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# Resilience, anxiety, and depression in amyotrophic lateral sclerosis patients

## Rezyliencja, lęk i depresja u pacjentów ze stwardnieniem zanikowym bocznym

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Abstract

**Introduction:** Research into amyotrophic lateral sclerosis often focuses on the purely medical aspects of the disease, without paying attention to patient's experience, suffering and difficulties they face on a daily basis. The aims of this study were to describe resilience and investigate its relationship with psychological well-being, measured as depression and anxiety in a sample of adult patients with different levels of amyotrophic lateral sclerosis severity. **Methods:** This was a cross-sectional study conducted in Sardinia (Italy). The study took place between January 2017 and June 2017. Thirty-one amyotrophic lateral sclerosis patients (55% males; mean age = 63.8 years; standard deviation, $SD$ = 9.6) were included in the study. They were recruited from one of the main regional centres for amyotrophic lateral sclerosis treatment on the island, and represented the total population of amyotrophic lateral sclerosis patients in the territory in question. Their age ranged from 37 to 81 years ($M$ = 63.81; $SD$ = 9.63). Assisted by the staff, they completed the Connor–Davidson Resilience Scale and the Hospital Anxiety and Depression Scale. **Results:** A significant, strongly negative correlation was found between resilience and psychological well-being. Moreover, the level of depression decreased with the increasing time after the diagnosis, but it increased with patient's age. **Conclusions:** In view of the results obtained, it can be hypothesised that proper psychological support designed to promote the activation of resilience resources could help an amyotrophic lateral sclerosis patient cope with negative emotions, pain, and difficulties that accompany the disease. Furthermore, these findings suggest assessing resilience in amyotrophic lateral sclerosis patients to better characterise the risk of mood disorders and direct mental health screening efforts.

**Keywords:** amyotrophic lateral sclerosis, resilience, anxiety, depression

Streszczenie

Badania dotyczące stwardnienia zanikowego bocznego często skupiają się na czysto medycznych aspektach choroby i nie uwzględniają doświadczeń i trudności, z jakimi pacjenci borykają się na co dzień. Celem niniejszego badania było opisanie rezyliencji (prężności psychicznej) oraz zbadanie jej związku z dobrostanem psychicznym, mierzonym występowaniem depresji i lęku w grupie dorosłych chorych na stwardnienie zanikowe boczne o różnym stopniu nasilenia. **Metody:** Autorzy prowadzili przekrojowe badanie na Sardynii (Włochy) w okresie od stycznia do czerwca 2017 roku. Do badania włączono 31 osób ze stwardnieniem zanikowym bocznym (mężczyźni: 55%, średnia wieku: 63,8 roku, odchylenie standardowe: 9,6), przebywających w jednym z głównych lokalnych ośrodków zajmujących się leczeniem stwardnienia zanikowego bocznego. Wiek pacjentów, reprezentujących całą populację chorych w omawianym regionie, mieścił się w przedziale od 37 do 81 lat ($M$ = 63,81; $SD$ = 9,63). Z pomocą personelu uczestnicy badania uzupełnili skalę rezyliencji Connor–Davidsona (Connor–Davidson Resilience Scale) oraz Szpitalną Skalę Lęku i Depresji (Hospital Anxiety and Depression Scale). **Wyniki:** Stwierdzono istotną, silnie ujemną korelację między rezyliencją a dobrostanem psychicznym. Ponadto zaobserwowano spadek nasilenia depresji wraz z upływem czasu od rozpoznania choroby oraz jej wzrost wraz z wiekiem pacjenta. **Wnioski:** W świetle uzyskanych wyników można przyjąć hipotezę, iż odpowiednie wsparcie psychologiczne sprzyjające aktywacji zasobów rezyliencji może pomóc chorym na stwardnienie zanikowe boczne w radzeniu sobie z negatywnymi emocjami, bólem i trudnościami towarzyszącymi tej chorobie. Ponadto uzyskane wyniki wskazują na potrzebę oceny rezyliencji u osób ze stwardnieniem zanikowym bocznym w celu lepszej charakterystyki ryzyka wystąpienia zaburzeń nastroju oraz odpowiedniego ukierunkowania badań przesiewowych w zakresie zdrowia psychicznego.

