development in improving oral health (Chen et al., 2021).

In fact, individuals living in disadvantaged countries/regions, where resources are scarce and financial barriers are considerable, are more likely to be affected by periodontal disease (Arcury et al., 2009).

Among the most affected countries, sub-Saharan African countries are in first place (Chen et al., 2021).

b) Genetics factors

Genetics play an important role in predisposition to periodontal disease. Studies have shown that certain genetic variants, such as polymorphisms in genes involved in the immune response and inflammation, may increase the risk of developing periodontal disease. Some genes are subject to polymorphisms and are associated with an increased susceptibility to develop periodontal disease, such as interleukin (IL)-1, tumor necrosis factor (TNF)-alpha, matrix metalloproteinase (MMP)-9 and vitamin D receptor (Loos & Van Dyke, 2020; Quappe et al., 2004).

Epigenetics, in turn, refers to changes in gene expression caused by chemical modifications to the deoxyribonucleic acid (DNA) molecules or proteins that surround them, rather than changes in the DNA sequence (Gayon, 2016). These epigenetic changes can be influenced by various factors, such as environment, lifestyle, diet, stress, among others (Suzuki & Yamada, 2022). Studies have shown that epigenetic changes, such as DNA methylation or histone acetylation, can affect the expression of genes involved in inflammation and immune response, which may contribute to the development and progression of periodontal disease (Kurushima et al., 2019; Larsson, 2017).

c) Systemic disease

Some systemic diseases can be predisposing factors or aggravating factors for periodontitis. Conditions that affect neutrophils quantitatively and qualitatively and conditions that affect other aspects of immunity (such as Papillon-Lefèvre syndrome, Down's syndrome, diabetes mellitus, Human Immunodeficiency Syndrome) have been associated with periodontitis, diabetes mellitus (type I and type II) also affects the evolution of periodontitis, especially in patients whose disease is difficult to control (Botelho et al., 2022; Jepsen et al., 2018; Linden et al., 2013; Preshaw et al., 2012). The relative risk for diabetic patients is 2.5 to 4.0 times higher than for non-diabetic patients (Papapanou, 1999b). Periodontitis may also be a risk factor for other systemic problems. It has been associated with cardiovascular problems, atherosclerosis, cerebrovascular accidents, endocarditis, brain, lung, cervical and abdominal abscesses, diabetes, preterm births and low birth weight (Machado et al., 2023; Page et al., 1997; Papapanou, 1999a; Paquette, 2002).

Periodontal treatment and the importance of self-management of periodontal disease

Periodontal treatment includes behavioral change techniques such as: oral hygiene instructions, behavioral change (in particular diet and smoking habits) followed by active periodontal therapy and supportive periodontal therapy.(Graziani et al., 2017; Lee et al., 2015). Active periodontal therapy includes mechanical debridement of the root surfaces, aiming to disrupt the supra- and subgingival biofilm (Graziani et al., 2017). These treatments have been shown to control periodontal infection and stop disease progression in a significant number of cases (Graziani et al., 2018) However, despite the completion of non-surgical treatment, a certain number of periodontal pockets may remain, which is why surgical treatment is necessary if oral hygiene conditions are controlled (Graziani et al., 2018).

Finally, the periodontal support phase, where periodontal disease is monitored and etiological factors are reduced or eliminated (Lee et al., 2015). Currently, periodontal supportive care faces low treatment compliance once individuals have completed the active part of treatment (Gokulanathan et al., 2014). In general, the most common reason for patients to seek medical and dental treatment is pain and discomfort, such as tooth decay (Gokulanathan et al., 2014). However, periodontal disease rarely causes acute pain, so patient motivation for periodontal treatment can be a difficult issue (Gokulanathan et al., 2014).

According to Haines, compliance refers to the extent to which a person's behavior coincides with medical or health advice (Jay et al., 1984) and according to the WHO as "the extent to which the patient follows medical instructions".,(Sabaté & Cluster, 2001) and includes the implication and commitment of the patient to his illness, his treatment and the therapist (López-Romero et al., 2016).

Periodontal maintenance, after active periodontal therapy, is carried out through appointments at pre-defined time intervals according to the diagnosis and periodontal recovery specific to each individual, in order to help periodontal patients maintain their oral health. The right interval between maintenance visits has not yet been determined, but should be set according to the patient's needs (Echeverría et al., 2019).

Periodontal maintenance of a patient with supportive periodontal therapy is considered to be one of the most important factors affecting long-term periodontal status (Lee et al., 2015).

Treatment adherence is not just about starting treatment, it has three components: initiation, implementation and persistence (Vrijens et al., 2017). Initiation refers to the moment when a patient actively begins the process of implementing a therapeutic plan recommended by their physician to treat a particular disease by taking concrete steps to initiate the prescribed therapeutic interventions or behaviours. This may include, for example, implementing lifestyle changes, adopting new habits, participating in specific activities or following pharmacological or non-pharmacological care recommendations (Vrijens et al., 2012). The initiation of treatment often involves a conscious decision and an active willingness to comply with the medical recommendations given. It may also be influenced by factors such as the patient's understanding of the disease, expectations about the benefits of treatment, trust in the health professional and perception of the need for treatment to improve health or prevent worsening of the clinical condition (Vrijens et al., 2012).

Treatment implementation refers to the systematic and consistent application of specific therapeutic interventions aimed at treating a medical condition or improving an individual's health, in the case of non-drug treatment, or as the extent to which patients adhere to the prescribed dosing regimen from the start to the last dose of the drug, in the case of drug treatment (Vrijens et al., 2017).

Persistence is related to the time the patient continues the prescribed treatment, i.e. the time from initiation to discontinuation of treatment (Echeverría et al., 2019).

