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Abstract

The human memory is used to carry out several tasks, with the appearance of diverse factors we sometimes perceive subtle changes in our memory. These changes can result in what are Subjective Memory Complaints, to evaluate these, we use questionnaires that allow us to identify these difficulties, however, for the Portuguese population, we have very few instruments that measure these complaints. This study aims to translate and present preliminary psychometric data of an existing questionnaire for application to the Portuguese population and to explore factors influencing these complaints. This study is comprised of 344 male and female participants, with ages between 18 and 80 years ($M = 36.4$; $SD = 15.9$). Participants completed self-report questionnaires that assessed sociodemographic characteristics, subjective memory complaints, general cognitive function, depressive symptomatology, and trait anxiety. The results indicate that the instrument presents good psychometric properties for the Portuguese population, namely internal consistency, and factorial validity, although the sample presents some limitations. The results also indicate that depression, age, and anxiety are associated with subjective memory complaints. As this instrument was revealed to be adequate for the Portuguese population, (although this is a preliminary study), this constitutes a starting point for new studies and is readily available for application.

Keywords: Subjective memory complaints, EMQ 13-items, psychometric, individual factors

Resumo

A memória humana é utilizada para realizar diversas tarefas, com o aparecimento de diversos fatores às vezes identificamos mudanças na nossa memória. Estas alterações podem resultar no que são Queixas Subjetivas de Memória, para avaliá-las utilizamos questionários que nos permitem identificar estas dificuldades, no entanto, para a população portuguesa, temos muito poucos instrumentos que medem estas queixas. Este estudo tem como objetivo traduzir e apresentar dados psicométricos preliminares, de um questionário existente, para aplicar à população portuguesa e explorar fatores que influenciam estas queixas. Este estudo contou com 344 participantes de ambos os sexos, com idades entre 18 e 80 anos ($M = 36.4$; $DP = 15.9$). Os participantes preencheram questionários de autorrelato que avaliaram características sociodemográficas, queixas subjetivas de memória, função cognitiva geral, sintomatologia depressiva e ansiedade-traço. Os resultados indicam que o instrumento apresenta boas propriedades psicométricas para a população portuguesa, nomeadamente consistência interna e validade fatorial, embora a amostra apresente algumas limitações. Os resultados também indicam que a depressão, a idade e a ansiedade estão associadas às queixas subjetivas de memória. Dado que este instrumento se revelou adequado à população portuguesa (embora se trate de um estudo preliminar), constitui um ponto de partida para novos estudos e está facilmente disponível para aplicação.

Palavras-chave: Queixas de memória subjetiva, EMQ 13-itens, psicométricas, fatores individuais.

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Abbreviations and Acronyms

SMCs Subjective Memory Complaints

EMQ 13-items Everyday Memory Questionnaire 13-items

BDI-II Beck Depression Inventory-II

State-Trait Anxiety Scale STAI-Y2

MoCA Montreal Cognitive Assessment

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Introduction

The present dissertation entitled “Everyday Memory Questionnaire [EMQ 13-Items]: Portuguese Translation and Preliminary Validation.”, was carried out within the scope of the culmination of the 2nd cycle of the master’s degree in clinical and health psychology at the Portucalense Infante D. Henrique University, in Porto. This present study presents positive clinical implications, as it contributes to the future validation and approval of a psychological evaluation instrument for the Portuguese population.

This project looks to validate the Everyday Memory Questionnaire for the Portuguese population, identifying its validity and factorial structure. It also looks to identify the relationship between some factors, that literature identifies as contributing to the appearance of these Subjective Memory Complaints. This dissertation follows the structure of an article with the following four main components: Theoretical framework, method, results, discussion, and conclusion.

Everyday Memory Questionnaire [EMQ 13-Items]: Portuguese Translation and Preliminary Validation.

Being able to identify the earliest signs of cognitive deterioration and the subsequent development of dementia is becoming a pressing matter today, therefore, we must recognise the initial markers of this decline, so we can identify and treat the appearance of these difficulties (Brailean et al., 2019). Identifying these tribulations also leads to a better chance of success when beating dementia, anticipating the severe biochemical and morphological alterations associated with these conditions (Bajo et al., 2010).

Human memory can be severely affected by cognitive deterioration, it is compartmentalised into various types that each have numerous functions (Klein, 2014). The process of memorising is described as the reception of incoming information, which then enters short-term memory where it can be kept by rehearsal and transferred to long-term memory, or in consequence, forgotten (Loftus & Loftus, 2019), it is characterised as an act of registration that determines whether the information is necessary to retrieve (Klein, 2014). To measure this, several instruments are used such as the Weschler Memory Scale (WMS-III; Weschler, 1997) this is one of the examples of instruments readily available for the Portuguese population, it measures the dysfunctions of human memory, premature diagnosis of dementia, degenerative conditions, and other factors (Gonçalves et al., 2017). This instrument currently presents good reliability, with an internal consistency ranging from 0.62 to 0.92, and temporal stability of alpha of Cronbach of 0.80 (Pliskin et al., 2021). However, our objective memory is not always responsible for the perception of the modifications that occur in our memory, sometimes these complaints are not linked directly to neurological alterations but are correlated to several different factors like emotional regulation (e.g., Depression; Anxiety) or others. Due to our metacognitive functioning, we can reflect on our mental processes and identify our emerging difficulties (Mecaccai & Righi, 2006), this perception of these difficulties is known as Subjective Memory Complaints (SMCs), these are more common in the community than objective complaints (Lautenschlager et al., 2005). These memory complaints may not only be identified by the individual but may also be based on self-reports and the perception of others such as family members or friends (Hohman et al., 2011). These may allow us to anticipate that our objective memory and cognition may be deteriorating (Jessen et al., 2014. Gifford and colleagues (2015) coin the SMCs as the perception of subtle memory impairments that interfere directly with day-to-day tasks.