**Słowa kluczowe:** stwardnienie zanikowe boczne, rezyliencja, lęk, depresja

**What is already known about this topic**
- Different research has studied resilience in amyotrophic lateral sclerosis (ALS) caregivers.
- Little is known regarding resilience in ALS patients.

**What this paper adds**
- Given that resilience represents one of the patient's most important resources, this research offers a comprehensive overview on resilience in a sample of ALS patients.
- Resilience was analysed in a relationship with depression, anxiety as well as clinical and demographic variables.
- We also analysed the role of resilience and psychological well-being among patients at different stages of the disease.

Various research studies in the field of psychology have investigated different aspects of pathology and its impact on patients and their loved ones. The area most commonly investigated in ALS patients at the psychological level is the construct of quality of life (QoL). The psychological component of this dimension, particularly in a degenerative pathology such as ALS, is very important (Pagnini, 2013). Anxiety and depression have been investigated most thoroughly as they threaten psychological well-being (Lulé et al., 2008). Studies have shown that anxiety is significantly higher in the diagnosis phase, not connected in a decisive way to the pathology as such, and positively correlated with depression, the rapid progression of pathology, and low life satisfaction (Vignola et al., 2008). Other studies observed that the level of depression is highly significant in predicting patients' mortality and is positively correlated with a high level of pathology severity, particularly in the initial stage of ALS (CD-RISC: Home, 2016). A study conducted by Lulé et al. (2008) found a significant negative correlation between patients' education level and the gravity of their depressive symptoms; this is probably due their greater ability to develop coping strategies compared to patients with lower education.

Resilience can be considered as a combination of personality traits and physiological characteristics (Thakore and Pioro, 2016), and it is referred to as the capability of a strained body to recover and adapt its size and shape after alterations caused by stressor events (Zani and Cicognani, 2008). It is well known how important resilience is in influencing psychological well-being, and this influence has been widely demonstrated in both normative and clinical populations (CD-RISC: Home, 2016). In particular, literature shows the positive effects of resilience on anxiety and depression in individuals affected by serious diseases, such as multiple sclerosis (Black and Dorstyn, 2015).

To our knowledge, most research has focused on resilience in ALS caregivers, and only a few studies have investigated resilience in ALS patients (Hogg et al., 1994; Rabkin et al., 2000; Tedman et al., 1997). However, it was not their primary focus and they did not employ validated instruments to measure the construct. Given that resilience represents one

of the patient's most important resources, which is of great value for a successful psychological intervention, we decided to address this gap in the literature. Hence, the aims of the present study were to describe resilience in a sample of ALS patients and analyse its relationship with depression, anxiety as well as clinical and demographic variables. Our further aim was to investigate the possible changes in the role of resilience at different stages of the disease by assessing the presence of differences in the strength of the link between resilience (both overall and subdimensions) and psychological well-being among patients at different stages of the disease.

## METHODS

### Participants

This was a cross-sectional study conducted in Sardinia (Italy). The study took place between January 2017 and June 2017. A total of 31 ALS patients living in the Italian region of Sardinia, including 55% of males (males: 17; females: 14), were included in the study. They were recruited from one of the main regional centres for ALS treatment on the island, and represented the total population of ALS patients in the territory in question. The participants were asked to take part in the research during their periodical medical examination. Questionnaires were administered at patients' homes by trained psychologists. The age of patients ranged from 37 to 81 years ($M = 63.81$; standard deviation, $SD = 9.63$), while the average time after a definite ALS diagnosis was 4.45 years ($SD = 3.14$). As for the education level, eight patients finished primary school, twelve had middle school education, five had high school education, and five declared a degree. One participant was illiterate. All patients were classified according to King's clinical staging system (Balendra et al., 2015) based on the assessment of sequential clinical milestones in ALS progression. Six patients were classified as stage 1 (i.e. symptom onset, functional involvement of one central nervous system region); 5 as stage 2 (i.e. involvement of two central nervous system regions); 5 as stage 3 (i.e. three regions involved); and 15 as stage 4. Informed consent was obtained from each participant included in the study.

