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Symptomatology of Depression and Anxiety After Ischemic Stroke in Different Evolution Periods

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Abstract

Background: Several studies suggest a high prevalence of symptoms of depression and anxiety after stroke. However, the prevalence and severity of this symptomatology may vary according to the period after a stroke in which the patient is assessed.
Goals: This study aims to compare the depressive and anxious symptoms of a population of patients who suffered from ischemic stroke and who are in different evolution periods after stroke.
Methods: This is an observational cross-sectional study. Participants were all individuals with ischemic stroke, without previous history of psychiatric disease nor pathologies involving Central Nervous System compromise or cognitive deficits, recruited from hospitals or from support units of the Rede Regional de Cuidados Continuados Integrados of the Região Autónoma da Madeira, Portugal. Participants were divided into four groups according to the post- stroke evolution period: short duration (0 to 3 months after the stroke), medium duration (4 to 12 months), chronic period I (13 to 24 months) and chronic period II (more than 24 months after the stroke). Data were collected by a psychologist, with the Beck Depression Inventory (BDI-II) and the State-Trait Anxiety Inventory, Form Y (STAI-Y), in individual self-report sessions.
Results: The study included 42 patients with ischemic stroke, 52.4% males, aged 55-88 years. The different post-stroke evolution period groups do not differ in age, sex, level of education, hemispheric location of the lesion or cognitive functioning. The results showed that the prevalence of depression is higher in the chronic group II; regarding the prevalence of anxiety, no significant differences were found between the four groups. As for the severity of symptoms of depression, it is also significantly higher in the chronic group II. With regard to anxiety, trait and state anxiety levels are higher in the medium duration group compared to participants in the short duration period. It was also observed higher levels of state anxiety in the medium duration group compared to the chronic group I.
Discussion: These results suggest the need to identify early emotional changes inherent to this population. These changes can have a major impact on the assessment, follow-up and neuropsychological rehabilitation of patients, so that their early identification will allow a more adequate intervention.

Keywords: Ischemic stroke; Depression; Anxiety; Emotional changes.

Introduction

Stroke is the most frequent neurological pathology in the elderly and the main cause of disability in this population (Kelly-Hayes et al., 2003). In 2014, 19 797 Portuguese individuals suffered from ischemic stroke, of which 2 286 resulted in death, with cerebrovascular disease having the highest average days of hospitalization (248 507 days in 2014), with high costs for the National Health Service (Ferreira et al., 2016).

This disease can be classified as hemorrhagic stroke and ischemic stroke, the latter being the most common, accounting for 85% of cases (Organization for Economic Co-operation and Development, OECD,

2015). It is a multifactorial disorder with a diverse syndromic condition, confirming structural and functional changes in the brain (Sila & Schoenberg, 2011). The changes caused by ischemic lesions may affect the neuronal mechanisms, namely the fronto-subcortical circuits, basal ganglia and limbic system, causing serotonergic and monoaminergic hyporegulation (Carod-Artal, 2006; Dieguez, Staub, Bruggimann, & Bogousslavsky, 2004) associated with most neuropsychiatric disorders, such as depression and anxiety.

Besides emotional disorders, stroke can be associated with multiple cognitive and physical deficits that often arise as an obstacle to neuropsychological intervention. Although physical changes are more noticeable, emotional changes can lead to changes in patient's behavior and thinking (Chun, Whiteley, Carson, Dennis, & Mead, 2015; Kim, 2016), reducing their motivation to engage in recovery and making the course of illness more unfavorable for both caregivers and patients. In this context, it is important to understand and study the evolution of these emotional changes in order to improve patient intervention, to facilitate the work of the multidisciplinary team and to reduce caregiver burden.

According to Zawadzka and Domańska (2014) and to Kim (2016), the most frequent emotional changes after stroke include depression. In this line of thought, Hackett and Pickles (2014) demonstrated that during the first-year after stroke, between 31 and 33% of patients had depression, and between the first and fifth year after stroke, the proportion of patients with depression was 25%. These authors consider depression as the most prevalent neuropsychiatric complication during the first year after stroke, being associated with the severity of the clinical condition.