These complaints are described as forgetfulness, increased distractibility, and some difficulty in being mentally alert (Aasvik et al., 2015). Since 2014 this term and the complaints attached to it have been formally recognised by international bodies and are seen as a crucial component of subjective cognitive worsening of the clinical concept (Jesen et al., 2020). SMCs are often observed in the more elderly population and play a crucial role in the diagnosis of clinical cognitive impairments such as mild cognitive impairment (Jacinto et al., 2014). The presence of SMCs has been shown to increase over time meaning that the older population, 10.5%, reports some form of perceived cognitive difficulties, whilst the younger population only 6.3% reports these (Begum et al., 2013). For example, a longitudinal study carried out by Kryscio and investigators (2014) identified that those with SMCs were more likely to develop Mild Cognitive Impairment within 9 years, and another study carried out on the Australian population showed a positive relationship between the severity of memory complaints and the baseline for the development of cognitive impairment after three years of the initial complaint (Sohrabi et al., 2019). This suggests that SMCs could represent the evolution from what is considered “normal aging” into clinical Alzheimer’s (Kim & Lee, 2022).

Nonetheless, chronological age isn’t the only factor responsible for the appearance of these complaints, at present the main reasons for the appearance of these SMCs are still being debated, some authors have identified the presence of poor executive functions as one of the predictors of these complaints (Steinberg et al., 2013). Paradoxically it is important to note that even if SMCs are not present, this does not indicate that there are no memory problems present, these individuals may still have cognitive decline (Roberts et al., 2009). At present, it is still very divided on whether there is a correlation between SMCs and the subsequent development of dementia, while some studies show that these are not directly linked others have found that these are predictive of an adverse cognitive outcome (Glodzik-Sobanska et al., 2007). Peter and colleagues identified this contrariety, some studies present a relationship between SMCs and cognitive decline whilst others identified that these were not directly linked or associated with cognitive measures (Peter et al., 2014). In another review carried out by Mitchell (2008) only 38% of the individuals with Mild Cognitive Impairment presented SMCs, some more recent studies have identified this relationship between SMCs and a worse outcome and result on objective neuropsychological tests, for example, the memory tests that we find in the WAIS-III (Wechsler Adult Intelligence Scale) (Hohman et al, 2011). Alternate reasons for this discrepancy between subjective memory complaints and objective memory difficulties

could be related to limited sample size, demographical information, lack of insight, psychiatric symptoms, or even personality traits (Steinberg et al., 2013).

It is also reported that various factors may influence how we perceive our impairment, such as the way we obtain knowledge of our difficulties (community versus clinical), the structure of the instruments used to measure and identify these difficulties, existing psychiatric symptoms, and our differences and personality traits (Zuroff et al., 2022). One factor is the presence of symptoms of mental disorders, these have been shown to lead to greater cognitive decline, resulting in an increased risk of progression to dementia. Most studies have indicated that individuals with SMCs demonstrate these symptoms (Yin et al., 2021). In both the younger and older generations SMCs have been related to the perception the individual has of his own stress and negative states such as anxiety and depression (Derouesné et al., 1999). Depression and depressive symptoms seem to play a big role in the appearance of the SMCs, an initial study by Zahn et al revealed that individuals with mild dementia who rated highly on the depression scale reported more subjective memory complaints than individuals with severe dementia who were not depressed (1975). Statistics show that 10-15% of the elderly population show signs of mild depressive symptoms, whilst 8-20% present severe depressive symptoms (Kim & Lee, 2022). A study carried out on the Portuguese population showed that older adults with no cognitive or neurological alterations who reported depressive symptoms had more SMCs, this appears to be one of the more important predictors of these complaints (Sousa et al, 2015). Some studies have also shown that the presence of depressive symptoms leads to a distorted subjective appraisal of memory functioning. These complaints occur due to the relationship that these have with depression and since these may reflect an extension of emotional distress, low self-esteem, and a lack of confidence that then contribute to the natural tendency for one to underestimate their memory performance, which may lead to the over-report of these memory failures (Aasvik et al., 2015). Thus, SMCs without objective memory impairment may still manifest depressive symptoms (Balash et al., 2013).

Another factor that seems to influence SMCs is anxiety, when one increases the other also seems to increase, despite there not being a direct link with worse objective memory performance (Dux et al., 2008). The marked presence of these SMCs may be related to these feelings of anxiety, since these, may disturb the memory processes and interfere directly with self-evaluation (Elfgren et al., 2009). In a study carried out in 2007 it was identified that increasing levels of anxiety sensitivity were associated with an

increase in SMC complaints in the absence of objective memory impairments (Dux et al., 2008). Trait anxiety is a stable factor when it comes to the presence of SMCs in the younger population, however, to date there is only one study that identifies a positive relationship between these two variables (Zapater-Fajará et al., 2022).

Differences between sexes have also been reported in the literature, one study carried out in 2013 indicated that in every age group (young to old) most of the complaints were reported by men, though this study has not been able to identify the reason why the male population reported more of these complaints than the female population (Holmen et al, 2013). Another study, in 2015 indicated the opposite, meaning that females reported a higher presence and appearance of these complaints. However, these results have been credited to sampling differences due to the small difference between both sexes (Hulur et al., 2015). Literature and the most recent studies are very divided on whether this variable is truly predictive of these complaints, attributing a higher importance to other factors mentioned above.