### Instruments

The Connor–Davidson Resilience Scale (CD-RISC) (Connor and Davidson, 2003; Italian version: Di Fabio and Palazzeschi, 2012) is a tool developed to quantify resilience in clinical patients using a short self-assessment scale. It is composed of 25 items on a 5-point Likert scale (0 = "not at all true"; 4 = "nearly always true"), and comprises 5 subscales: Personal Competence, Tolerance to Negative Affect, Positive Acceptance, Personal Control, and Spiritual Orientation. The overall resilience score is a sum of responses to all the items (range: 0–100). The scale has been

translated into different languages, including the Italian version used in this study, and all versions have demonstrated validity and reliability of the CD-RISC, as well as excellent internal coherence, with a Cronbach's alpha between 0.82 and 0.93 in various research studies (CD-RISC: Home, 2016). In this study, the Cronbach's alpha value for overall reliability was 0.93. The subscales' Cronbach's alpha values ranged from 0.60 to 0.89.

The Hospital Anxiety and Depression Scale (HADS) (Zigmond and Snaith, 1983) is a short self-assessment test designed to measure anxiety and depression, which "are not seen in a specifically clinical perspective, but as the intrinsic components of the experience of illness," in patients affected by organic pathologies (Fossati and Marzocchi, 2008). The HADS is composed of 14 items assessed on a 4-point Likert scale (from 0 to 3) and contains 2 subscales: Anxiety and Depression. The study used the Italian version of the tool (Costantini et al., 1999), validated in a study conducted in cancer patients, which showed its good reliability (Cronbach's alpha for the depression dimension = 0.71, and for anxiety = 0.86). The Cronbach's alpha values for this study were 0.87 and 0.82 for anxiety and depression scales, respectively.

## Data analysis

As a first step, we computed descriptive statistics for all study variables, namely anxiety and depression, overall resilience, and resilience subscales, and tested for the presence of differences in depression, anxiety and resilience linked to socio-demographic variables, using one-way ANOVA. For resilience dimensions, we performed a one-way within-subjects ANOVA to test for the presence of significant differences among subscales. The levels of resilience at different stages of the disease were reported, testing for possible differences using a one-way between-subjects ANOVA. Thereafter, in order to investigate the relationships between resilience and other study variables, Spearman's correlations were calculated among the CD-RISC overall and subscale scores as well as depression and anxiety, demographics, and clinical variables (i.e. time from diagnosis). The relationship between resilience and ALS stage was analysed with a one-way ANOVA using the ALS stage as a predictor and the CD-RISC scores as dependent variables. Lastly, using the Fisher's Z test, we tested for the presence of significant differences in the strength of correlations between resilience and depression and anxiety among patients at different stages of the disease.

## RESULTS

Tab. 1 shows the descriptive statistics related to the study variables and normative values for the general Italian population. We performed a repeated measure ANOVA to test for the presence of significant differences among different resilience subscales. No significant differences emerged,

| | Study sample | | | | General population | |
|---|---|---|---|---|---|---|
| | Min | Max | M | SD | M | SD |
| **HADS** | | | | | | |
| Anxiety | 1 | 18 | 8.26 | 4.91 | 7.6 | 4.4 |
| Depression | 0 | 14 | 5.68 | 4.45 | 5.4 | 4.0 |
| **CD-RISC** | | | | | | |
| Overall resilience | 27 | 92 | 60.48 | 19.06 | 74.16 | 9.99 |
| Personal competence | 0.63 | 4.00 | 2.55 | 0.96 | | |
| Tolerance negative affect | 0.57 | 3.57 | 2.27 | 0.80 | | |
| Positive acceptance | 0.60 | 4.00 | 2.45 | 0.87 | | |
| Personal control | 0.33 | 4.00 | 2.48 | 1.04 | | |
| Spiritual orientation | 0.50 | 4.00 | 2.23 | 1.06 | | |
| *Note:* General population norms are reported when available. | | | | | | |

Tab. 1. Descriptive statistics of study variables

with Wilk's Lambda = 0.83, $F(4, 27) = 1.35$, and $p = 0.28$. In terms of the effects of disease stage on resilience, we performed a one-way ANOVA for the overall resilience and for each of the resilience subscales (descriptive statistics by ALS stage are reported in Tab. 2). No significant differences emerged. The scores obtained for the anxiety subscale in the HADS showed no anxiety in 48% of the participants, mild to severe anxiety in the remaining 52%; 65% of patients did not present depressive symptomatology, while the others had mild to moderate depression and there were no patients with severe depression.

