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Depression, Social Support, Executive Functioning, Functionality, and Quality of Life in Institutionalized Elderly People

Depressão, Suporte Social, Funcionamento Executivo, Funcionalidade, e Qualidade de Vida em Idosos Institucionalizados

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Abstract

Aim: Our aim was to study the executive functioning, functionality, and quality of life of institutionalized old aged persons and to determine the potential roles of self-reported depression and satisfaction with social support on these domains.
Method: The sample comprised 36 volunteers (13 males and 23 females) aged between 71 and 94 years. The measures used consisted of well-established battery of neuropsychological tests. A comparative study was performed.
Results: Participants with depressive symptoms shown impaired executive functioning. Cognitive flexibility, functionality in instrumental activities of daily living, and quality of life are more affected in participants with higher levels of depression that also report higher levels of satisfaction with social support.
Conclusion: This result is intriguing and may highlight the relevance of considering not only depression, but also factors related to social isolation and loneliness in the explanation of cognitive performance, functionality, and quality of life.

Keywords: aging, social support, depression, executive functioning, quality of life

Resumo

Objetivo: O nosso objetivo foi estudar o funcionamento executivo, a funcionalidade, e a qualidade de vida em idosos institucionalizados, e determinar o papel da depressão e da satisfação com o suporte social nestes domínios.
Método: Participaram 36 voluntários (13 do sexo masculino e 23 do sexo feminino) com idades compreendidas entre 71 e 94 anos. Neste estudo comparativo a avaliação foi realizada através da aplicação de uma bateria constituída por reconhecidos testes neuropsicológicos.
Resultados: Os participantes com sintomatologia depressiva demonstraram um nível de funcionamento executivo inferior aos participantes sem depressão. A flexibilidade cognitiva, a funcionalidade, e a qualidade de vida encontram-se mais comprometidas em indivíduos com sintomatologia depressiva que relataram níveis elevados de satisfação com o suporte social.
Conclusão: Embora surpreendente, o resultado deste estudo sublinha a importância de, na explicação do funcionamento executivo, funcionalidade, e qualidade de vida das pessoas mais velhas, se considerar não só a depressão, mas também outros fatores relacionados com o isolamento social e a solidão.

Palavras-Chave: envelhecimento, suporte social, depressão, funcionamento executivo, qualidade de vida

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Executive functions (EF) are described as a set of high-level capacities responsible for the control of behaviour and cognitive flexibility that are required to deal with environmental demands (Diamond, 2013). Although EF can be conceptualized as a unitary construct, the most common view conceptualizes EF as a multidimensional construct (Friedman & Miyake, 2017). According to Miyake, Emerson, and Friedman (2000), EF are composed by three main dimensions – updating, shifting, and inhibition – which are correlated and, according to Bock, Haeger, and Voelcker-Rehage (2019), this correlation is higher among the elderly population. However, working memory (Baddeley, 1992), planning (Lezak, Howieson, & Loring, 2004), and verbal fluency (Troyer, Moscovitch, & Winocur, 1997) have also been proposed as other dimensions of EF.

The declines in cognitive ability in the elderly constitute a risk factor for impairment in activities of daily living (ADL) and functioning (Lau, Parikh, Harvey, Huang, & Farias, 2015). Several studies reported that impairments in EF are strongly associated with difficulties in instrumental activities of daily living (IADL; de Paula et al., 2015; McAlister & Schmitter-Edgecombe, 2016). Other studies stressed the importance of EF on the maintenance of independence in older adults, by suggesting a negative impact of declines in EF on walking speed, gait, and increased risk of falls (Gothe et al., 2014; Hsu et al., 2016).

The relationship between EF and depression in late life is well documented. Negative changes in EF were identified as an important risk factor for depression (Klojčnik, Kavcic, & Vukman, 2017; Knouse, Barkley, & Murphy, 2013). In addition, results from some studies are consistent in suggesting an association between EF and depression in older adults (Alexopoulos, 2019; Pantzar et al., 2014; Ros et al., 2013; Zhang, Xu, & Chan, 2016). However, a recent study has shown a weak association between depressive symptoms and EF in older adults (de Vito, Calamia, Greening, & Roye, 2019).

In the elderly, psychosocial condition and social isolation have been described as factors that correlate with depressive symptoms (Taylor, Taylor, Nguyen, & Chatters, 2018). The quality of social relationships is crucial for depression (Mohd, Yunus, Hairi, Hairi, & Choo, 2019), morbidity, mortality, and quality of life (QoL; Datta, Datta, & Majumdar, 2015). Relationships, usually composed by relatives and friends living in the same neighbourhood, promote a sense of belonging that has been recognized as an important factor for QoL in aging, autonomy and independency, well-being, and health (MacKean & Abbott-Chapman, 2012). According to Chappell and Funk (2011), elderly adults who are able to keep themselves socially engaged, report higher instrumental and emotional social support level, which contributes for a higher perception of social support (SS).