However, one third of patients end up leaving supportive care after 1-2 years (Echeverría et al., 2019). And this, while regular supportive periodontal therapy is recommended to prevent and control the development of periodontal disease after active periodontal therapy (Lee et al., 2015) as this disease, like many other chronic diseases, requires lifelong treatment (Echeverría et al., 2019).

It was determined that compliance with periodontal therapy and maintenance visits could positively or negatively affect the onset or progression of periodontal disease (López-Romero et al., 2016).

Good adherence to periodontal maintenance leads to a reduction in plaque, bleeding on probing, and potentially a slowing or stopping of disease progression (Echeverría et al., 2019).

Indeed, patients with good plaque self-management showed little evidence of periodontal disease recurrence, in contrast to patients with poor plaque removal, who had a high incidence of additional attachment loss (Arweiler et al., 2018).

Whereas, if a patient does not receive adequate supportive periodontal treatment at the prescribed intervals, periodontal disease may progress despite the performance of active periodontal therapy (Renvert & Persson, 2004).

Many factors influence the clinical results during supportive periodontal therapy: adherence to the proposed appointments, risk factors, initial prognosis of the tooth, location of the tooth, persistence of residual pockets and bleeding on probing, symptoms, among others (Renvert & Persson, 2004; Suvan et al., 2014).

In addition, patients with acute symptomatology, such as those undergoing surgery, compliance is higher than in reported patients from other dental specialties (Chambrone et al., 2010).

On the other hand, it is essential to reinforce the long-term effect of the treatment (Lindhe et al., 1984). In fact, well-performed professional periodontal maintenance treatment combined with poor oral hygiene techniques leads to long-term treatment failure (Rosén et al., 1999). Thus, a combination of patient self-care and professional care performed by the dentist is essential to achieve the best results from supportive periodontal therapy (Rosén et al., 1999).

Thus, the success of periodontal treatment, whether non-surgical, surgical or maintenance, depends not only on the dentist but also on patient compliance, i.e. the extent to which patient behaviour coincides with medical or other health-related advice (Haynes et al., 1976). The patient's prognosis depends mainly on their attitude towards the disease, their willingness and ability to maintain good oral hygiene and manage risk factors (Oliveira Costa et al., 2011). Thus, in more cooperative patients, the prognosis will be better (Oliveira Costa et al., 2011).

Finally, to improve adherence to therapy, patients need to acquire an active role in the management of their disease, improve their autonomy and self-care capacity, know and understand the disease, its treatment and, above all, the importance of adherence as well as the prescribed treatment and the importance of complying with it (Echeverría et al., 2019).

Although prevention has become more developed and treatment of this type of disease is now successful, recent epidemiological studies have indicated a great lack of knowledge about

periodontal diseases among the population (Aronson, 2007; Echeverría et al., 2019; Manresa et al., 2018).

That is why it is important not to neglect the self-management part of the patients, in order to maintain good long-term results, and not only at the beginning of the treatment of the disease, because it will have to be treated throughout life (Echeverría et al., 2019).

SELF MANAGEMENT ABILITY QUESTIONNAIRE (SMAQ)

The precise definition of self-management was introduced by Lorig in 2003 where patients monitor signs of illness and improve their behavior's in order to reduce the negative effect of social function, interpersonal relationships and emotional experience (Lorig & Holman, 2003).

The SMAQ is a questionnaire that was created and published in 2019 by a team from Tianjin University of Traditional Chinese Medicine (Chen et al., 2019a). It was based on scientific evidence, literature reviews, semi-structured interviews and consultation with experts (Chen et al., 2019a) There are three major themes: medicine, role and emotional management (Corbin & Strauss, 1988). The aim of this questionnaire and its application through further research is to qualitatively measure self-management skills in patients with chronic periodontitis (Chen et al., 2019b). The questionnaire contains three domains: 1) medical management of chronic periodontitis (12 items), 2) role management (7 items), 3) emotional management (5 items) (Chen et al., 2019b).

This study is important for several reasons, firstly, chronic periodontitis is a complex and chronic disease that often requires long-term care. The role of periodontal patients in their own treatment, following their dentist's instructions, opting for a healthy lifestyle and improving their oral hygiene habits is of great importance. This is why assessing this self-management capacity is crucial (Chen et al., 2019a).

The SMAQ provides a validated tool to measure the self-management ability of chronic periodontitis (Chen et al., 2019a), which is interesting in that it helps healthcare professionals understand how periodontal patients self-manage their periodontal disease on a daily basis, assessing the effectiveness of interventions and treatments in order to plan treatment and maintenance appointments personalized to each patient. This personalization allows for

educating individuals and developing their involvement in disease management, which can reduce periodontal healthcare (Panagioti et al., 2014) thanks to the maintenance of periodontal health and improve the quality of life related to oral health (Barker et al., 2018a; Chapple et al., 2015). It has been shown that patients who have high self-management skills are more likely to correctly follow recommended treatments and maintain good long-term oral health (Arcury et al., 2009; Woelber et al., 2015).

Researchers from Tianjin University of Traditional Chinese Medicine developed a shortened version of the SMAQ with the aim of obtaining and validating a shorter version of the SMAQ for patients with chronic periodontitis. This new version maintains the same objective but makes the questionnaire easier and quicker to use in the medical-dental context. This new version has been validated for the Chinese population and can therefore enable healthcare professionals to assess the self-management ability of patients with chronic periodontitis. It contains 12 items compared to 24 in the original SMAQ and still has the 3 major themes (medical, role and emotional management) (M. Li et al., 2022a). Considering the potential impact of the SMAQ and the need for further validation worldwide and the discussed need to confirm whether the SMAQ-12 is comprehensive enough to assess the self-management ability of patients with periodontitis, validation into other languages is strongly encouraged. In this study, the aim of the present thesis is to perform the translation and psychometric validation of the SMAQ-12 into the Portuguese language, named SMAQ-12-PT.