Tab. 3 shows significant correlations, which were negative between resilience (overall and subscales) and anxiety and depression, positive between depression and anxiety, positive between anxiety and depression and patient age, and negative between time from diagnosis and depression. The strength of these correlations ranged from moderate to strong; the strongest relationship was found between anxiety and depression. In the CD-RISC subscales,

| | Stage 1 | | Stage 2 | | Stage 3 | | Stage 4 | |
|---|---|---|---|---|---|---|---|---|
| | M | SD | M | SD | M | SD | M | SD |
| **HADS** | | | | | | | | |
| Anxiety | 9.25 | 4.99 | 8.33 | 7.09 | 6.33 | 4.16 | 8.33 | 4.99 |
| Depression | 5.50 | 2.89 | 4.67 | 5.51 | 4.67 | 2.08 | 6.00 | 4.96 |
| **CD-RISC** | | | | | | | | |
| Overall resilience | 67.50 | 12.82 | 57.00 | 30.05 | 57.00 | 22.54 | 60.14 | 19.11 |
| Personal competence | 3.03 | 1.12 | 2.33 | 1.20 | 2.46 | 1.30 | 2.51 | 0.91 |
| Tolerance negative affect | 2.39 | 0.07 | 2.29 | 1.27 | 2.05 | 1.09 | 2.28 | 0.82 |
| Positive acceptance | 2.70 | 0.68 | 2.07 | 1.22 | 2.40 | 0.40 | 2.47 | 0.93 |
| Personal control | 2.92 | 0.74 | 2.44 | 1.50 | 2.11 | 1.26 | 2.46 | 1.05 |
| Spiritual orientation | 2.13 | 0.48 | 2.33 | 1.04 | 2.33 | 1.76 | 2.21 | 1.11 |

Tab. 2. Descriptive statistics of outcome variables by ALS stage

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| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CD-RISC** | | | | | | | | | | |
| 1. Overall resilience | | | | | | | | | | |
| 2. Personal competence | 0.918** | | | | | | | | | |
| 3. Tolerance negative affect | 0.863** | 0.701** | | | | | | | | |
| 4. Positive acceptance | 0.891** | 0.745** | 0.702** | | | | | | | |
| 5. Personal control | 0.863** | 0.777** | 0.707** | 0.717** | | | | | | |
| 6. Spiritual orientation | 0.273 | 0.098 | 0.085 | 0.341 | 0.119 | | | | | |
| **HADS** | | | | | | | | | | |
| 7. Anxiety | −0.576** | −0.507** | −0.478** | −0.641** | −0.504** | −0.015 | | | | |
| 8. Depression | −0.699** | −0.619** | −0.569** | −0.664** | −0.595** | −0.294 | 0.815** | | | |
| 9. Gender | −0.231 | −0.222 | −0.253 | −0.237 | −0.217 | 0.207 | 0.354 | 0.244 | | |
| 10. Age | −0.110 | −0.088 | −0.224 | 0.012 | −0.068 | 0.004 | 0.362* | 0.445* | 0.190 | |
| 11. Time from diagnosis | 0.036 | −0.011 | −0.028 | 0.133 | −0.025 | 0.203 | −0.310 | −0.392* | 0.014 | −0.168 |
| * $p < 0.05$, ** $p < 0.001$. | | | | | | | | | | |

*Tab. 3. Pearson's correlations (r) between resilience, anxiety, depression, gender, age, and time from diagnosis*

a strong positive correlation was found between the various dimensions and the total score, and there was a moderate negative correlation between the subscales and the patients' anxiety and depression levels; the only exception was Spiritual Orientation, which revealed a non-significant correlation. For education level, none of the variables in the study showed significant differences, with the only exception being depression, which was significantly higher among individuals with lower education levels ($F(3, 27) = 5.23$, $p = 0.04$). Lastly, for the clinical variables, there were no significant associations between resilience and time from diagnosis ($r \leq 0.20$, $p > 0.05$) or the stage of the disease, as defined by King's system ($F(3, 27) \leq 0.39$, $p > 0.05$). Furthermore, no significant differences ($p > 0.05$) were found in the strength of correlation between resilience dimensions and depression and anxiety among patients at different stages of the disease.