Other authors have analyzed these symptoms in earlier stages of evolution and found that in the first month after stroke there is a strong probability of progression of symptoms of depression (see, for example, Barker-Collo, 2007; Berg, Palomaki, Lehtihalmes, Lonnqvist, Kaste, 2003; Donnellan, Hickey, Hevey, & O'Neill, 2010; Morrison, Pollard, Johnston, & MacWalter, 2005) with a prevalence ranging from 21.6% to 49.5%. For example, Terroni, Mattos, Sobreiro, Guajardo, and Fráguas (2009) studied 126 patients during the first three weeks after stroke and found that 40% developed mild depressive symptoms and 12% moderate to severe symptomatology of depression.

After the first month, it has been found a decrease in symptomatology of depression that continues until 12 months (Kim, 2016; Morrison et al., 2005; Nunes, Pereira, & Silva, 2005; Robinson & Spalletta, 2010). In contrast, Nys et al. (2006) found an increase in prevalence in the medium duration period, specifically, between 6 and 10 months. According to Donnellan et al. (2010), Hayee, Akhtar, Haque, and Rabbani (2001), and Kotila, Numminen, Waltimo, and Kaste (1999), no decrease or increase in symptomatology of depression was found in this period.

The studies comparing the prevalence of depression after 12 months (chronic period) are scarcer. Recently, Zawadzka and Domańska (2014) have shown that there is a decrease in symptomatology of depression after the first year; however, it may increase again after two or three years. On the other hand, Liman et al. (2012) found similar prevalence of depression for the chronic period (after three and five years: 10.0 and 9.6% respectively) and for the medium duration period (at 12 months: 11.4%).

Studies about the prevalence of depression after stroke do not seem to be entirely consistent. According to Hackett, Yapa, Parag, and Anderson (2005), these inconsistencies can be attributed to different methodologies used in the studies. For example, there are many factors that can contribute to the variability of the results, such as: how the depression is diagnosed, the origin of the studied population (e.g., hospital, community, outpatient and rehabilitation centers), the heterogeneity of the selected samples (e.g., sample size, inclusion and exclusion criteria), elapsed time after stroke in which the patients were evaluated, and the assessment instruments that have been used. Also, the presence of anosognosia, apathy or emotional lability may interfere with the assessment of depression after stroke, contributing to the discrepancy of the results. It is important to note that

some studies do not consider the existence of psychiatric disorders prior to stroke, namely depression. If a previous depression condition occurs, stroke can aggravate the symptoms or prolong the pre-existing depression state. However, the period after stroke seems to be the variable that more variability seems to introduce in the results, because we can find different prevalence figures of depression if the patient is in the short duration period (0 to 3 months), in the medium duration period (4 to 12 months) and in the chronic (more than 12 months) period after stroke.

With regard to anxiety after stroke, this is considered a very common disorder, with a great impact in this population and yet, little studied (Campbell et al., 2013; Kim, 2016; Tang, Lau, Mok, Ungvari, & Wong, 2013). From the perspective of Chun et al. (2015), the fact that anxiety is most of the time underdiagnosed (e.g., anxious symptoms may be confused with stroke symptoms leading to misdiagnosis) could be part of the explanation for the few studies that address this emotional disturbance in the context of ischemic stroke. Also, sleep disturbances or fatigue, that may be part of an anxiety disorder, are often underestimated because they may be confused as sequelae of stroke itself.

In a literature review involving 39 studies and 4 706 patients, Campbell et al. (2013) found that the prevalence of anxiety after stroke ranged from 18% (when assessed through clinical interview) to 25% (when assessed through assessment scales). As in depression after stroke, the authors observed that anxiety has different after-stroke prevalence rates, according to patient's period after stroke: 20% in the first month, 23% in 1-5 months after stroke, and 24% in six months after stroke. In contrast, studies by Morrison et al. (2005) and Astrom (1996), did not observe changes of anxiety levels over the three years after stroke. Although De Wit et al. (2008) noted a decrease in the intensity of symptomatology of anxiety between the fourth and the sixth month, they have verified that the prevalence between the first and the sixth month was similar (22 and 25%). Donnellan et al. (2010) observed similar values in terms of anxiety prevalence between the first month (35%) and the end of the first year (34%). Concerning to the chronic period (more than one year after stroke), Morrison et al. (2005) found no differences in anxiety levels between the first and third year after stroke. However, the scarcity of studies about the prevalence of anxiety after stroke does not allow us to state with certainty if the prevalence is different when the patient is in the short, medium or chronic duration period after stroke.