II-MATERIALS AND METODS

DESIGN AND PARTICIPANTS

This study was developed at the Department of Periodontology of the Egas Moniz Dental Clinic (EMDC) with consecutive pool of patients, a Portuguese university dental clinic (Almada, Portugal). The Institutional Review Board approved this study (Ethics Committee of Egas Moniz, ID: 1050) that followed the Declaration of Helsinki of 1975, as revised in 2013.

To be eligible for participation, individuals had required to be 18 years of age or older, Portuguese natives, diagnosed with periodontitis, and in a specific phase of the periodontal treatment or maintenance. If they were eligible, each person was invited to participate by completing a self-administered questionnaire signed an informed consent form.

CROSS-CULTURAL ADAPTATION OF THE SMAQ

The short form of the SMAQ is a 12-item instrument divided into 3 subscales: role management (items 1 to 5, ranging from 0 to 20), medical management (items 6 to 9, ranging from 0 to 16) and emotional management (items 10 to 12, ranging from 0 to 12) (Table 1) (M. Li et al., 2022b). Responses to the items are given on a 5-point Likert scale, ranging as follows: 0 = “never”; 1 = “rarely”; 2 = “sometimes”; 3 = “frequently”; and 4 = “very frequently” (Supplementary Table S1). Total scores ranged from 0 to 48 after recording, with higher total scores indicating a greater degree of self-management.

Initially, two independent bilingual individuals fluent in both Portuguese and English translated the original English version of the SMAQ-12 into Portuguese (V.M. and J.B.) in a “double-blind” process. There was no disagreement, and a final single translated version was produced, named SMAQ-12-PT. Second, the translated version was back translated to English to confirm the semantic and conceptual equivalence (Supplementary Table S1).

The SMAQ-12-PT test-retest was carried out on a random sample of 28 individuals (10% of the total sample required for validation). The inclusion of this pilot-test sample followed the exact inclusion criteria established previously. In addition to reliability (eligibility criteria are present in the subsection ‘Design and Participants’), the pilot test was also designed to provide feedback on semantics, which occurred uneventfully. Participants completed the SMAQ-12-PT

on two moments, one week apart. Validity and reliability assessments were conducted out between August and September 2022. The validation phase was carried out between September 2022 and February 2023.

VARIABLES

Sociodemographic characteristics were collected from self-reported questionnaire. We collected information regarding age, sex, education level (elementary, high school or higher), marital status (single, married, divorced and widowed) and employment status (employed, unemployed or retired).

Among the participants habits variable, we included smoking habits (categorized as non-smokers, former smokers and active smokers), brushing habits (never, <1 time/day, 1 time/day, 2 times/day, 3 times/day or more), interproximal hygiene in a week (from 0 to 7), last dental visit (<6 months, 6-12 months, >12 months).

Participants periodontal information was retrieved from the Periodontology Department of CDEM.

Periodontal diagnosis was based on a full-mouth protocol that included clinical parameters circumferentially using a CP-12 manual periodontal probe (Hu-Friedy®, Chicago, USA). PPD, CAL, and bleeding on probing (BOP) were recorded at six sites per tooth (mesiobuccal, buccal, distobuccal, mesiolingual, lingual, and distolingual). PPD included the distance from the free gingival margin to the bottom of the pocket and recession (REC) as the distance from the cementoenamel junction (CEJ) to the free gingival margin, and this assessment was given a negative sign if the gingival margin was located coronally to the CEJ. CAL was calculated as the algebraic sum of the REC and PPD measurements for each site. Measurements were rounded to the nearest whole millimeter. Tooth mobility was further assessed according to Lindhe et al. (Lindhe & Nyman, 1977a) (Lindhe & Nyman, 1977b). Furcation involvement (FI) was assessed using a Naber probe (Hamp et al., 1975) and categorized accordingly.

Periodontitis cases were defined according to the AAP/EFP 2018 consensus, where a patient was a periodontitis case if interdental CAL was detected in ≥ 2 mm of non-adjacent teeth, or buccal or oral CAL ≥ 3 mm with pocketing > 3 mm was detected in ≥ 2 teeth (Tonetti et al.,

2018). Each case was then staged and graded each case according to the case definition (Tonetti et al., 2018).

SAMPLE SIZE CALCULATION

We applied the strategy proposed by Terwee et al. (2007), guaranteed a minimum of 5 individuals per questionnaire item, to determine the minimum number of participants required. A total minimum number of 280 subjects to allow stability of the variance/covariance matrix when performing confirmatory factor analysis (CFA). This sample did not include participants from the pilot test group of patients.

STATISTICAL ANALYSES

Reliability of SMAQ-12-PT

Using the R version 1.0.8 (R Studio Team 2018), we examined internal consistency through Cronbach's alpha (α) coefficient using the "ltm" package. An α coefficient of at least 0.70 was defined as acceptable (DeVon et al., 2007). We also assessed the intraclass correlation coefficient (ICC) using the "irr" package, and interpreted as follows: excellent (greater than ≥ 0.9), acceptable (0.80–0.89), weak (0.6–0.79) and inexistent (less than 0.60) (Weir, 2005).

Descriptive Analysis and Construct Validity

Results of each subscale and domain are presented as counts and corresponding percentages (%), means and standard deviations (SD), medians and interquartile ranges (IQR), and minimum and maximum values. The statistical analysis was performed using the R "plyr" package.