Research has converged to indicate that a decrease of SS and loneliness is associated with depression and depressive symptomatology (Aziz & Steffens, 2013; Elsayed, El-Etreby, & Ibrahim, 2019). Institutionalization increases the likelihood of changes in social contacts, physical incapacity, cognitive decline, and functionality impairment that can contribute to depressive and anxious states as well as decreases in QoL (Castellanos, 2010; Júnior et al., 2019). In a study with institutionalized elderly adults, Dale, Sævareid, Kirkevold, and Söderhamn (2010) have found that higher rates of mental and physical decline were associated with lower social participation, suggesting that SS can attenuate depressive symptomatology in the elderly.

There is empirical evidence that SS is related to healthy cognitive aging (La Fleur & Salthouse, 2017), whereas social interaction is related with impacts on EF (Kuo, Huang, & Yeh, 2018).

In the elderly, the execution of ADL independently is positively related to QoL (Júnior et al., 2019) in the same way that better EF is associated with higher QoL (Forte, Boreham, De Vito, & Pesce, 2015). In addition Zainab and Humaira (2017) found a positive correlation between the execution of ADL, social participation, and perceived wellness.

The aim of this study was to evaluate EF, functionality in IADL, and QoL in the elderly, while considering the potential roles of depression and SS. We compared the performance of elderly groups with different levels of depression and SS on measures of EF, functionality, and QoL. In line with the literature, it was expected that depressed individuals with lower perception of SS showed lower executive performance, higher difficulties in IADL, and lower QoL.

Method

Participants

A total of 36 volunteers (13 males and 23 females) aged between 71 and 94 years participated in this study. Their educational level ranged from 2 to 12 years. The inclusion criteria were: 1) 70 years older or more, no cognitive deficit; 2) attendance of a senior community (e.g., lunch and afternoon snack) and/or living in a geriatric residence; 3) absence of sensorial, motor, and verbal deficits that could interfere with the tests' execution; 4) no alcohol and/or drug abuse; and 5) no history of neurological and psychiatric disorders. All volunteers who did not meet these criteria were excluded from the study.

Participants were divided in two groups according to the Geriatric Depression Scale (GDS; Barreto, Leuschner, Santos, & Sobral, 2008; Yesavage et al., 1982-1983). Group 1, depressed elderly adults, comprised 19 participants (M_{age} = 81.37; SD_{age} = 6.15; 13 females) and group 2, non-depressed controls, comprised 17 participants (M_{age} = 83.12; SD_{age} = 5.44; 10 females).

Measures

The evaluation protocol included measures of neuropsychological assessment and functionality, as well as three scales used for evaluation of psychological adjustment through satisfaction with social support, presence of depressive symptomatology, and quality of life.

The Mini Mental State Examination (MMSE; Guerreiro et al., 1994) was used as a screening tool to examine global cognitive capacity. Total score ranges from 0 to 30 and cut-off points are defined according to educational level.

Executive functions were evaluated by four different tasks: Frontal Assessment Battery, Stroop, Color Trails Test, and Wisconsin Card Sorting Test. Frontal lobe functions were examined by the Frontal Battery Assessment at Bedside (FAB; Dubois, Slachevsky, Litvan, & Pillon, 2000; Lima, Meireles, Fonseca, Castro, & Garrett, 2008), which is composed by six tests that explore different frontal skills: conceptualization, mental flexibility, motor programming, sensitivity to interference, inhibitory control, and environment autonomy. Total score ranges from 0 to 18. The Stroop Test – Word and Color Test (Golden, 2007) was used to evaluate sensitivity to interference (inhibitory control) in reading of coloured words which describe different colours (WC form). Interference is measured by the highest number of errors and longer execution times. The Color Trails Test (CTT;

D'Elia, Satz, Uchiyama, & White, 1996) was used in the evaluation of response sequencing, mainly by part B, which requires participant to alternate between two different coloured circles. The performance is evaluated by the execution time and number of errors, near-misses, and prompts. The interference index (interference resistance) is obtained by the difference between CTT1 and CTT2 execution time. The Wisconsin Card Sorting Test (WCST; Heaton, Chelune, Talley, Kay, & Curtiss, 1993) was used to assess cognitive flexibility (shifting), in which the participant should derive the correct card sorting principle. The outcomes of the WCST were based on the number of trials (number of correct trials), total number of errors (number of incorrect responses in identifying the card sorting rule), number of perseverative errors, and number of categories completed.