Overall, although studies are consistent with the presence or absence of depression and anxiety in the period after stroke, the prevalence rates and severity of symptoms of depression and anxiety presented in the different studies are not entirely consistent. It can therefore be affirmed that the evolution of symptoms of depression and anxiety after stroke are not clear.

Considering that studies in this area do not present consistent results, we have sought to characterize the prevalence of depression and anxiety, as well as the severity of symptoms of depression and anxiety, in a multicenter sample of patients with different evolution periods after ischemic stroke.

Methods

This study follows a cross-sectional observational design, comparing four different groups of patients, with data collected through face-to-face administered questionnaires.

Participants and sampling

Participants in this study were individuals with clinical diagnosis of ischemic stroke, all hospitalized or institutionalized in support units of the Rede Regional de Cuidados Continuados Integrados (RRCCI) of the Região Autónoma da Madeira (RAM), Portugal. Participants were divided into four groups regarding their period of ischemic after stroke evolution: short duration (0-3 months), medium duration (4-12 months), chronic period I (13-24 months) and chronic period II (> 24 months). We considered the following inclusion criteria: (1) clinical diagnosis of ischemic stroke; (2) cognitive profile sufficiently functional to understand and answer the formulated questions; and

(3) inpatients and/or institutionalized participants. Regarding exclusion criteria: (1) previous history of psychiatric disease, including depression (assessed retrospectively through questionnaire and clinical records); (2) prior history of pathologies involving central nervous system (CNS) in addition to stroke; (3) hemorrhagic nature stroke; and (4) patients with cognitive deficits following stroke, evaluated through Mini Mental State Examination (MMSE, Guerreiro et al., 1994).

Instruments

The Beck Depression Inventory (BDI-II) was used to characterize symptoms of depression, and the State-Trait Anxiety Inventory, Form Y (STAI-Y) to evaluate symptoms of anxiety.

BDI-II (Beck, Steer, & Brown, 1996; Portuguese version of Campos & Gonçalves, 2011) is a self-report instrument which allows to evaluate the occurrence and severity of symptoms of depression. It consists of 21 items answered through a Likert-type scale of 0 to 3 points. The overall value of the scale is obtained through the sum of the scores, varying between 0 and 63 points (Campos & Gonçalves, 2011). The cutoff points, recommended by the authors of the Portuguese version, are: 0-13 = no depression or minimal depression; 14-19 = mild depression; 20-28 = moderate depression; and 29-63 = severe depression (Campos & Gonçalves, 2011).

STAI-Y (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983, Portuguese version of Silva, 2003) is divided into two sections, each one composed of 20 items. The first section (STAI-Y1) evaluates the state-anxiety, that is, the transient emotional state characterized by consciously perceived subjective feelings of tension, nervousness and worry (Silva & Spielberger, 2011). The second section (STAI-Y2) evaluates anxiety-trait, that is, the relatively stable anxious propensity that characterizes individuals with a tendency to perceive situations as threatening (Silva & Spielberger, 2011). Each item is answered by a Likert-type scale of 1 to 4 points and the total is obtained by adding the values of each scale (minimum of 20 points and maximum of 80 points). The cutoff points recommended by the authors, also used in the Portuguese population, are ≥ 47 to define a high level of anxiety-state and ≥ 42 to define a high level of anxiety-trait (Silva, 2003; Spielberger et al., 1983).