Education level is also a factor that has been identified as directly impacting SMCs, this is because the higher the education level the more often a complaint will be registered. A recent study of the Portuguese population identified that education directly impacts the frequency with which types of memory complaints are reported. When one possesses a higher education level, they usually resort to the use of different types of memory auxiliaries to avoid forgetting things and to help fortify their memory (João et al., 2015). These physical reminders and auxiliaries seem to be the strategies adopted by individuals with more demanding professional activities and obligations, which usually result from a higher education level (João et al., 2015). Hülür and colleagues argued that individuals with higher education have more experience in cognitive comparisons which leads to a more accurate self-evaluation of these memory difficulties (2015).

All these discrepancies that have surged about whether SMCs do predict cognitive decline in older age may be connected to the methods we currently use to assess these difficulties, such as the standard memory tests, some of these may not be sensitive enough to identify these subtle memory difficulties that appear hand in hand with the first SMCs (Abdulrab & Heun, 2008). One of the other ways to obtain more robust information about these complaints is by gathering additional information from external sources or patient's clinical records (Zuroff et al., 2022). The most frequent way to quantify these complaints is by using memory questionnaires, these tend to provide a few examples of the day-to-day memory difficulties that may arise, and participants are asked to rate how often these

occur (Burmester et al., 2015). Factor-analytic work developed using these questionnaires has assisted in mapping the dimensions of metamemory, allowing us to obtain a measure of the individual's perception of their memory difficulties as evaluated by them using questions that describe a prototypical memory situation (Herrmann, 1982). The Everyday Memory Questionnaire 13-items (EMQ 13-items) is one of the most recently validated instruments with excellent psychometric properties to measure SMCs, it was developed by Sunderland and colleagues (1983) originally with three main versions; it was intended to investigate the effects of closed-head injury though it is also readily prepared to be applied to use with normative individuals (Cornish, 2000). Through interviews with individuals with traumatic brain injuries and caregivers, the EMQ was developed (Sander et al., 2018). The original questionnaire consisted of 35 items, each with the importance of describing a particular memory failure (Sunderland et al., 1983), a year later, reducing it to 22 original items and adding six new ones (Sunderland et al., 1984). The EMQ had been previously applied to the following clinical samples: survivors of head trauma; the elderly; patients with Alzheimer's disease; stroke survivors; multiple sclerosis and epilepsy (Royle & Lincoln, 2008), but is currently applied most frequently in the elderly population due to the high demand for identifying these complaints in populations with a higher risk of developing mild cognitive impairment (Calabria et al., 2011). In 2008, Royle and Lincoln conducted a factor analysis to determine the validity and psychometric properties of the EMQ, after this they were able to reduce the questionnaire to 13 questions with a four-point scale. The revised version allows us to distinguish between three factors, the first being identified as retrieval, the second factor attentional tracking, and lastly a remaining third factor that has not been labeled and identified (Aasvik et al., 2015). The factor 'retrieval' indicates problems with being able to recall information for long-term memory, and the second factor 'attentional tracking' is related to problems with attention and working memory (Stančić et al., 2018). Currently, reliability tests have shown that the EMQ 13-items has strong internal reliability, with an alpha of Cronbach ranging from 0.82 and 0.86 (Evans et al., 2019). With a positive review and strong reliability, this was the instrument we chose to translate and validate for the Portuguese population, as currently, the existing ones present some structural flaws and reliability issues. Currently, a very limited number of instruments for the Portuguese population measure this variable, one of these is the *Escala de Queixas de Memória*, this questionnaire was created by Schmand and colleagues (1996) and later adapted and translated for the Portuguese population by Ginó et al. (2007). This scale presents 10

items, a total of 21 points, with a latitude of the scale ranging from zero to three. This instrument presented an alpha of Cronbach of 0.83, this value is not extremely elevated, in another study by Vale, Balieito-Jr, and Silva-Filho (2012) the alpha of Cronbach was slightly more elevated. The instrument chosen for this investigation has a higher alpha making it more reliable and valid for application. Another reason is the need for a new instrument for this measure, as the ones currently available show some structural flaws, either being too short or long or too broad in measuring these complaints.

Objectives

The main and general objective of this thesis is to translate and present the preliminary psychometric data of the EMQ 13-items for the Portuguese population, looking to in the future apply this instrument in both general and clinical settings, thus way combating the shortage of instruments that measure SMCs for this population. We looked to analyse the validity and factorial structure of this same instrument.

As for the more specific objectives the first one is to pinpoint what factors are associated with the appearance of these SMCs such as sociodemographic variables, age, sex, and education, and the possible association between depressive and anxiety symptoms. For this first specific objective literature currently points to a correlation between the rise of SMCs, when there is the presence of depressive or anxiety symptoms, one recent study has shown a close association between subclinical depression and anxiety and that these complaints are progressively more common among those with lower psychometric properties (Balash et al., 2013), it is expected that in our sample those individuals that score higher on the Beck Depression Scale (BDI-II) and the State and Trait Anxiety Scale (STAI-Y2) will also score higher on the EMQ 13-items, resulting in a positive correlation between these two factors. The second specific objective with the presence of a sub-sample is to observe the relationship that SMCs may have with objective memory. This is discussed widely by the scientific community and is currently very contradictory in the evidence presented, some studies have found a positive relationship between subjective and objective memory complaints suggesting that these could be important indicators of further cognitive decline. Others have not found any evidence of this association (Basset & Folstein, 1993; Jonker et al., 2000). Therefore, we hope to determine if there is a relationship between subjective memory complaints and impairment of objective memory, we will be able to measure these difficulties by

applying several different tasks that measure several different executive functions such as memory.

Method

Sample

The final sample was composed of a total of 344 participants all these met the following inclusion criteria were the following: (1) age 18 and over; (2) no acute or serious medical conditions; minimum education required (Year 4). Of the 344 participants 79.7% were collected via an online format and the remaining 20.3% were collected in a in-person format. Some participants were removed because they did not meet the criteria mentioned below of being older than 18 ($n = 5$), not being Portuguese ($n = 11$), and not having completed all the tasks required ($n = 2$). Table 1 presents the sociodemographic characterisation of the sample.