## DISCUSSION

ALS patients show significantly higher anxiety and depression compared with the general population. The data obtained showed that the percentage of patients with moderate-to-severe depressive symptoms was lower than in other research studies conducted previously using the same instruments to study ALS patients ($p < 0.05$). Indeed, 19% of cases in our sample scored over 11 points in contrast to 44% reported by Hogg et al. (1994) and 35% reported by Tedman et al. (1997). As for resilience, we found that its levels in ALS patients in our sample are on average significantly lower than those reported for a healthy population in Italy, $t(67) = 3.61$, $p < 0.001$ (Ghisi et al., 2013). This is not surprising, and it is in line with literature investigating resilience in clinical populations. More specifically, we found that all resilience dimensions (i.e. Personal Competence, Tolerance to Negative Affect, Positive Acceptance, Personal Control, and Spiritual Orientation) were strongly correlated, among other things, with the exception of Spiritual

Orientation, which appeared to be not related to other resilience components. This was probably due to the specificity of the spiritual and religious ways of dealing with stressful events. Thus, the role of religiosity and spirituality in dealing with illness should be studied in more detail. In our sample, no differences in resilience dimensions were found; this could be due to the specificity of the sample, the salient features of the disease, or the characteristics of the Italian version of the CD-RISC. Moreover, both overall resilience and the dimensions of resilience were not affected by the stage of ALS, thus leading us to believe that resilience is not linked to the purely physical impairment involved in the disease.

The results of the present study revealed that a strong relationship exists between negative emotions in ALS and protector factors tied to individual resilience resources, which can help in coping. In view of the strong negative correlation between total CD-RISC scores and the levels of anxiety and depression in the sample, we could hypothesise that the low level of resilience in ALS patients is responsible for the higher level of negative emotions. On the other hand, the significant negative correlation between the CD-RISC subscales (except for Spiritual Orientation) and the HADS scores could suggest that anxiety and depression cause an inhibition of some components of resilience, which are therefore lower in patients with higher HADS scores. It is also possible that some sort of circular reaction is triggered, meaning that low resilience leads to an increase in anxiety and depression, which in turn increasingly inhibit the patient's remaining resilience resources (which would explain the difference from the average healthy population and the negative correlation). However, this is not certain since there is no data on the resilience in each patient in the period preceding the disease.

As for resiliency, we did not find a correlation between ALS stages and the levels of anxiety and depression; this could confirm the fact that in a disease such as ALS, the individual's well-being is not determined by the physical domain of

life, but explained by the various dimensions of resilience. Moreover, the analysis of the link between each patient's clinical information and the scores in the two tests revealed a negative relationship between the time from diagnosis and depression, suggesting that the initial negative reaction to the discovery of the disease later becomes a more functional response focusing on adapting to the situation, as in line with previous studies (Hillemacher et al., 2004). This finding contradicts previous research findings that highlighted the presence of a positive correlation between depression and disease duration. A more in-depth study could be useful to disambiguate the issue (e.g. by applying a longitudinal design to follow psychological well-being trends starting from the diagnosis).

With regard to the patients' education level, the strongly negative correlation between this variable and depression can be seen as a confirmation of the study by Lulé et al. (2008) cited above. This is probably because educated participants have a greater capacity to trigger adaptive mechanisms in order to cope with depressive experiences. In addition, the positive correlation between participant age and the level of anxious-depressive symptomatology could be explained by the greater ability of younger participants to develop coping strategies to deal with the negative experiences related to the illness.

Study limitations include a small sample size and possible bias, since this was not a random sample. The geographic provenance of participants is very homogeneous and this could represent a limitation to the generalisability of results; further studies recruiting more subjects from different regions/areas are needed to confirm our findings.

On the whole, our findings have relevant implications: the influence of resilience on individual competence in dealing with the disease indicates the need to identify factors linked to different levels of resilience. Furthermore, specific interventions could be developed to improve or consolidate individual's resilience during disease progression.

## Ethical approval

## Informed consent

## Conflict of interest

## Funding/Support and role of the sponsor

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