Procedures

The data collection was carried out between July and August 2015, in the hospitals and health units of the RRCCI. Participants were identified by the responsible clinical directors of the health units, that signaled a total of 59 participants with ischemic stroke (census approach). On basis of clinical records, five of the selected patients did not fulfill the inclusion criteria (lack of functional cognitive profile) and were, therefore, excluded.

A psychologist with training in neuropsychology administered the MMSE. Three participants were excluded from the sample on bases of MMSE (due to answers suggesting cognitive deficits). After MMSE, a sociodemographic and clinical questionnaire was administered and nine more participants were excluded due to previous depression history. Eligible participants completed the instruments to assess depression and anxiety in an individual face-to-face session.

The data was analyzed with IBM SPSS Statistics program (version 24.0). The prevalence and severity of depression and anxiety were calculated for the entire sample and stratified per group of participants (groups defined by time elapsed following stroke). To compare symptoms of depression and anxiety between groups, we performed an ANOVA, with the period after stroke considered as a factor and scores on the depression and anxiety scales as dependent variables.

Ethical issues

The study was approved by the Ethics Committee of the Health Service of the Região Autónoma da Madeira, E.P.E. and by the RRCCI Ethics Committee. Participants signed an informed consent document prior to data collection.

Results

Forty-two of the initial 59 individuals identified with clinical diagnosis of ischemic stroke participated in this study: 15 (35.7%) belong to the short duration period

(0-3 months), 11 (26.2%) to the medium duration period (4-12 months), 11 (26.2%) to the chronic period I (13-24 months) and five (11.9%) to the chronic period II (> 24 months).

In Table 1 we can observe participants' sociodemographic and clinical characteristics for each of the groups under study. Slightly more than half of the participants were male (52.4%), aged 55-88 (M = 68.79, SD = 10.49). The results indicate an absence of association between sex and period after stroke ($\chi^2_{(3)}$ = 0.89, p = .889; corrected with Monte Carlo simulation). We also did not observe significant differences in the mean age of each group ($F_{(3.38)}$ = 1.68, p = .187).

Table 1. *Participants' sociodemographic and clinical characteristics*

		Duration period after stroke			
		Short period (0-3 months)	**Medium period** (4-12 months)	**Chronic condition I** (13-24 months)	**Chronic condition II** (>24 months)
Sex (%)	**Male**	60.0	45.5	54.5	40.0
	Female	40.0	54.5	45.5	60.0
Age (Mean (SD))		68.30 (11.4)	71.20 (7.8)	71.10 (10.4)	59.80 (10.7)
Level of education (completed) (%)	**5th grade or less**	93.3	81.8	81.8	80.0
	6th - 8th grade	0.0	18.2	9.1	20.0
	9th grade or more	6.7	0.0	9.1	0.0
Marital status (%)	**Without mate**	29.4	52.9	63.7	33.3
	With mate	70.6	47.1	36.4	66.7
Social support (%)	**Family**	94.1	88.2	45.5	0.0
	Institutional	5.9	11.8	54.5	100
Stroke location (%)	**Left-Hemisphere**	40.0	18.2	27.3	40.0
	Right-Hemisphere	53.3	72.7	54.5	60.0
	Bilateral	0.0	0.0	18.2	0.0
	Brain stem	0.0	9.1	0.0	0.0
	Not specified	6.7	0.0	0.0	0.0
Stroke frequency (%)	**First AVC**	80.0	90.9	81.8	100
	Second AVC	13.3	9.1	9.1	0.0
	More than 2 AVCs	6.7	0.0	9.1	0.0
MMSE (Mean (SD))		25.30 (2.5)	24.80 (1.6)	25.00 (2.1)	23.20 (0.4)

$n_{total} = 42$; $n_{short\ period} = 15$; $n_{medium\ period} = 11$; $n_{chronic\ I} = 11$; $n_{chronic\ II} = 5$

Most participants have between 0 and 4 years of formal education (first cycle of primary education or less). No association was found between school level and time after stroke ($\chi^2_{(3)}$ = 4.34, p = .631, corrected with Monte Carlo simulation).