Functionality status was evaluated regarding basic and instrumental activities of daily living using two different measures. Basic activities of daily living were assessed by the Index of Independence in Activities of Daily Living (ADL; Katz, 1983) which evaluates the functional status or physical performance in these activities. Scores equal to 0 indicates total dependency. Instrumental activities were measured by the Instrumental Activities of Daily Living (IADL; Lawton & Brody, 1969), which explores a more complex level of functionality in eight different instrumental activities. The total score ranges from 0 (*dependence*) to 8 (*independence*).

Psychological adjustment was measured by social support, depressive symptomatology, and quality of life. Social support was evaluated with the Satisfaction with Social Support Scale (SSSS; Ribeiro, 1999) that is based on four dimensions: satisfaction with friends/friendships, intimacy, satisfaction with family, and social activities. Total scores range from 15 (*low satisfaction*) to 75 (*high satisfaction*).

Depression was assessed by the Geriatric Depression Scale (GDS; Barreto et al., 2008). Total scores range from 0 to 30 and cut-off points were defined as follow: scores from 0 to 10 indicates absence of depression, scores from 11 to 20 indicates mild depression and scores from 21 to 30 indicates severe depression.

Finally, QoL was evaluated with the Assessment Index of the Quality of Life of the Elderly (IQVI [Índice de Avaliação da Qualidade de Vida do Idoso]; Direção-Geral da Saúde, 1995). The IQVI evaluates seven basic components of adulthood life: isolation/affective and social communication, mobility, ADL, occupational activity, ludic activity, family relationships, and economic resources. Scores above 23 indicates quality of life.

Procedure

Different senior community centres and geriatric residences were contacted. The study was approved by the community center and geriatric residences Ethics Committee and participants signed an informed consent prior to participation. They were all informed about the nature of the study and the rights of anonymity, confidentiality, and to withdraw participation at any time of the study. Participants were tested individually in a quiet room. Given the age of participants, we decided to perform three evaluation sessions that took place within four days. The MMSE, ADL, IADL, and IQVI were applied in the first session, the GDS 30 and ESSS on the second session, and the FAB, Stroop Test, CTT, and WCST on the third session. The third session focused in the EF assessment. Each session lasted, on average 90 minutes.

Statistical analysis was performed using two between-subjects Analysis of Variance (ANOVA) with two levels, in order to examine the main effects and interaction between the factors on each dependent variable. Neuropsychological (FAB, Stroop Test, CTT, and WCST), functionality (ADL and AIDL), and QoL (IQVI) outcomes were included as dependent variables, while depressive symptomatology and SS, both of them with two levels,

were defined as independent variables. The independent variables were recoded into groups according to the cut-off points for our population on these measures. The GDS scores (Barreto et al., 2008; Yesavage et al., 1982-1983) were used in order to generate the non-depressive group (score ≤ 10) and the depressive group (score > 10). Given the lack of cut-off points for the SSSS, we choose to divide the total score by the median value of this distribution (group 1 with values lower than the median, and group 2 with values higher than the median). The statistically significant effects on the ANOVA were analysed through multiple comparisons with Bonferroni correction. Confidence level was defined at .05.

Results

Correlations Between Social Support and Neuropsychological Function Controlling for Depressive Symptoms

These were bivariate correlations performed using the Pearson statistic, and revealed no significant correlations between SSSS, MMSE, FAB, WCST, Stroop Test, ADL, IADL, and IQVI total scores ($p > .05$).

Descriptive Statistics by Psychological Domain

The results for global cognitive ability are in line with normative data, considering the educational levels (Guerreiro et al., 1994). However, the FAB score was lower than expected for the cut-off points defined by Dubois et al. (2000). For depression, the overall mean in this sample was slightly higher that the cut-off suggested for the presence of depressive symptomatology (Table 1).

Table 1

Descriptive Statistics

	Descriptive statistics						
Variable	***M***	***SD***	**Min**	**Max**	**P25**	**P50**	**P75**
MMSE	27.03	2.66	21.00	30.00	25.25	28.00	29.00
FAB	12.58	3.87	2.00	18.00	11.00	13.50	16.00
CTT1 ET	108.69	34.87	50.00	180.00	76.75	106.50	135.75
CTT1 errors	2.28	11.29	0.00	68.00	0.00	0.00	1.00
CTT1 nmiss	0.19	0.58	0.00	3.00	0.00	0.00	0.00
CTT1 prompt	0.94	1.24	0.00	4.00	0.00	0.00	1.75
CTT2 ET	230.00	68.08	96.00	360.00	180.00	204.50	279.75
CTT2 errors	1.75	2.71	0.00	11.00	0.00	0.50	3.00
CTT2 nmiss	0.11	0.40	0.00	2.00	0.00	0.00	0.00
CTT2 prompt	3.72	2.64	0.00	10.00	2.00	3.00	5.00
CTT Index	1.69	3.02	0.37	19.00	1.00	1.00	1.48
WCST trials	124.36	11.86	72.00	128.00	128.00	128.00	128.00
WCST errors	68.97	24.42	11.00	105.00	54.00	74.50	89.75
WCST P errors	46.08	23.25	9.00	94.00	27.75	42.50	59.50
WCST categ	2.06	2.06	0.00	6.00	0.00	1.50	3.75
ADL	5.36	0.96	2.00	6.00	5.00	6.00	6.00
IADL	4.97	2.64	0.00	8.00	3.00	5.00	8.00
IQVI	30.22	8.19	13.00	46.00	23.50	30.50	35.00
Stroop W	58.97	19.11	8.00	100.00	45.25	55.00	70.50