Table 1.
Sociodemographic characterisation of the sample.

	<i>N</i>	Percentage
<i>Sex</i>		
Male	103	29.9%
Female	241	70.1%
<i>Age Groups</i>		
18-22	108	31.4%
23-33	66	19.2%
34-49	88	25.6%
50 \geq	82	23.8%
<i>Education Level</i>		
1st cycle of Basic Education	18	5.2%
2 nd cycle of Basic Education	27	7.8%
3 rd cycle of Basic Education	19	5.5%
Secondary Education	64	18.6%
Higher Education	58	16.9%
<i>Perception of Memory Difficulties</i>		
Yes	72	38.7%
No	114	61.3%

The sex distribution reflects a higher prevalence of the female sex with 70.1% ($n = 241$) and the remaining 29.9% being male ($n = 103$). The age ranges from 18 to the oldest being 80, the age group with the highest frequency with 31.4% was up to 22 years old ($n = 108$) the second most frequent age group was 34-49 composing 25.6% of the sample ($n = 88$). The third age group was composed of individuals 50 or more years 23.8% ($n = 82$) and the final group made up the smallest percentage 19.2% (23-33 years old). As for the level of education, the sample presents as the predominant level of secondary education making up 18.6% of the population ($n = 64$), the second most dominant being higher education with 16.9% of the population ($n = 58$), the third most common education level in our sample was the 2nd cycle of basic education composing 7.8% of the sample ($n = 27$). The 1st cycle makes up 5.2% ($n = 18$) and the 3rd cycle of basic makes up 5.5% of the sample ($n = 19$). As for the perception of memory difficulties, our sample presents a higher number of participants who report no memory difficulties, 33.2% ($n = 115$). The remaining 21.1% identify subjective memory difficulties ($n = 73$).

Instruments

The first instrument applied was a questionnaire to obtain socio-demographic information (e.g., age, sex, relationship status, etc.). We then applied four other instruments to measure different variables.

- a) Translated version of the *Everyday Memory Questionnaire-Revised* (Royle & Lincoln, 2007; adapted by Ribeiro et al., 2023). It is composed of 13 items, with a Likert-type scale ranging from “once or less in the last month” (1) to “once or more once per day” (5). The English revised version presents an alpha of Cronbach of 0.91 demonstrating excellent internal consistency (Royle & Lincoln, 2007). Reliability analyses indicate strong internal reliability and a good correlation between each item and the item’s total (Royle & Lincoln, 2008).
- b) Beck Depression Inventory-II (BDI-II) (original version: Beck et al., 1996; Portuguese version Campos & Goncalves, 2011). It contains 21 items, with a scale ranging from zero to three points, zero being the absence of symptoms and three being the presence of strong symptomatology. An alpha of Cronbach of 0.91 reveals an excellent internal consistency for the Portuguese adaptation. The BDI-II is a good index of the severity of depressive symptomatology. This instrument contains a two-factor structure the first being the Cognitive-affective and the second being somatic symptomatology (Campos & Gonçalves, 2011).

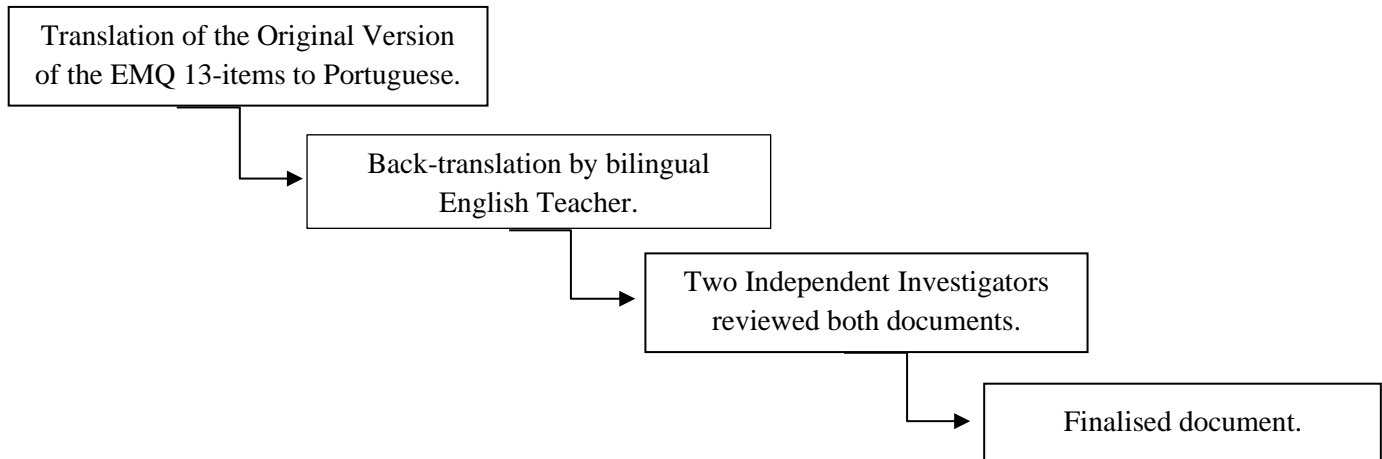
- c) State-Trait Anxiety Inventory (STAI-Y2) (Spielberger et al., 1983; Portuguese version Silva, 2003) was an instrument developed to measure an individual's tendency to experience anxiety. This instrument is divided into two types of measures, the first one being trait anxiety where we measure the individual's tendency to appraise situations as threatening (Elwood et al., 2012). State anxiety is a transitory emotion characterised by physiological arousal and feelings of apprehension, dread, and tension (Spielberg, 1966). We will be using the trait anxiety scale to measure the day-to-day presence of anxiety. This instrument consists of 20 items each. It contains a Likert-type scale from one to four, this one being the highest score. The Portuguese validation presents good psychometric properties (Silva, 2003).
- d) A subgroup of the population was screened with an objective memory task to then analyse a correlation between objective memory and the subjective memory complaints registered on the Everyday Memory Questionnaire. The instrument selected for this purpose is the Montreal Cognitive Assessment (MoCA). This instrument looks to measure the following factors: memory, language, orientation, attention, executive functions, and visuospatial skills. The translation, adaptation, and validation of the MoCA for the Portuguese population was carried out by Freitas and colleagues (2010). This instrument for the Portuguese population presented an overall alpha of Cronbach of 0.90 confirming good psychometric properties (Freitas et al., 2011).