Regarding social support of participants, little more than half of the participants (54.9%) had a partner, and there were no differences between groups ($\chi^2_{(3)}$ = 3.97, p = .303). The provision of support, in case of need, is carried out mainly by a partner, family member or close friend (70.6% of the total sample), existing differences between groups ($\chi^2_{(3)}$ = 24.83, p < .001): in the medium and short duration groups, the support is mainly family-based, whereas in chronic I and chronic II groups, this support is institutional.

The data about the occurrence of stroke and hemispheric location of the lesion indicate that there are no differences between the four groups regarding the number of participants with one, two or more than two strokes ($\chi^2_{(6)}$ = 2.25, p = .966, corrected with the Monte Carlo simulation), nor regarding the hemispherical location of the lesion ($\chi^2_{(12)}$ = 11.88, p = .485, corrected with Monte Carlo simulation) (Table 1).

Table 1 also shows the mean MMSE total score values obtained by participants. The results indicate that there are no significant differences between groups ($F_{(3.38)}$ = 1.29, p = .291).

Table 2 indicates the prevalence of depression and anxiety according to time after stroke. From the 81.0% of participants having symptoms of depression, 38.1% had scores above 28 which is an indicator of severe depression, 16.7% of participants had moderate depression and 26.2% had mild depression. The results of the chi-square test indicate that there is a significantly higher proportion of patients with severe depression in the chronic period II than in the remaining groups ($\chi^2_{(3)}$ = 11.01 p = .011, with Monte Carlo simulation, η = .51).

Table 2. *Total Scores of BDI-II and Y-STAI, and prevalence of severe depression, high-state and high-trait anxiety*

	Duration period	Mean	*SD*	Prevalence (%)
Depression (BDI-II)	Short period	17.47	10.51	20.0
	Medium period	25.54	12.93	45.5
	Chronic I (13- 24 months)	23.73	14.97	27.3
	Chronic II (>24 months)	44.00	7.55	100.0
	Total	24.38	14.27	31.3
State Anxiety (STAI-Y1)	Short period	39.47	9.31	40.0
	Medium period	57.45	11.63	63.6
	Chronic I (13- 24 months)	48.82	8.99	72.7
	Chronic II (>24 months)	57.00	7.28	100.0
	Total	50.43	10.98	61.9
Trait Anxiety (STAI-Y2)	Short period	39.47	11.18	53.3
	Medium period	55.09	13.82	81.8
	Chronic I (13- 24 months)	48.82	12.03	90.9
	Chronic II (>24 months)	58.20	7.60	100.0
	Total	48.24	13.53	76.2

n_{total} = 42; $n_{short\ period}$ = 15; $n_{medium\ period}$ = 11; $n_{chronic\ I}$ = 11; $n_{chronic\ II}$ = 5.

[a] *Cutoff points for prevalence calculation: severe depression (≥ 29), high state anxiety (≥ 47), high trait anxiety (≥ 42)*

The ANOVA results showed that the period after stroke is associated with the BDI-II score ($F_{(3.38)}$ = 5.93, p = .002). Contrast tests revealed that there are no significant differences in BDI-II scores between the short-duration group and the medium-duration group ($t_{(38)}$ = -1.66, p = .104) nor between the medium-duration group and the chronic group I ($t_{(38)}$ = 0.35, p = .729). Only moderate-size differences exist between participants in this subset (short-duration, medium-duration and chronic period I) and participants in chronic period II ($t_{(38)}$ = -3.07, p = .004, d = .50). Thus, we found no evidence that the mean BDI-II is different in the short, medium duration and chronic period I; only for the chronic period II we found a significantly higher symptomatology of depression (Figure 1).