CFA was performed using the "lavaan" package to compute the factorial loads and model fit of each subconstruct. Maximum likelihood method was used to compute the model, and differences between models were explored through chi-square (χ^2) and likelihood ratio test. To test the fitness of CFA we used: χ^2/df ratio (good adjustment with values < 2) (Tabachnick &

Fidell, 2007), the root mean squared error of approximation (RMSEA; a good model adjustment considered for values between 0.05 and 0.10%; 90% confidence interval (CI)) (Steiger, 2007), the confirmatory fit index (CFI) (cut-off criterion of ≥ 0.90 indicates a good fit) (Byrne, 2013), goodness-of-fit (GFI) statistics (values of 0.90 or greater indicate well-fitting models) (Shevlin & Miles, 1998) and normed-fit index (NFI) (cut-off criterion of 0.90) (Hu & Bentler, 1999).

Then, we analyzed the sex invariance of the SMAQ-12-PT. To do this we estimated four consecutive models: (1) unconstrained; (2) factor-loading-constrained (Model 1); (3) factor-loading- and structural-covariance-constrained (Model 2); and (4) factor-loading-, structural-covariance- and measurement-residual-constrained (Model 3). We were able to obtain the delta values for CFI delta values (ΔCFI) and chi-square ($\Delta\chi^2$). We defined a cut-off point $\Delta\text{CFI} < 0.01$ as the presence of invariance (Byrne, 2013; Dimitrov, 2010), $\Delta\chi^2 < 0.095$ as invariance between the models (Bollen, 1989; Satorra & Bentler, 2010). In addition, we examined the relationships between the SMAQ-12-PT items using Spearman's rank correlation coefficient (ρ).

The level of statistical significance was set at 5% for all inferential analyses.

III- RESULTS AND DISCUSSION

RELIABILITY

Following a successful inclusion of all estimated participants to test reliability, 17 (60.7%) were females and 11 (39.3%) were males, with similar age intervals (females: 48.9 ± 12.1 vs. males 50.2 ± 5.0 , as mean $\pm$ SD). The median total score of the SMAQ-PT questionnaire was 31 (range 24-39).

The overall internal consistency was 0.90 (95% CI: 0.77; 0.97), while each subscale showed excellent coefficient values for all subscales (Table 1). In addition, ICC analyses showed an overall result of 0.90 (95% CI: 0.79; 0.95) ($p < 0.001$), with all subscales reporting values above 0.85, between 0.87 and 1.00. Nominally, one subscale had excellent reliability (Emotional Management subscale = 1.00), and the remaining had acceptable reliability (Table 1 and supplementary file Table S2).

Table 1. Test–retest reliability using ICC for the SMAQ-12-PT questionnaire.

	Cronbach's α coefficient (95% CI)	p-value*	ICC (95% CI)	p-value*
Sub-scales				
Medical Management	0.94 (0.87; 0.98)	<0.001	0.87 (0.71; 0.94)	<0.001
Role Management	0.91 (0.72; 0.98)	<0.001	0.84 (0.68; 0.92)	<0.001
Emotional Management	0.78 (0.32; 0.92)	<0.001	0.65 (0.36; 0.82)	<0.001
Total score	0.90 (0.77; 0.97)	<0.001	0.90 (0.79; 0.95)	<0.001

Abbreviations: CI - confidence interval; ICC - intraclass correlation coefficient.

* $p < 0.05$ mean statistical significance. The p-values for Cronbach's Coefficient Alpha and Intraclass Correlation Coefficient indicate that a small p-value (e.g., $p < 0.05$) indicates a good internal consistency and good agreement between the measurements, for Cronbach and ICC, respectively.

CHARACTERISTICS OF PARTICIPANTS

Overall, this validation phase involved 293 periodontitis cases, with 13 participants being excluded due to missing information. A total of 280 participants completed the SMAQ-PT questionnaire, with a mean age of 60.6 (SD ± 11.8), ranging from 28 to 85 years, (60.3 ± 10.9 and 60.8 ± 12.6 for females and males, respectively, as mean $\pm$ SD). The group was predominantly composed of male participants (51.8%, $n=145$) (Table 2). Overall, the majority had stage III and IV periodontitis (80.3%), grade B (55.4%) and with generalized extent

(57.1%). Most participants were in a diagnosis stage of treatment, 24.3% were active smokers and 26.4% had never performed interproximal hygiene in the past 7 days.

The highest mean scores of the SMAQ-PT were observed in items 4 and 6 with 3.1 (SD $\pm$ 1.0) and 3.1 (SD $\pm$ 0.8), respectively. Items 5 and 11 had the lowest scores with 1.0 (SD $\pm$ 1.3) and 1.0 (SD $\pm$ 1.1), respectively (Table 3).

Table 2. Sociodemographic data of included participants (n=280).

Variable	Result
Age, mean (SD) [min-max]	60.6 (11.8) [28-85]
Females, % (n)	48.2 (135)
Periodontitis Staging, % (n)	
I	3.6 (10)
II	16.1 (45)
III	33.2 (93)
IV	47.1 (132)
Periodontitis Grading, % (n)	
A	6.4 (18)
B	55.4 (155)
C	38.2 (107)
Periodontitis Extent, % (n)	
Localized	42.9 (120)
Generalized	57.1 (160)
Stage of treatment	
Diagnosis	51.4 (144)
Revaluation	34.3 (96)
Periodontal Maintenance	14.3 (40)
Smoking, % (n)	
Never	39.3 (110)
Former	36.4 (102)
Active	24.3 (68)
Toothbrushing, % (n)	
0	0.4 (1)
1	8.2 (23)
2	61.4 (172)
3 or more	30.0 (84)

Interproximal hygiene on the last 7 days, % (n)	
0 times	26.4 (74)
1-7 times	73.6 (206)

Table 3. Test–retest reliability using ICC for the SMAQ-12-PT questionnaire.