Procedure

The first step of this investigation was to research, review the literature, and identify the instrument with the best psychometric properties to be translated for the Portuguese population. After this initial step, we began the translation of the original version of the EMQ 13-items (Royle & Lincoln, 2008) into Portuguese, this task was carried out by an investigator. A bilingual English teacher was then brought in to back-translate, this way we were able to identify the validity and correctness of our initial translation. Two independent investigators then proceeded to observe the translated version to identify whether any translations did not correspond with the original version by Royle and Lincoln (2008). After the review of the translated version, we proceeded with the presence of psychologists to finalise the document and its final structure. Figure 1 identifies the steps taken to translate and validate the EMQ 13-items.

Figure 1.

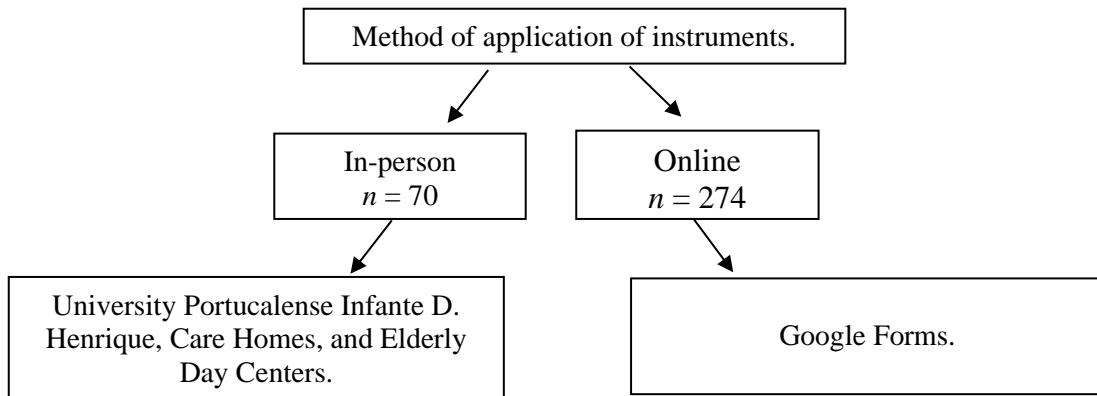
Steps were taken to translate the original EMQ 13-items to Portuguese.



We then applied this final version of the EMQ 13-items to a small group of participants ($n = 85$) using the Google Forms platform. After this first pilot study phase, and having reviewed how the first application occurred, and not having any difficulties, we were prepared to collect the final data (these first participants were kept in the final sample). Before the final application of the instruments, it was necessary to identify for logistical reasons what modality of application would be used to retrieve data. The methodology of data collection used was a non-probabilistic snowball sample, this is due to the necessity of a wide range of ages, it was important to combat the difficulties that some of the ages would face in completing the instruments but also reaching all the age gaps. To face these difficulties, it was decided that both the physical and the online modalities would be used. Figure 2 describes the method used, the number of participants exposed to what application, and finally where and how data was collected.

Figure 2.

Method of application of psychological instruments.



Both the participants collected online and those in person saw their confidentiality respected and guaranteed. Before the application of any instrument, they were asked to sign a consent form (in-person) or tick the box that corresponds with their willingness to participate (online). The application of the physical instruments was carried out in various environments such as at the University Portucalense Infante D. Henrique, care homes, and day centres, each participant was given 30 to 45 minutes to conclude the tasks. The data that was collected face-to-face at the University Portucalense Infante D. Henrique was comprised of the following questionnaires: Sociodemographic Questionnaire, STAI-Y2, BDI-II, and EMQ 13-items. As for the data collected at care homes and day centres, these were subjected to the same questionnaires as the previous group but were also handed an objective memory task by the MoCA. This group was the only one subjected to this objective memory task due to the age range and the possible correlation between age-caused cognitive decline and SMCs. The in-person data collection occurred on four separate occasions having visited the care home and day centre on 3 different occasions and the university students on one separate occasion. The various physical questionnaire applications were balanced to control possible effects on the variables such as ordering effects.

With the use of the online platform Google Forms, the questionnaires were created and then launched on several social media platforms such as Facebook and Instagram. The online participants completed the following questionnaires: Sociodemographic Questionnaire, STAI-Y2, BDI-II, and EMQ 13-items. The expected duration of response was 15 to 20 minutes for each participant. Some of the online participants ($n = 158$) were

only subjected to the application of the Sociodemographic Questionnaire and the EMQ 13-items, these results were obtained via a third party, solely due to the difficulty of gathering a higher number of results individually.