Results in STAI-Y are indicators of high levels of anxiety state (61.9% have scores greater than 47) and anxiety-trait (76.2% have scores higher than 42) in most participants. However, no significant differences were observed, regarding the prevalence of state anxiety ($\chi^2_{(3)}$ = 6.69, p = .085, with Monte Carlo simulation, η = .40) or trait anxiety ($\chi^2_{(3)}$ = 7.39, p = .059, with Monte Carlo simulation, η = .41), between the different evolution periods (Table 2). Anyhow, the ANOVA results indicate that groups differ at the level of anxiety-state symptoms ($F_{(3.38)}$ = 4.79, p = .006). Contrast tests found large differences between short and medium duration groups ($t_{(38)}$ = -3.42, p =.002, d = -.55) and of moderate size between medium duration group and chronic group I ($t_{(38)}$ = 2.08, p = .044, d = .34). No differences were found between chronic group I and chronic group II ($t_{(38)}$ = -1.56,

p = .127). Participants in the medium duration group had significantly higher values of anxiety than participants of the short duration and chronic period I groups.

For the anxiety-trait symptoms, we also found significant differences between groups ($F_{(3.38)}$ = 5.15, p = .004). Contrast tests indicated large differences between short and medium duration groups ($t_{(38)}$ = -3.32, p = .006, d = -.54), with no differences between medium duration group and chronic group I ($t_{(38)}$ = 1.24, p = .222) not between chronic I and chronic II ($t_{(38)}$ = -1.47, p = .150). Participants in the period of medium duration presented values significantly higher than participants in the short-duration group (Figure 1).

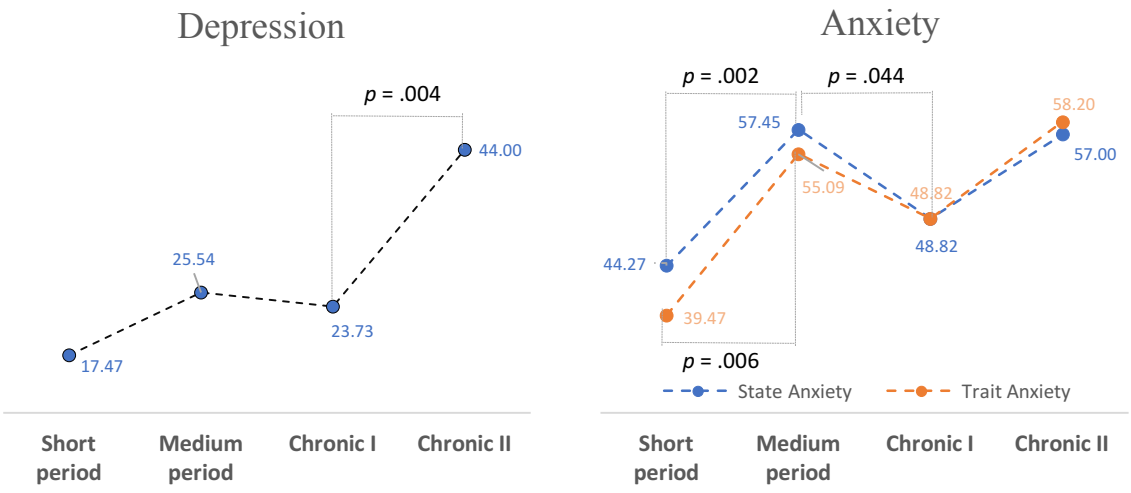

Figure 1. *Mean levels of depression, state anxiety and trait anxiety for each of the after-stroke groups*

It was also observed that 33.3% of all participants had severe levels of depression together with high levels of anxiety-trait. In short duration period group, this percentage was 11.8%, 52.95% for the medium duration period, and 27.3% for the chronic period I. We also observed a significantly higher proportion of patients with both disorders in chronic period II ($\chi^2_{(3)}$ = 15.71, p = .001, with Monte Carlo simulation, η = .61). All participants in chronic period II had severe depression together with high levels of anxiety-trait (100%).

Discussion

This study aimed to compare the prevalence and severity of symptomatology of depression and anxiety in a population of patients who suffered from ischemic stroke, at different evolution periods after stroke, hospitalized or institutionalized at the Região Autónoma da Madeira.