	Descriptive statistics						
Variable	***M***	***SD***	**Min**	**Max**	**P25**	**P50**	**P75**
Stroop C	41.67	9.77	19.00	70.00	34.25	42.00	48.00
Stroop WC	19.64	8.53	8.00	47.00	13.00	19.00	23.75
GDS	11.94	7.05	0.00	24.00	7.00	12.00	17.00
SSSS	46.53	13.07	19.00	74.00	37.25	48.50	57.50

Note. MMSE = Mini-Mental State Examination; FAB = Frontal Assessment Battery; CTT ET = Color Trails Test execution time; CTT errors = Number of errors; CTT nmiss = Near misses; CTT prompt = Prompts; CTT Index = Interference índex; WCST trials = Wisconsin Card Sorting Test number of trials; WCST errors = number of errors; WCST P = Perserverative errors; WCTS categ = Number of categories completed; ADL = Basic Activities of Daily Living; IADL = Instrumental Activities of Daily Living; IQVI = Quality of Life; Stroop W = Word form; Stroop C = Color form; Stroop WC = Word-color form; GDS = Geriatric Depression Scale; SSSS = Satisfaction with Social Support Scale.

Depression and SS Effects on Global Cognitive Ability

The statistical procedure consisted in a two-way ANOVA (GDS and SSSS), to tests the effect that each factor had (two levels: below vs. above cut-off point) on the dependent variable defined as the MMSE global score. No significant statistical results were observed ($p > .05$).

Depression and SS Effects on Executive Functions

Regarding the FAB, the ANOVA showed only a main effect of depression on the global score of this measure, $F(1, 36) = 4.470$; $\eta_p^2 = .123$; $p = .042$. The non-depressive group reported higher scores than the depressive group (Figure 1). No statistically significant effect of SS or interaction was observed ($p > .05$).

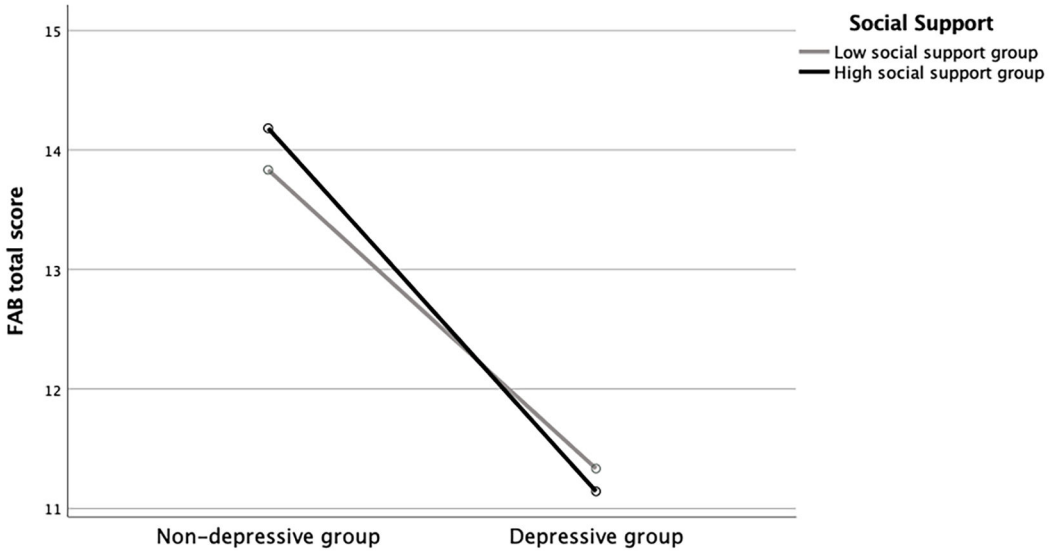

Figure 1. Effects of depression on frontal lobe functioning through the FAB scores.