Statistical Analysis

In this investigation we used descriptive and inferential analyses, we looked to measure, internal consistency and ran an exploratory factor analysis. We also ran a Multiple Regression to identify what factors are correlated directly with the appearance of SMCs. The fourth analysis was a Test-T for independent measures to pinpoint if there is or is not a relationship between sex and a higher prevalence of SMCs. We also ran an exploratory association (Pearson Correlations) to identify the possible relationship between objective memory and subjective complaints. Lastly, to identify if there was a difference between the level of complaints concerning education level, we conducted a one-way ANOVA. All the statistical analyses were run using the computer program Statistical Package for the Social Sciences (IBM SPSS version 27).

Results

Psychometric Properties

¹A preliminary analysis of item properties was conducted using the total sample included in the study. Scores vary between 0 (min) and 4 (max) points for most items, with higher average scores being obtained for item one ‘having to check whether you have done something that you should have done’ The item-total correlations were mostly positive and greater than 0.40. Based on these results, the analysis of the construct validity of the measure was conducted with the 13 items. Table 2 illustrates the descriptive statistics of the EMQ 13-items.

Table 2.

Descriptive properties of the EMQ 13-Items.

¹ Preliminary data from this study was presented at an international congress (Ribeiro, B., Rodrigues, P. F. S., & Fernandes, S. M. (2023, May 25-27). Everyday Memory Questionnaire [13-Items]: Pilot Study for Portuguese Population [Poster Presentation]. 3rd Health & Well-Being Intervention International Congress, Viseu, Portugal. Repositório Institucional UPT. <http://hdl.handle.net/11328/5043>)

Item	Item Description	Min	Max	M	SD	Corrected Item-total correlation	Cronbach's alfa is the item is deleted
1	Having to check whether you have done something that you should have done.	0	4	1,83	1,38	0,575	0,919
2	Forgetting when it was that something happened; for example, whether it was yesterday or last week.	0	4	1,40	1,25	0,683	0,914
3	Forgetting that you were told something yesterday or a few days ago, and maybe having to be reminded about it	0	4	1,21	1,18	0,703	0,914
4	Starting to read something (a book or an article in a newspaper, or a magazine) without realizing you have already read it before.	0	4	0,66	1,10	0,440	0,923
5	Finding that a word is 'on the tip of your tongue'. You know what it is but cannot quite find it.	0	4	1,49	1,25	0,658	0,915
6	Completely forgetting to do things you said you would do, and things you planned to do.	0	4	1,14	1,21	0,741	0,912
7	Forgetting important details of what you did or what happened to you the day before.	0	4	0,97	1,13	0,741	0,912
8	When talking to someone, forgetting what you have just said. Maybe saying 'what was I talking about?'	0	4	1,25	1,26	0,712	0,913
9	When reading a newspaper or magazine, being unable to follow the thread of a story; losing track of what it is about.	0	4	0,91	1,17	0,662	0,915
10	Forgetting to tell somebody something important, perhaps forgetting to pass on a message or remind someone of something.	0	4	1,03	1,11	0,710	0,914
11	Getting the details of what someone was told you mixed up and confused.	0	4	1,04	1,19	0,610	0,917
12	Forgetting where things are normally kept or looking for them in the wrong place.	0	4	1,46	1,34	0,677	0,915
13	Repeating to someone what you have just told them or asking someone the same question twice.	0	4	1,03	1,17	0,678	0,915

This allows us to proceed with further analysis of our data. The factorial structure of this questionnaire was determined by a principal component analysis with the resource of orthogonal rotation (Varimax). We proceeded to run the KMO test to identify if it was possible to run further analysis. We obtained an amount superior to 0.50 ($KMO = .93$)

and Bartlett's sphericity test [$\chi^2 (78) = 2417.436, p \leq .001$]. We obtained a two-factor structure that combined explained 60.3% of the total variance. As reported schematically in Table 3 the first component identified presented an eigenvalue of 6.78 which explains 67.8% of the total variance This component is made up of 8 items (Q1, Q2, Q3, Q5, Q6, Q8, Q11, and Q12), with values ranging from 0.58 (Q11) to 0.79 (Q2). This first factor we propose to be named 'Retrieval', identical to what Royle and Lincoln proposed in their study, this is because the factors that were indicated in the analysis all concern retrieving words, actions, and events (Lincoln & Royle, 2008). The second component was identified, with an eigenvalue of 1.06 which explains 10.6% of the variance. This second component is made up of 5 items (Q4, Q7, Q9, Q10, Q13) with values ranging from 0.59 (Q13) to 0.82 (Q4) This second component we propose the same name as the original study 'Attentional tracking' this is because all the items that our analysis identified are related with the use of working memory or losing track of conversations or when reading (Royle & Lincoln, 2008). We identified an α of Cronbach of 0.92 for this Factorial Exploratory Analysis.

Table 3.

Factorial structure of EMQ 13-items Portuguese Translation.

Items	Components		H2
	1	2	
Q1	.76		.58
Q2	.79		.66
Q3	.66		.58
Q4		.82	.68
Q5	.64		.53
Q6	.75		.67
Q7		.67	.69
Q8	.67		.60
Q9		.73	.66
Q10		.60	.62
Q11	.58		.46
Q12	.67		.55
Q13		.59	.57
Eigenvalue	6.78	1.06	

% explained variance	67.80%	10.60%
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Table 4.

Descriptive frequencies of variables sex, education, and age group.

	Retrieval (M; SD)	Attentional Tracking (M; SD)
<i>Total samples</i>	346	346
<i>Sex</i>		
Male	11; 7.29	4; 4.44
Female	10; 7.72	3; 4.42
<i>Education</i>		
1 st cycle	15; 5.01	10; 3.63
2 nd cycle	14; 7.44	7; 5.11
3 rd cycle	6; 7.88	3; 5.21
Secondary education	9; 7.88	3; 4.33
Higher education	11; 7.75	4; 4.01
<i>Age</i>		
[18-49]	10; 7.55	3; 4.29
[50-80]	12; 7.69	4; 4.87

Individual Variables associated with SMCs.