The results obtained through face-to-face administration of the BDI-II suggest that 81.0% of these participants have depression and a relevant part (38.1%) have severe depression, being among the highest values observed in the literature review. Several hypotheses have appeared in the literature to explain the presence of this symptomatology in this population. For some authors (Hellmann-Regen et al., 2013; Loubinoux et al., 2012; Robinson & Spalletta, 2010), the high prevalence of depression can be explained by the impact that cognitive and physical changes caused by stroke can exert at mental level, triggering depressive conditions. However, for Salter et al. (2016), the emotional consequences after stroke can be explained due to an imbalance of neurotransmitters caused by brain injury; and Li et al. (2014)

suggest that these alterations may be associated with other psychopathological complications.

Due to our research design, we cannot establish a causal relationship for emotional changes after stroke. However, an after-stroke time-associated change in mood and anxiety symptomatology was observed and these modifications may result from an influence and/or interaction between multiple associated risk factors (e.g., extent of injury, location, vascular comorbidities, previous personality, coping mechanisms) as well as a multiplicity of structural, neuronal and functional occurrences that arise in response to the new state of disability.

We observed that while in the short, medium duration and chronic I periods there are no differences in terms of levels of symptoms of depression, in the chronic period II much higher levels were observed. Similar results were observed by Donnellan et al. (2010), Hayee et al. (2001) and Kotila et al. (1999) who in their longitudinal studies did not find differences in symptoms of depression when comparing patients with 3 to 12 months after stroke. Berg et al. (2003) also did not observe differences between participants in medium duration period and participants of the chronic period I. However, the higher levels that we found in chronic period II are not similar to other investigations that observe a decrease regarding the levels of depression and its prevalence over the same period (Hackett & Pickles, 2014; Liman et al., 2012; Morrison et al., 2005). The exceptions are the longitudinal study of Astrom (1996) and the cross-sectional study by Zawadzka and Domanska (2014), who found that levels of depression are superior three years after stroke.

A possible explanation for the high prevalence of depression in our sample may be due in part to the fact that it has been withdrawn from long and medium periods inpatient hospital settings, where patients may experience more severe symptoms of depression. In contrast, the study by Liman et al. (2012) and the meta-analysis by Hackett and Pickles (2014) are based on a community sample, with only between 5 and 13% of patients hospitalized at the time of data collection. Considering that all participants of the chronic period II were hospitalized at the time of data collection, it is possible that these levels of symptomatology of depression reflect a detriment of the patient's self-image (facing the fact that two years after stroke they still observe sequelae with low recovery potential). None of the participants who were in chronic period II have family support, which may contribute to a decline in their self-esteem and abilities and may contribute to symptoms of depression. Thus, the impact of stroke associated with the degree of dependence, fear and insecurity about the future, the need for adjustment and adaptation in patient's life are stressful factors that may contribute to the evolution of a mood disorder. Thus, the high prevalence of depression found among participants of this study is suggestive of the need for a timely intervention to prevent the aggravation of symptoms of depression in the acute phase of the stroke.

Despite the high prevalence of depression after stroke and its impact on long-term quality of life, we consider that depression is not adequately recognized by professionals in Portugal. In common clinical practice, the intervention is directed toward physical and non-emotional rehabilitation. The absence of intervention at the level of emotional disturbance may result in a decrease in patient's adherence to physical rehabilitation programs and, therefore, contribute to treatment failure and worsening of the state of depression.

Regarding the anxiety-related symptoms, as evaluated by STAI-Y, our data also indicated a high prevalence of participants with high levels of anxiety-state (61.9%) and anxiety-trait (76.2%), though with no significant differences between groups. Similar results have been found in recent investigations that highlight anxiety as a relevant disorder in after-stroke setting (e.g., Broomfield, Quinn, Abdul-Rahim, Walters, & Evans, 2014; Campbell et al., 2013).

Although we did not find differences in prevalence when comparing groups, we observed lower levels of symptoms of anxiety-state and anxiety-trait in participants within the short duration period (0 to 3 months), being higher in participants within the medium duration period (4 to 12 months). De Wit et al. (2008) obtained similar results, when observing that from the

fourth and sixth month, the severity of symptoms of anxiety increases and Campbell et al. (2013) observed an increase in the prevalence of anxiety from the six-month after stroke.