For the response sequencing, measured by the CTT, no statistically significant effects of depression and SS on both trails of the CTT were observed ($p > .05$).

Regarding to cognitive flexibility, the results of the WCST showed an interaction effect between depression and SS through the number of errors, $F(1, 36) = 8.467$; $\eta_p^2 = .209$; $p < .01$, suggesting a significant difference on

WCST errors in depressed versus non-depressed participants, but only for those with higher satisfaction with SS ($p < .05$). This result (Figure 2) was replicated for the number of categories completed in the WCST, $F(1, 36) = 6.889$; $\eta_p^2 = .177$; $p = .013$; Figure 3). No other statistically significant effects were observed ($p > .05$).

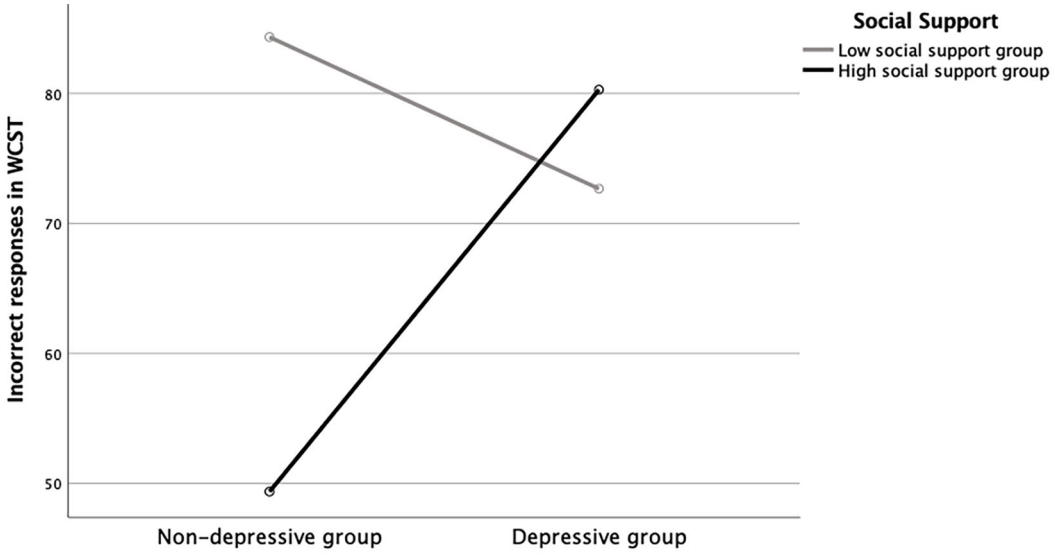

Figure 2. Effects of depression and social support on cognitive flexibility (incorrect response in the WCST).

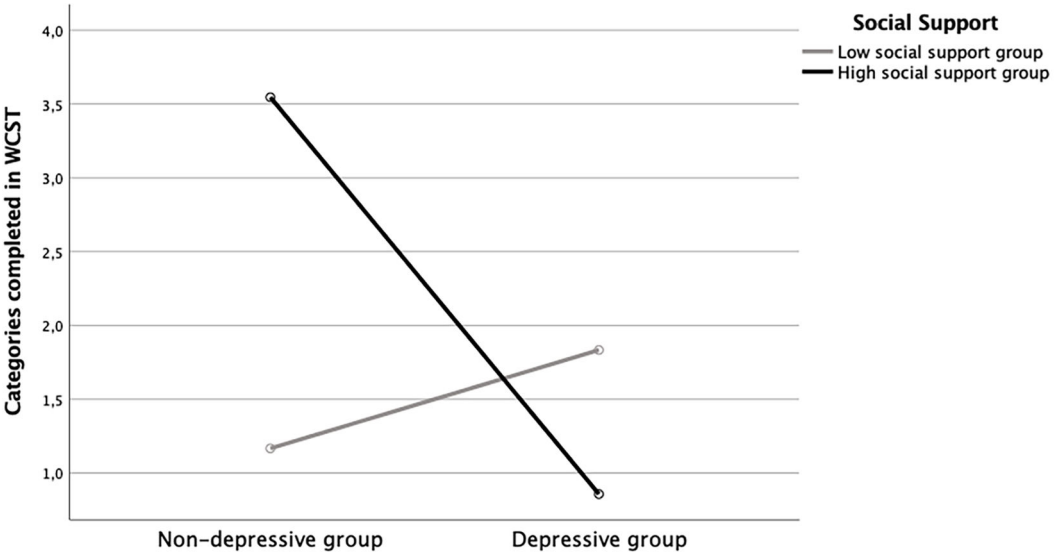

Figure 3. Effects of depression and social support on cognitive flexibility (number of categories completed in the WCST).