	Mean (SD)	Median (IQR)	min-max
SMAQ-12-PT Total Score	27.5 (6.0)	28 (8)	12-46
Item 1	2.3 (1.4)	3 (2)	0-4
Item 2	3.0 (1.0)	3 (2)	0-4
Item 3	3.0 (1.1)	3 (1)	0-4
Item 4	3.1 (1.0)	3 (1)	0-4
Item 5	1.0 (1.3)	0 (2)	0-4
Item 6	3.1 (0.8)	3 (1)	0-4
Item 7	3.0 (0.9)	3 (2)	1-4
Item 8	2.0 (1.2)	2 (2)	0-4
Item 9	1.5 (1.7)	1 (3)	0-4
Item 10	1.7 (1.3)	2 (3)	0-4
Item 11	1.0 (1.1)	1 (2)	0-4
Item 12	2.8 (1.1)	3 (2)	0-4
<i>SMAQ-12-PT Domain</i>			
Medical Management	12.3 (3.7)	12 (5)	2-20
Role Management	9.6 (2.5)	10 (4)	4-16
Emotional Management	5.5 (2.0)	6 (3)	0-12

SMAQ-12-PT VALIDITY

Factor Validity

The CFA analysis confirmed the structure of the SMAQ (Table 4). The first order model showed an adequate model fit: GFI = 0.947; CFI = 0.853; RMSEA = 0.052 90% CI (0.034–0.070) (Table 4).

Table 4. Model fit indices in the original model and configurational invariance by sex.

Description	χ^2	df	χ^2/df	CFI	GFI	RMSEA (90% CI)	ΔCFI	$\Delta\chi^2$	Δdf
Original model	89.797*	51	1.76	0.853	0.947	0.052 (0.034-0.070)	-	-	-
Measurement invariance across sex									
Unconstrained	170.01*	102	1.67	0.769	0.987	0.069 (0.055-0.091)	-	-	-
Model 1	180.16*	111	1.62	0.765	0.986	0.067 (0.054-0.088)	0.030	10.15	9
Model 2	197.98*	120	1.65	0.735	0.985	0.068 (0.051-0.085)	0.030	17.82	9
Model 3	197.98*	120	1.65	0.735	0.985	0.068 (0.051-0.085)	0.000	0.0	0

χ^2 – chi-square, df – degrees of freedom, CFI - comparative fit index, GFI - Goodness-of-fit index, RMSEA - root mean square error of approximation, Δ – delta.

Psychometric Analysis

The SMAQ-12-PT demonstrated adequate reliability with a Cronbach's α coefficient of 0.90 (95% CI: 0.77-0.97), indicating of an adequate psychometric properties.

Gender Invariance Measurement

According to the multigroup CFA results (Table 4), we did not verify invariance for gender groups based on the comparisons of CFIs, χ^2 and the degrees of freedom across the unconstrained and constrained models examined.

Components correlation

Subsequently, we assessed the correlation between the items of the SMAQ-PT using Spearman's rank correlation coefficient. There was a significantly low number of significant correlations (16.5% of all correlations, 20 out of 121) (Supplementary Table S3). The correlation between the subscales was also performed, confirming significant correlations between 'Medical Management' with 'Role Management' and 'Emotional Management', but 'Role Management' did not correlate with 'Emotional Management' (Table 4).

Table 5. Correlation between SMAQ-12-PT subscales scores.

SMAQ-12-PT subscale	Medical Management	Role Management	Emotional Management
Medical Management	1.00	0.41 ***	0.23 ***
Role Management	-	1.00	0.11
Emotional Management	-	-	1.00

Values are the Spearman's rank correlation coefficient (rho), *** $p < .001$ mean statistical significance.

IV- DISCUSSION

We have successfully cross-culturally adapted and validated the Portuguese version of the 12-item SMAQ, showing an adequate psychometric property on the participants' view to report ability to self-manage periodontitis. Overall, we found adequate internal consistency and reliability. At the subscale level, reliability and validity remain.

As known, periodontitis is a chronic non-communicable disease characterized by the accumulation of dental plaque and the subsequent establishment of an altered oral microbiome (oral dysbiosis), followed by an exacerbated host immune response (Könönen et al., 2019). Despite its microbiological etiology, periodontitis relies heavily on the patient behaviors and habits towards oral hygiene, such as poor oral care and smoking, that can significantly worsen their disease and compromise its management (Kassebaum et al., 2014). To effectively address periodontitis through non-surgical standard therapy, a combination of self-management and professional care is necessary. Self-management entails implementing motivational and behavioral changes to achieve optimal oral hygiene practices (controlling gingival inflammation) and assessing local and systemic modifiable risk factors that may contribute to disease exacerbation (such as active smoking) (Suvan et al., 2020). Whereas professional care involves removing supra- and, mainly, subgingival plaque and calculus, eliminating local retentive factors, which are critical for effective and long-term stable disease management (Sanz et al., 2020). In fact, self-management of periodontitis and patient cooperation are keystone for the ongoing treatment. Less motivated patients tend to accumulate more interdental plaque and have higher gum bleeding, which explains why professional care alone is not sufficient to control the disease (Oruba et al., n.d.).

The development of a validated Portuguese version of the SMAQ-12-PT has several implications for individual and public health. Self-management ability is an important factor in the controlling of chronic diseases such as periodontitis, which requires active involvement of patients in maintaining good oral hygiene practices and adherence to treatment plans (Barker et al., 2018b). The development of a validated Portuguese version of the questionnaire will allow clinicians to better understand the self-management skills of Portuguese-speaking patients with periodontitis, which may lead to more accurate diagnoses, tailored treatment plans and improved patient outcomes.

Improved patient outcomes can have a significant impact on both individual and public health. Patients with better self-management skills are more likely to adhere to treatment plans, comply with medication regimens and adopt healthy lifestyle habits, which can ultimately lead to improved oral and systemic health outcomes (Bodenheimer et al., 2002). In addition, improved patient outcomes can lead to reduced health care costs, reduced health care utilization, and improved quality of life (Bodenheimer et al., 2002).