To identify what factors, result in a higher or lower presence of these complaints we ran several different analyses. One of these is a multiple regression analysis with a stepwise method to predict the subjective memory complaints resorting to the variables age, and score on STAI-Y2 and BDI-II. Through this analysis, we were able to identify that all three variables are statistically significant predictors of subjective memory complaints, contributing to the explanation of $F(3,18) = 33,361$ $p < .001$. The variable that contributes the most to this prediction is the total obtained on the BDI-II ($\beta = .469$, $p \leq .001$). According to these results, a higher score on the depression scale (BDI-II) results in a higher appearance of subjective memory complaints, this is corroborated by what the literature currently indicates. The second variable that contributes most is age this

contributes ($\beta = .138, p = .026$). This indicates that the older the participant the higher the presence of SMCs. The third and last variable is the total obtained on STAI-Y2 which contributes ($\beta = .126, p = -.133$) The results obtained on the STAI-Y2, show a negative correlation with subjective memory complaints. Therefore, for our sample, we cannot identify that anxiety leads to a higher or lower presence of SMCs.

To further analyse if age was a concerning factor for the appearance of these SMCs and if there was a higher prevalence of complaints in the older population of our sample we ran a Test-T for independent measures. We were able to identify that there were no statistical differences between the younger ($n = 262$; 18-49 years) and the older participants ($n = 82$; ≥ 50), $t(130) = -1,439, p = .151$. The averages obtained by both age groups were very similar and close in value, with the younger participants (18-49) presenting an average of 14.93 ($SD = 11.18$), as for the older group (≥ 50) an average of 16.99 ($SD = 11.74$).

Biological sex has also been viewed in some studies as playing a role in the frequency at which these complaints appear. To analyse if there was a difference in sex as some of the literature claims we ran a T-test for independent measures. We were able to conclude that there were not any statistical differences between the female and male sexes, $t(204) = 1.30, p = .195$. The average obtained by our questionnaire was revealed to be very similar for both sexes, with the male sex presenting a median of 16.63 ($SD = 10.82$), and for the female sex was 14.95 ($SD = 11.51$).

The level of education an individual possesses is another one of the factors that literature identifies that may contribute to a higher appearance of these complaints. Therefore, to identify this possible relationship we conducted a one-way ANOVA to compare the several different education levels (Basic Education, Secondary, and Higher Education) and the score on the EMQ 13-items. There was a significant effect of the level of education on the score of the EMQ 13-items [$F(4,183) = 47.79, p \leq .001$]. Specifically, multiple comparisons using post-hoc Tukey tests revealed statistically significant differences between all levels ($p < .003$), except for the 2nd cycle and 3rd cycle ($p = .326$), or between secondary education and superior education ($p = .316$).

Subjective Memory complaints and objective measures.

The last analysis ran was to identify the exploratory association between MoCA and the Everyday Memory Questionnaire-Revised, through a Pearson Correlation, we identified that there was a statistically significant negative correlation ($r = -.75, p = .002$),

which indicates that individuals with a higher score on the MoCA, (which corresponds to a higher cognitive function), present less subjective memory complaints. We ran further analysis to identify the association between the different cognitive domains of the MoCA and the EMQ 13-items. In the following domains, we identified statistically significant negative correlations: Visuospatial ($r = -.59, p = .024$), Naming ($r = -.61, p = .021$), Attention ($r = -.66, p = .010$), Abstraction ($r = -.68, p = .007$), Delayed Recall ($r = -.57, p = .035$), and Orientation ($r = -.68, p = .008$). This indicates that individuals with higher scores in these domains present fewer SMCs. As for the Language domain, this was not statistically significant ($r = -.40, p = .154$), indicating that our results do not identify a relationship between the score on this domain and the number of SMCs.

Discussion

The main aim of the study was to translate the EMQ 13-items and apply this to the Portuguese population to obtain the psychometric properties for the application, fighting the shortage of instruments that our population currently has available for this diagnosis. The psychometric properties were explored using a non-probabilistic snowball sample of participants. The factor analysis that was run obtained a two-factor structure without the removal of any item, the first factor we named 'Retrieval' and the second 'Attentional Tracking'. This formula resulted in a high value, which further indicates that the instrument is a good and reliable measure for SMCs and presents higher validity than the instruments that are currently available. The 13-items version originally identified by Lincoln and Royle indicated a three-factor structure (2008) our results identify only two factors, however, a more recent study carried out by Evans and colleagues also identified a similar two-factor structure (2019). The difference between our results and the original analysis of the structure could be due to methodological limitations. These may be related to the difference in the size of the sample, the characteristics of the population, and the way the sample was obtained (online or face-to-face). This structure could also be due to the pathological and healthy samples that the original investigation presents, our study only presents a healthy sample of individuals meaning that the results may have been influenced, as the original questionnaire was created focused on a clinical sample.