As for the inhibitory control, the results revealed statistically significant main effects on Stroop WC form. The ANOVA indicates a main effect of depression, $F(1, 36) = 4.523$; $\eta_p^2 = .124$; $p = .021$, but also an interaction effect between factors on correct responses in the Stroop Test, $F(1, 36) = 4.945$; $\eta_p^2 = .134$; $p = .033$. The main effect described higher number of errors in non-depressive group, while interaction suggested differences between depressive and non-depressive groups only in participants with high satisfaction with SS ($p < .05$; Figure 4).

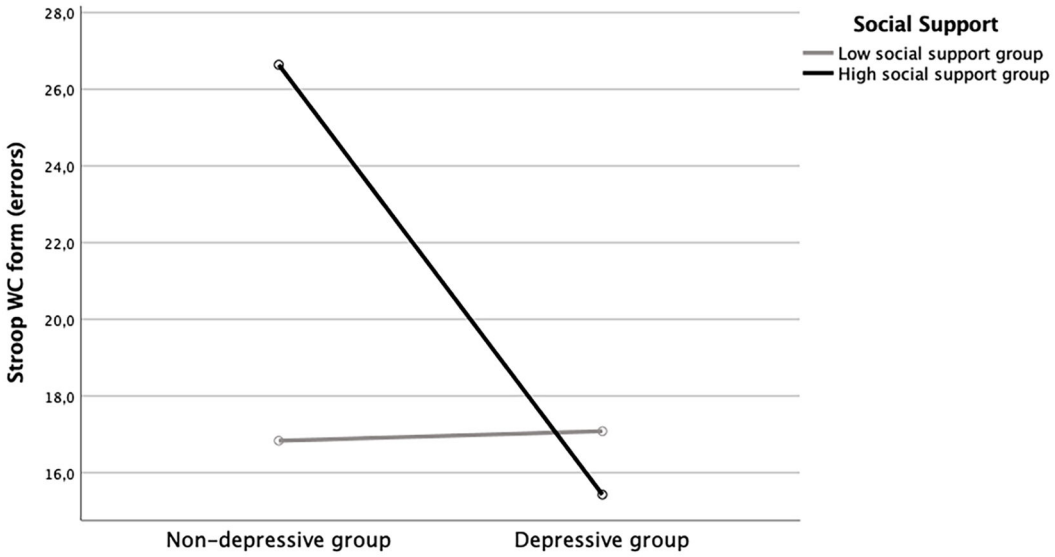

Figure 4. Effects of depression and social support on inhibitory control.

Effects of Depression and SS on Functionality

The ANOVA performed on the ADL total score showed no statistically significant results of both depression and SS ($p > .05$). However, the same analysis conducted for the IADL total score revealed an interaction effect between depression and SS, $F(1, 36) = 5.316$; $\eta_p^2 = .142$; $p = .028$), which was in line with previous data on executive functioning by suggesting a significant difference between depressed and non-depressed participants, but only in participants with high satisfaction with SS (Figure 5). No other statistically significant effects were observed ($p > .05$).

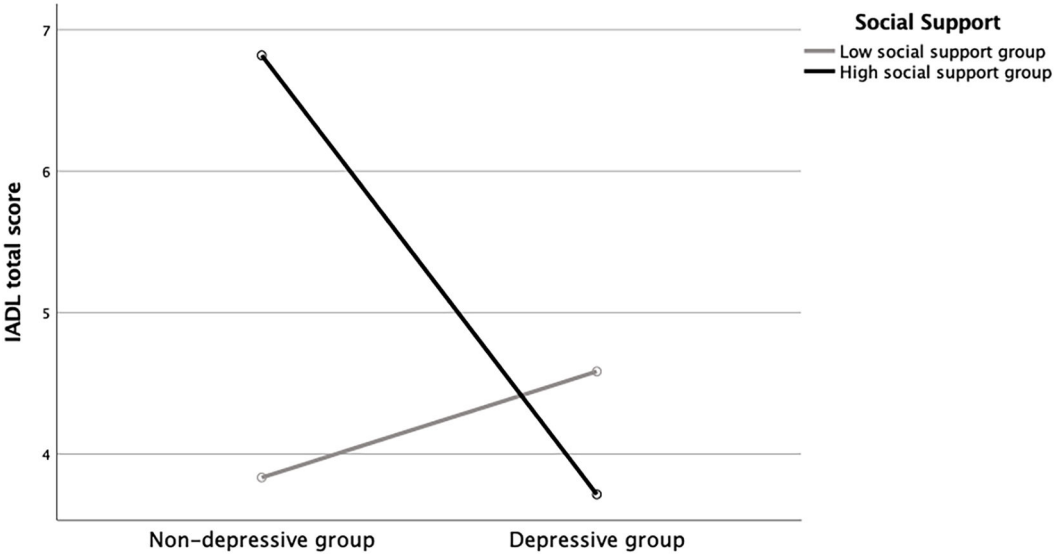

Figure 5. Effects of depression and social support on functionality status.