The development of a validated Portuguese version of the questionnaire may also lead to increased patient satisfaction, which is an important factor in healthcare delivery. Patients who feel understood and supported by their healthcare providers are more likely to be satisfied with their care, which can lead to improved patient-provider communication, better patient engagement in their own care, and increased adherence to treatment plans (Kennedy et al., 2017).

Finally, the cross-cultural adaptation and validation of the Portuguese version of the Self-Management Ability Questionnaire short form for periodontitis has important public health implications. By improving the diagnosis and treatment of periodontitis through the use of a validated Portuguese version of the questionnaire, public health officials can better address this important public health issue, leading to improved oral and systemic health outcomes for the Portuguese-speaking population (Machado et al., 2022).

STRENGTHS AND LIMITATIONS

Concerning the strengths of this study, the translation into Portuguese version of SMAQ-12 was carried out by experts following a rigorous linguistic strategy in order to keep the Portuguese version an equivalent measure to the original English questionnaire, without compromising content validity. The short form may contribute to a high level of interest in its application in the daily clinical practice. In addition, we used the most recent periodontitis case definition, which strengthens the validity of clinical screening or public health surveillance in the future. The mode of questionnaire administration was traditional self-administration method, who reduce the interviewer bias and increases respondents' willingness to disclose sensitive information.

Although all strengths, this study had some important limitation worth discussing. First, the sample was a consecutive pool of patients at the University Dental Clinic, although its location may have contributed to limit the generalizability of our results to the entire Portuguese population. Second, the cross-sectional nature of this study analyzes a number of variables at a given point in time but does not provide any information regarding the influence of time on the variables measured. In the periodontitis scenario, time may be crucial to reveal the efficacy of self-management to maintain periodontal health over a lifetime, even with a reduced periodontium.

V- CONCLUSION

The SMAQ-12-PT showed reliability, internal consistency, and construct validity to measure self-periodontitis patient management skills.

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APPENDIX

Annex 1) Authorization from the Ethics Committee



Comissão de Ética EGAS MONIZ

Processo Interno n.º 1108

Ex.ma Senhora
Vanessa Machado

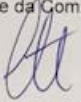
Monte de Caparica, 30 de junho de 2022.

Ex.ma Senhora,

Em resposta ao Pedido de Parecer que submeteu à apreciação da Comissão de Ética da Egas Moniz, com o tema denominado: **"Adaptação transcultural e validação do questionário da capacidade de autogestão em pacientes com periodontite na população portuguesa"**,

APROVADO

A Presidente da Comissão de Ética da Egas Moniz



Professora Doutora Maria Fernanda de Mesquita

EGAS MONIZ – COOPERATIVA DE ENSINO SUPERIOR, CRL
Campus Universitário – Quinta da Granja – Monte de Caparica
2829-511 Caparica

Annex 2) Self Management Ability Questionnaire

30/05/22, 10:53

Self-Management Ability Questionnaire (SMAQ) for chronic periodontitis

Self-Management Ability Questionnaire (SMAQ) for chronic periodontitis

No âmbito da Área Investigação Clínica do Centro de Investigação Interdisciplinar Egas Moniz, solicita-se autorização para a participação no estudo "Adaptação transcultural e validação do questionário de capacidade de autogestão em pacientes com periodontite na população portuguesa". Este questionário demora aproximadamente 10 minutos a concluir.

OBJETIVO DO ESTUDO

O objetivo deste trabalho é realizar a adaptação cultural do questionário originalmente em língua inglesa Self-management Ability for Patient with Chronic Periodontitis (em português, capacidade de autogestão em pacientes com periodontite crónica) para a língua portuguesa na população adulta acompanhada na Clínica Dentária Egas Moniz, Monte da Caparica.

Os comportamentos de saúde são influenciados por múltiplos fatores sociais, ambientais e psicológicos (por exemplo, estado emocional, atitudes e crenças, educação, contexto social, políticas de saúde e acesso a cuidados de saúde) que interagem de forma complexa. Neste sentido, os valores relacionados com a saúde oral e/ou estado de doença oral são percebidos individualmente. Os trabalhos de investigação na área de percepção do indivíduo são escassos em medicina dentária e justificam a tradução e adaptação cultural do questionário de capacidade de autogestão em pacientes com periodontite.

PARTICIPAÇÃO

Sua participação é voluntária. Pode recusar participar ou sair a qualquer momento, sem qualquer inconveniência. Você é livre de se recusar a responder a qualquer pergunta específica que não queira responder por qualquer motivo.

Neste estudo, a população-alvo são indivíduos adultos com idade igual ou superior a 18 anos, com periodontite crónica e que assinem o consentimento informado, livre e esclarecido acompanhados na Clínica Dentária Egas Moniz. A participação consiste no preenchimento de dois questionários: 1) questionário de capacidade de autogestão; e 2) sociodemográfico e hábitos do indivíduo.

BENEFÍCIOS

Você não receberá benefícios diretos por participar neste estudo de investigação. No entanto, as suas respostas podem-nos ajudar a aumentar a sua percepção do estado de saúde periodontal atual.

RISCOS

Não há riscos previsíveis envolvidos na participação, além daqueles encontrados na vida cotidiana.

ÉTICA E CONFIDENCIALIDADE

O estudo mereceu parecer favorável da Comissão de Ética Egas Moniz. Os contactos serão feitos em ambiente de privacidade clínico, ao abrigo do Código Deontológico e de Conduta Ética da Ordem dos Médicos Dentistas.

As respostas desta investigação serão armazenadas eletronicamente numa base de dados de acesso restrito e protegida por password do Google Docs. O Google Docs não recolhe informações de identificação, como nome, endereço de e-mail ou endereço. Portanto, as suas respostas permanecerão anónimas. Ninguém será capaz de identificar a sua identidade e as suas respostas, e ninguém saberá se participou ou não do estudo.