According to Salter et al. (2016), the medium duration period may correspond to a transient interval in which the patient is still in a phase of adaptation of stroke effects, becoming later more aware of the complications related to his current condition. These difficulties experienced by individuals may be expressed in increased levels of anxiety after the fourth month after stroke. Some investigations indicate that the fear of having a recurrent stroke, of falling or showing difficulties in returning to work, as well as difficulties in daily life activities may contribute to the occurrence of anxiety in the medium duration period (Campbell et al., 2013). This increase in anxiety levels at a time when the patient is confronted with the possible permanence of some deficits, deficits that can have repercussions on the functionality of the patient, seems to be corroborated by our results. We found that participants in mid duration period (between 4 and 12 months after stroke) presented higher values of state anxiety than those presented by the chronic period I group. It is possible that after the first year there is a decrease in the state of transient emotional anxiety (Spielberger et al., 1983), once the patient has passed the adaptation phase and accepted his current condition. However, anxiety-trait levels remain similar until chronic period II, in our study. This persistence of anxiety-trait from the period of medium duration on, not diminishing over time, should raise a special attention from health professionals who accompany this population.

Although the prevalence of anxiety after stroke is relatively high, the study of this emotional disturbance compared to depression continues to deserve little attention. For some authors, this neglect can be interpreted by the fact that most studies have found a lower prevalence of anxiety disorder compared to depression (Campbell et al., 2013; Tang et al., 2013). However, others (see, for example, Broomfield et al., 2004; Campbell et al., 2013; De Wit et al., 2008) suggest that the low prevalence of anxiety found by previous studies may be explained by the underdiagnoses of this condition, together with belief that this disorder often occurs naturally in the elderly population. In addition, symptoms of excessive worry, agitation, irritation, drowsiness or fatigue problems that are part of anxious conditions may be perceived as natural sequelae after stroke (Chun et al., 2015).

Although our results provide a contribution to understanding the symptoms of anxiety in identifying the severity of symptoms after stroke, the study does not allow to determine whether these symptoms are a natural sequel of stroke or a result of after stroke adaptation. However, the higher levels of symptoms of anxiety in the medium duration group support the hypothesis that this disorder may arise from the difficulties to adapt to after-stroke conditions. Further quantitative and qualitative studies focusing on anxiety after stroke are needed to clarify its prevalence, to disambiguate anxiety from other health-related issued (e.g., fatigue, sleep and agitation), and to understand its medium- and long-term effects in patients.

Considering that emotional changes may be different according to period after stroke, as our results suggest, it is crucial to evaluate, intervene and develop preventive strategies, tailored for the period after stroke, especially for those periods in which stroke participants are most vulnerable (medium and chronic period II). In this context, it would be important to develop specific neuropsychological assessment tools aimed at depression and anxiety after stroke for patients who present aphasia or other serious language disorders. These subjects are usually excluded from research, creating a significant gap in understanding, as well as in providing intervention and rehabilitation (Fernandes, 2016).

The fact that the present study is cross-sectional and has been performed with a relatively small sample of participants from a specific region limits the generalization of the results to other regions of Portugal. Likewise, we used the global scores of the emotional state assessment scales that did not indicate a clinical diagnosis, but rather a general understanding of the

levels of the variable under study. In a study of this nature, it would be appropriate to carry out a longitudinal investigation to analyze not only the prevalence but the incidence of these disorders, accompanying the same patient over the various periods and using the clinical diagnosis criteria according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) and/or International Classification of Diseases (ICD-10). It would be also important to carry out investigations qualitative and mixed investigations that would allow to identify in detail the relations between the insight of patients about their cognitive and affective functioning and the neuropsychological scales used.

In conclusion, the results confirm the need to recognize in a timely manner the emotional changes typical from this population, since these emotional changes can have a great impact on the assessment, follow-up and neuropsychological rehabilitation of patients who suffered an ischemic stroke.

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Declaration of Conflicting Interests

The data collection of the participants was carried out within the framework of a dissertation to obtain a master's degree in Cognitive Neurosciences and Neuropsychology, by the author NF. The authors declare no conflicts of interest with respect to the research, authorship, and/or publication of this article.

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