Effects of Depression and SS on QoL

In this analysis we observed a main effect of both factors, depression, $F(1, 36) = 12.403$; $\eta_p^2 = .279$; $p < .01$) and SS, $F(1, 36) = 6.306$; $\eta_p^2 = .165$; $p = .017$, as well as an interaction effect between the factors, $F(1, 36) = 7.436$; $\eta_p^2 = .189$; $p < .01$). The main effects describe worse scores for the non-depressive participants and for participants with low satisfaction with SS (Figure 6), while the interaction effect was in agreement with the previous analyses, which suggested differences between depressive groups only for participants with high satisfaction with SS ($p < .05$).

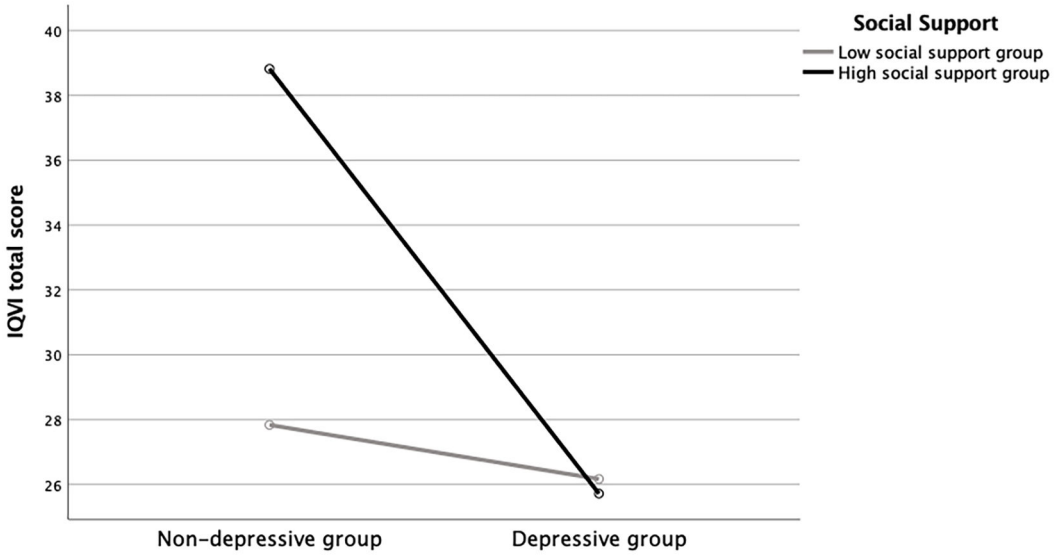

Figure 6. Effects of depression and social support on quality of life.

Discussion

The purpose of this study was to evaluate executive functions, functionality in IADL, and QoL in the elderly participants over 70 years old, depending on their levels of depression and SS. The main goal was to determine whether depression and SS (low and high) would affect performance in executive measures, functionality, and QoL in elderly participants.

Regarding the executive functions, the results of this study can be systematized in two fundamental points. First, the level of SS did not have an isolate effect on performance of the frontal functions nor on the other components of the EF assessed in the current study (i.e., cognitive flexibility, response sequencing, and inhibitory control). Second, the level of depression impacts only on the performance of the frontal functions and inhibitory control.

Results showed the main effects of depression on FAB scores as well as on the number of correct responses in the Stroop Test. Regardless of the level of social support, elderly adults without depression reported higher scores in FAB than depressed elderly adults, which suggest better frontal functioning in old aged persons without depression. Similarly, this group revealed more correct responses in the Stroop Test, which is evidence of better inhibition and resistance to interference.

Unlike previous studies that have shown the relevance of SS in cognitive aging (La Fleur & Salthouse, 2017) and demonstrated that social interaction promotes better executive functioning (Kuo et al., 2018), the results of our study indicated that the level of SS by itself is not an explanatory variable of executive functioning.

As for the effect of depression, our data converge with the literature reporting difficulties in executive functioning of elderly adults with depression (Alexopoulos, 2019; Pantzar et al., 2014; Ros et al., 2013; Zhang et al., 2016). By having fewer correct responses on the Stroop Test than the non-depressive group, depressed elderly adults shown their difficulty and slowness in inhibiting inadequate responses within the time available to do so. The speed of information processing, which is diminished in depression (Yen, Rebok, Gallo, Jones, & Tennstedt, 2011), may have contributed to explain these difficulties. The difficulty in inhibitory control may also contribute to explain the poor performance of the frontal functions of the depressed group. This performance was evaluated with the FAB, which, in addition to the specific subtests for inhibitory control and resistance to interference, consists of four other subscales of frontal functioning that also require efficacy of the inhibitory control for its success (Bock et al., 2019; Miyake et al., 2000).