A informação recolhida destina-se unicamente a tratamento estatístico e/ou publicação e será tratada pelos investigadores. A sua recolha é anónima e confidencial.

CONTACTO

Se tiver dúvidas a qualquer momento sobre o estudo ou os procedimentos, pode entrar em contato com a equipa de investigação, por telefone em 212946840 ou por e-mail em vmachado@egasmoniz.edu.pt

Selecione a sua opção abaixo.

Pode imprimir uma cópia deste formulário de consentimento para seu registo.

***Obrigatório**

1. Consentimento Eletrónico *

Por favor, selecione a opção "Concordo" se: Leu as informações acima; Concorda em participar voluntariamente; Tem 18 anos de idade ou mais.

Marcar apenas uma oval.

- ☐ Concordo
☐ Não concordo

Questionário SMAQ-12

Este questionário visa quantificar os determinantes que testem o comportamento dos participantes na capacidade de autogestão da periodontite. Pedimos que leia com atenção e que assinale a resposta a cada item, da forma mais honesta possível. Se não tiver a certeza sobre a resposta a dar, dê-nos a que achar mais apropriada.

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Self-Management Ability Questionnaire (SMAQ) for chronic periodontitis

2. *

Marcar apenas uma oval por linha.

	Muito frequente	Frequente	Às vezes	Raramente	Nunca
Uso escovilhão interdentário/fio dentário para higienizar os meus dentes quando sofro da periodontite.	☐	☐	☐	☐	☐
Escovo os meus dentes/bochecho a minha boca após cada refeição.	☐	☐	☐	☐	☐
Escovo o espaço entre a gengiva e os dentes.	☐	☐	☐	☐	☐
Vou ao dentista seguindo o conselho de um dentista, quando eu sofro da periodontite.	☐	☐	☐	☐	☐
Obtenho informações sobre periodontite através da internet/livros/palestras.	☐	☐	☐	☐	☐
Como alimentos ricos em cálcio e vitamina D, como como peixe e leite.	☐	☐	☐	☐	☐
Lido de imediato com a retenção de alimentos entre os dentes.	☐	☐	☐	☐	☐
Não como alimentos que possam danificar os meus dentes, como nozes, refrigerante e café.	☐	☐	☐	☐	☐
Evito hábitos que possam danificar os dentes, como chuchar no dedo, cerrar os dentes, roer unhas e morder o lápis/caneta.	☐	☐	☐	☐	☐
Quando as minhas gengivas não estão bem e isso tem um impacto negativo em mim, eu partilho com outras pessoas.	☐	☐	☐	☐	☐
Quando as minhas gengivas não estão bem e isso tem um impacto negativo em mim, tento ignorar.	☐	☐	☐	☐	☐
Continuo otimista mesmo sofrendo da periodontite.	☐	☐	☐	☐	☐

<https://docs.google.com/forms/d/15OExDyUuJ3YQfM03lhWdLzvqDQrcIpzU7XIwXTImBuA/edit>

2/5

30/05/22, 10:53

Self-Management Ability Questionnaire (SMAQ) for chronic periodontitis

Características do participante

3. Idade *

4. Sexo *

Marcar apenas uma oval.

☐ Feminino

☐ Masculino

5. Qual é o seu nível de escolaridade (que está concluído)? *

Marcar apenas uma oval.

☐ Não frequentou a escola

☐ 1º ano

☐ 2º ano

☐ 3º ano

☐ 4º ano

☐ 5º ano

☐ 6º ano

☐ 7º ano

☐ 8º ano

☐ 9º ano

☐ 10º ano

☐ 11º ano

☐ 12º ano

☐ Bacharelato

☐ Licenciatura

☐ Mestrado

☐ Doutoramento

6. Nacionalidade *

Marcar apenas uma oval.

☐ Portuguesa

☐ Outro: _____

30/05/22, 10:53

Self-Management Ability Questionnaire (SMAQ) for chronic periodontitis

Hábitos de higiene oral

13. Quantas vezes escova os dentes por dia? *

Marcar apenas uma oval.

- ☐ Não escovo os dentes todos os dias
☐ 1 vez por dia
☐ 2 vezes por dia
☐ 3 ou mais vezes por dia

14. Nos últimos 7 dias, em quantos dias escovou os dentes? *

Marcar apenas uma oval.

0	1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐	☐

15. Nos últimos 7 dias, em quantos dias realizou higiene interproximal (isto é, utilização de fio dentário ou escovilhão) *

Marcar apenas uma oval.

0	1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐	☐

16. A higiene interproximal é realizada em todos os dentes? *

Marcar apenas uma oval.

- ☐ Sim, em todos
☐ Não, apenas em alguns
☐ Não, não faço higiene interproximal

17. Quando foi a última vez que foi ao dentista? *

Marcar apenas uma oval.

- ☐ Há menos de 6 meses
☐ 6 a 12 meses
☐ 1 a 2 anos
☐ Mais do que 2 anos

Este conteúdo não foi criado nem aprovado pelo Google.

Google Formulários

30/05/22, 10:53

Self-Management Ability Questionnaire (SMAQ) for chronic periodontitis

7. Raça *

Marcar apenas uma oval.

- ☐ Caucasiana
☐ Negra
☐ Asiático
☐ Australóide

8. Estado matrimonial *

Marcar apenas uma oval.

- ☐ Solteiro(a)
☐ Casado(a) / União de facto
☐ Divorciado(a)
☐ Viúvo(a)

9. Qual é o seu estado de empregabilidade? *

Marcar apenas uma oval.

- ☐ Estudante
☐ Empregado
☐ Desempregado
☐ Reformado

Hábitos tabágicos

10. É fumador(a)? *

Marcar apenas uma oval.