The second aim of this study was to verify what factors are associated with SMCs. Therefore, we ran a multiple regression to identify the possible correlation between the dependent variable subjective memory complaints and the independent variable age, with

results on the BDI-II and STAI-Y2. It was possible to identify that there is a positive relationship between these complaints and the presence of depressive symptoms proving our original hypothesis, this follows the pattern that current literature indicates, a recent study carried out in 2018, identifies that the presence of SMCs was still reported in patients with depressive symptoms despite age, cognitive ability, and sex (Schweizer et al., 2018). Another study carried out on the Portuguese population indicates the same existing relationship that we identified in our results. This relationship is that more subjective memory complaints were identified in participants with depressive symptoms than those without (Sousa et al., 2015). As for the variable age, the results indicate that the higher the age the more likely the presence of SMCs; this follows what current literature indicates, that with the appearance of cognitive decline normative to aging it is expected that these complaints may lead to the prediction of dementia in two years (Brigola et al., 2015). This does not rule out the effect that psychological characteristics may have on individuals. The results obtained on STAI-Y2 when compared to the results of the EMQ 13-items identified that the presence of anxiety-based symptoms shows no positive correlation between these two measures. This means that it was not possible to say that the higher the presence of the symptoms the more subjective memory complaints. This follows the current trend in literature as it is currently still very divided on whether there is a relationship between these two variables. One study carried out in 2022 indicates that there is a positive relationship that higher trait anxiety, at any age, was related to more SMCs (Zapater-Fajari et al., 2022). However, our result may be due to a lack of participants with a clinical diagnosis of anxiety or the presence of a high score on this scale. To combat this limitation in future investigations a clinical group, with the diagnosis of anxiety, could be created to measure if there is a relationship between the higher the anxiety the higher the SMCs. As for the role of sex in the appearance of these complaints, our study showed this was not a variable that presented differences. This means that neither the male nor the female sex seems to be predisposed to a higher number of these complaints. As mentioned in the literature review some studies currently published identified both hypotheses, some say that sex plays a role in the appearance of these complaints whilst some say there isn't a direct association. A literature review carried out in 2017 identified that studies with the variable sex were inconclusive, however when the same investigators carried out their investigation, they identified that the female sex did present a higher percentage of subjective memory complaints (Carrasco et al., 2017). Another study carried out by Crumley, and colleagues reported

the same result identifying that the female population does present a higher presence of these complaints (Crumley et al., 2014). Our results showed no difference between sexes this could be directly affected by the unbalanced number of individuals in both groups, in a future study a more balanced sample could reveal a different result. Another reason for this result could be linked to the small effect that this variable has on the appearance of these complaints. One of the other factors that the literature identifies as having a possible impact on the number of complaints is the level of education that individuals possess. As this variable is one of our inclusion criteria, we explored whether the level of education predicts the number of SMCs. The results obtained identified that education level does indeed predict the appearance of these complaints, this allows us to infer that the higher the education level the more memory complaints individuals display. Our findings support what the literature currently identifies, a recent study identified that subjective complaints are correlated with those who show a lower education level, but also are at their highest the more education an individual possesses this seems to be related to a greater level of self-awareness of changes to their memory (Röhr et al., 2020)

As for the relationship between objective memory and subjective complaints, our study revealed a negative correlation, meaning that a higher score on the MoCA does not mean that there is a higher score on the EMQ 13-items. Further analysis of each domain measured on the MoCA identified that the scores on the Visuospatial, Naming, Attention, Abstraction, Delayed Recall, and Orientation were all statistically significant negative correlations. This means that individuals with higher scores on these present fewer SMCs. The only domain that was not significantly statistical was Language, therefore, we cannot identify a relationship between this and SMCs. More recent studies have identified a wide variation of hypotheses connected to this correlation, some identifying that there is a positive relationship whilst others have yet to confirm this relationship. However, there is a higher prevalence of studies that identify a positive correlation. A study by Brailean and colleagues identifies that SMCs accompany objective memory difficulties, they also pinpoint the importance these complaints have in anticipating the appearance of neurodegenerative diseases (Brailean et al., 2019). Our results agree with what most current literature indicates, that the higher cognitive functioning the fewer SMCs presented, however, due to a small sample size it was not possible to fully explore this result on a wider number of participants.

This study like any other study presented some limitations that may have affected some of the results. The main difficulty was the sample size, to proceed in validating this instrument for the Portuguese population a larger sample size would help in obtaining data that would allow the generalisation of the questionnaire for the population. We must acknowledge the young average age of our sample, with an average age between 18 and 49, these complaints can appear at any age, nevertheless, they appear with a higher frequency in the elderly population. For future studies, a higher number of participants aged over 50 would help investigate these results even further. We must also acknowledge the small sample of those who performed the Montreal Cognitive Assessment (MoCA), we were also not able to fully explore the relationship between objective and subjective memory and whether this is one of the variables that contribute the highest to the appearance of these complaints and vice versa. A future study with a more representative population and a higher number of elderly participants will allow us to carry out a new factorial analysis on half the sample and a Confirmatory factor analysis on the remaining.

In conclusion, this study allowed us to begin the process of validation of an instrument that we can apply to track complaints in the general population, however, there must be a greater investment in research into the use of this instrument in clinical populations.

Conclusion

The present study explores the validity and factorial structure of the EMQ 13-items and examines some factors that are related to subjective memory complaints measured by this same questionnaire. The results obtained in this present investigation indicate that the Portuguese version of the instrument presents was positively translated and presents good psychometric properties, although this is an exploratory study. We were able to identify that the higher presence of depressive symptomatology is associated with more subjective memory complaints. Concerning other factors such as anxiety, age, sex, and education level, our results show negative correlations, this could be due to an unbalanced sample in terms of age since our sample has a heavier population of young adults. As for the relationship between objective and subjective memory, our results revealed a negative correlation, however only a small sample of individuals were exposed to the MoCA, so we cannot infer the full relationship between these variables. The results of this study allow for future publication and application of this self-report instrument to identify these complaints and possibly anticipate the appearance of neurodegenerative diseases.

Regarding personal experience on the completion of this dissertation, it allowed for growth permitting more understanding of subjective memory complaints and all the factors related to the appearance of these complaints, it also allowed for more understanding of the process of validating an instrument. The biggest limitation of this study is related directly to the size of our sample, the difficulty of gathering participants, and the characteristics of some of the population, the effects expected in some of our analyses could have been compromised. Therefore, a bigger sample would result in a bigger effect size becoming more representative of the general population.

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