Being able to deal with conceptualization and abstraction, evoking the highest number of words beginning with a given letter in 60 seconds, executing a series of motor responses and following a rule, implies the capacity to not process irrelevant information and being able to inhibit incorrect responses. Such as Bock et al. (2019) suggested, in this population there is an increased correlation between the different components of EF, so difficulties in inhibitory control will reflect in other tasks, which may have been also affected by the decrease in the speed of information processing.

We have also expected that depression would affect cognitive flexibility, but this result was not observed. However, an interaction between depression and SS was found for WCST results (number of categories performed and the number of errors). According to the interpretation of this test (Heaton et al., 1993), the number of categories performed constitutes a fundamental indicator of cognitive flexibility, and the number of errors provides important information in the understanding of standard performance. Thus, a greater number of categories completed and fewer errors indicate higher levels of cognitive flexibility. The results obtained in WCST have shown that, in participants with higher levels of satisfaction with SS, the depressed elderly adults completed fewer categories and had more errors than the non-depressed elderly adults. These results are consistent with data from the Stroop Test, which suggested that differences in inhibitory control between depressed and non-depressed participants are only relevant when the level of satisfaction with SS is high. Taken together these results indicate that within participants with high perception of SS, the depressed ones show lower cognitive flexibility and inhibitory control. This finding converges with previous studies reporting these difficulties (Klojčnik et al., 2017) however the fact that it fits in participants with a high SS is surprising and diverges from literature. Given that our sample is composed by institutionalized subjects, we can hypothesize that their high perception of SS received may be related to the satisfaction of ADL, leading to a false perception of independence on ADL; i.e. if there is no need to solve such activities and/or to find alternatives for this purpose, the use of cognitive flexibility may not be required and would be dispensable, and they can feel independent although they are not. This result also suggests that higher levels of social support may not always be a factor that contributes for the happiness of those who receive it.

Regarding functionality, this study revealed that there are no isolated effects of depression and SS and showed an interaction between these factors indicating that within participants with higher social SS, the non-depressed

group reveal higher levels of functionality than the depressed group. Although in line with literature (MacKean & Abbott-Chapman, 2012), these results should be interpreted with caution because functionality was assessed using a traditional scale of IADL and not by a room of activities in daily living. On the other hand, the participants own evaluation of their functionality may be biased by the services provided by the institution itself, such as meal preparation, laundry, and medication management. However other psychosocial variables must be considered (e.g. helping someone do their daily activities while respecting their independence and autonomy). Regarding QoL, our study showed main effects of depression and SS on this domain. The interaction describes that higher QoL was reported by non-depressed participants with greater perception of SS. This finding corroborates some studies reporting that the quality of contacts and social bonds, as well as perceived SS are related to depressive symptomatology (Elsayed et al., 2019; Mohd et al., 2019; Taylor et al., 2018) and QoL (Castellanos, 2010; Júnior et al. 2019). As previously mentioned, their high perception of SS received may be related to the solving/satisfaction of the ADL, leading to a false perception of independence. In addition, the instrument used to assess QoL focuses on the evaluation of domains such as mobility, ADL, occupational and leisure activities, which may be inherent to the institutionalization process itself. The possibility that some subjects may have this awareness and the probable emotional frailty caused by depressive symptomatology may explain the lower level of QoL. The lack of effects of depression and SS on the global cognitive ability provides an additional guarantee of the adequacy of participants' cognitive status for this study. However, the fact that the descriptive results of the FAB are lower than the cut-off point suggested by Dubois et al. (2000), seems to support the theory of the frontal hypothesis proposed by West (1996). Considering the age of the participants, this result may be due to the biological changes caused in the frontal lobes by ageing.

The sample size and the use of traditional questionnaires to evaluate the functionality are the main limitations that should be discussed. In the future, in order to obtain a more rigorous and ecological assessment, it is suggested to use measures with ecological validity to assess the functionality. In summary, this study provides evidence that SS does not have an isolate effect on cognitive flexibility, response sequencing, and inhibitory control, and that depression has an influence on global frontal outcomes and inhibitory control. More importantly, our data indicates an interaction between depression and SS in the explanation of certain domains of frontal functioning, functionality, and QoL. This suggests better results for elderly adults without depression and with higher perception of SS. These findings may highlight the relevance of considering depressive symptomatology, but also other factors related to social isolation and loneliness in the explanation of cognitive performance, functionality, and QoL.

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Competing Interests

The authors have declared that no competing interests exist.

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