- ☐ Sim Pular para a pergunta 11
☐ Não Pular para a pergunta 12

Se fuma

11. Quantos cigarros fuma por dia? *

Pular para a pergunta 13

Se não fuma

12. Se não fuma, alguma vez fumou? *

Marcar apenas uma oval.

- ☐ Sim
☐ Não

Pular para a pergunta 13

Supplementary Table 1. Original and Portuguese versions of the SMAQ-12 questionnaire.

Item	Original	Portuguese
1	I use interdental brush/dental floss to clean my teeth when I suffer from chronic periodontitis.	Uso escovilhão interdentário/fio dentário para higienizar os meus dentes quando sofro da periodontite.
2	I brush my teeth/rinse my mouth after every meal.	Escovo os meus dentes/bochecho a minha boca após cada refeição.
3	I brush the space between the gum and the teeth.	Escovo o espaço entre a gengiva e os dentes.
4	I go to the dentist following a dentist's advice, when I suffer from chronic periodontitis.	Vou ao dentista seguindo o conselho de um dentista, quando eu sofro da periodontite.
5	I obtain information about chronic periodontitis through internet/books/lectures.	Obtenho informações sobre periodontite através da internet/livros/palestras.
6	I take calcium- and vitamin D-rich foods, such as dried small shrimp, fish, and milk	Como alimentos ricos em cálcio e vitamina D, como como peixe e leite.
7	I deal with food impaction just in time.	Lido de imediato com a retenção de alimentos entre os dentes.
8	I do not eat food that can damage my teeth, such as betel nut, carbonated drink and coffee	Não como alimentos que possam danificar os meus dentes, como nozes, refrigerante e café.
9	I avoid habits that can damage teeth, such as sucking fingers, clenching teeth, biting nails, and biting pencils.	Evito hábitos que possam danificar os dentes, como chuchar no dedo, cerrar os dentes, roer unhas e morder o lápis/caneta.
10	I share how I feel with others when my periodontal tissue is unwell and triggers a negative emotion.	Quando as minhas gengivas não estão bem e isso tem um impacto negativo em mim, eu partilho com outras pessoas.
11	I divert my attention when my periodontal tissue is unwell and triggers a negative emotion.	Quando as minhas gengivas não estão bem e isso tem um impacto negativo em mim, tento ignorar.
12	I stay optimistic even though I suffer from chronic periodontitis.	Continuo otimista mesmo sofrendo da periodontite.

These twelve items are rated on a response scale: 1 = "Never", 2 = "Rarely", 3 = "Sometimes", 4 = "Often", and 5 = "Very often" (in Portuguese 1= "Nunca"; 2 = "Raramente"; 3 = "Às vezes"; 4 = "Frequente"; 5 = "Muito frequente").

Supplementary Table 2. Test–retest reliability using ICCs for the SMAQ-PT questionnaire.

	Cronbach's α coefficient (95% CI)	ICC (95% CI)	p-value
Item 1	0.93 (0.84; 0.97)	0.87 (0.73; 0.94)	<0.001
Item 2	0.81 (0.62; 0.92)	0.68 (0.42; 0.84)	<0.001
Item 3	0.86 (0.54; 0.96)	0.77 (0.55; 0.89)	<0.001
Item 4	0.93 (0.77; 0.99)	0.87 (0.74; 0.94)	<0.001
Item 5	0.88 (0.73; 0.96)	0.76 (0.50; 0.89)	<0.001
Item 6	0.89 (0.75; 0.96)	0.79 (0.60; 0.90)	<0.001
Item 7	0.96 (0.89; 1.00)	0.93 (0.86; 0.97)	<0.001
Item 8	0.86 (0.66; 0.94)	0.76 (0.55; 0.89)	<0.001
Item 9	0.87 (0.10; 0.97)	0.59 (0.28; 0.79)	<0.001
Item 10	0.91 (0.70; 0.95)	0.78 (0.57; 0.89)	<0.001
Item 11	0.85 (0.54; 0.97)	0.74 (0.59; 0.85)	<0.001
Item 12	0.79 (0.46; 0.96)	0.66 (0.38; 0.83)	<0.001
SMAQ-12	0.90 (0.77; 0.97)	0.90 (0.79; 0.95)	<0.001

CI - confidence interval; ICC - intraclass correlation coefficient.

Supplementary Table 3. Correlation between SMAQ-12 item scores.

Item	1	2	3	4	5	6	7	8	9	10	11	12
1	1.000	0,74 **	0,96 ***	0,82 ***	0,36	0,63 *	0,57	0,2	0,56	0,34	-0,1	0,56
2	-	1.000	0,88 ***	0,83 ***	-0,08	0,73 **	0,83 ***	0,33	0,02	0,08	-0,38	0,62 *
3	-	-	1.000	0,85 ***	0,15	0,74 **	0,71 *	0,18	0,36	0,18	-0,2	0,64 *
4	-	-	-	1.000	0,1	0,67 *	0,58 *	0,1	0,24	0,29	-0,38	0,83 ***
5	-	-	-	-	1.000	-0,06	0,03	0,38	0,79 ***	0,92 ***	-0,08	-0,26
6	-	-	-	-	-	1.000	0,86 ***	-0,02	0,06	0,03	-0,5	0,73 **
7	-	-	-	-	-	-	1.000	0,23	-0,02	0,17	-0,49	0,47
8	-	-	-	-	-	-	-	1.000	0,29	0,42	-0,24	-0,29
9	-	-	-	-	-	-	-	-	1.000	0,66 *	0,13	0,01
10	-	-	-	-	-	-	-	-	-	1.000	-0,3	-0,08
11	-	-	-	-	-	-	-	-	-	-	1.000	-0,24
12	-	-	-	-	-	-	-	-	-	-	-	1.000

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.