Use of coping strategies in MND/ALS: association with demographic and disease-related characteristics

Schlüter DK1, Holland DP2, Mills RJ2,3, McDermott CJ4, Williams T5, Young CA2,3 on behalf of the TONiC study group~

1 Lancaster University, UK

2 University of Liverpool, UK

3 Walton Centre NHS Trust, Liverpool, UK

4 Sheffield Institute for Translational Neuroscience University of Sheffield, Sheffield, UK

5 Royal Victoria Infirmary, Newcastle upon Tyne, UK

**Corresponding author:** Schlüter DK, Centre for Health Informatics, Computing and Statistics, Lancaster Medical School, Faculty of Health and Medicine, Lancaster University, Lancaster LA1 4YW, UK; e-mail: d.schlueter@lancaster.ac.uk

Word Count:3356

Running title:

Use of coping strategies in MND/ALS

Abstract

Objective

Understanding the use of coping strategies and which factors are associated with strategy utilisation might help clinical staff anticipate which coping strategies individuals are more likely to utilise. In this study, we assess coping strategy use in the Motor Neuron Disease (MND, also known as Amyotrophic lateral sclerosis (ALS)) population and examine associations of demographic and disease variables with individual coping strategies.

Participants and Methods

233 participants with MND/ALS were recruited into the ongoing Trajectories of Outcomes in Neurological Conditions study from MND clinics across the United Kingdom. Participants completed a questionnaire pack collecting data on demographics and a range of patient reported measures including the Coping Orientations to Problems Experienced scale. Associations between demographic and clinical characteristics and coping strategies were examined by simple and multiple ordinal logistic regression.

Results

The most commonly used strategy was Acceptance, followed by Active Coping, Planning and Positive Re-interpretation and Growth. The least used strategies were Substance Use, Turning to Religion and Denial. Ten out of the fifteen strategies showed statistically significant associations with demographic and clinical characteristics. Most markedly, females were found to utilise many strategies more than males, namely Restraint, Seeking Instrumental Social Support, Seeking Emotional Social Support, Focus on and Venting of Emotions, Behavioural Disengagement, and Mental Disengagement.

Conclusion

Clinical staff should be aware that coping strategy use is associated with several demographic and disease characteristics. Targeted advice on coping may improve coping capacity and facilitate psychosocial adjustment.

Keywords: Amyotrophic Lateral Sclerosis, coping, Motor Neuron Disease, psychological adjustment, quality of life, TONiC

Introduction

Motor Neuron Disease (MND, also known as Amyotrophic lateral sclerosis (ALS)) describes a group of diseases characterised by progressive degeneration of the motor neurons controlling voluntary muscles. This leads to widespread muscle weakness and wasting, affecting voluntary movement, speech, swallowing and breathing. Most people with MND die of respiratory failure within 3 to 5 years of symptom onset 1,2. Currently there is no cure available and thus the main focus of care is on treating symptoms and improving quality of life. Previous studies have found that quality of life in MND is substantially affected by psychological factors and support from family and friends 3-7. The constantly changing stresses of a progressively disabling, incurable and terminal condition like MND place considerable demands on patients’ coping abilities.

Coping involves ‘cognitive and behavioural efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person’ 8. There are two main groups of coping strategies, those that alter the situation that is causing distress (problem-focussed strategies) and those that reduce or manage the emotional response to the stressor (emotion-focussed strategies ) 8. These two types of coping are complementary and are generally used together 8, including in MND 9,10. Both cross-sectional and longitudinal studies have found that coping capacity and the strategies used affect depressive symptoms and quality of life 5,6,9,11,12.

The role of coping strategies in adjustment to MND has been the focus of a number of small studies 6,9,12. The use of support and positive action have been found to correlate with lower levels of depression and anxiety, as measured by the Hospital Anxiety and Depression Scale 13, whereas avoidance and venting were positively correlated with increased levels of anxiety 12. Similarly, patients who use positive action, positive thinking and independence were found to have fewer symptoms of depression 9. The use of a group of coping strategies consisting of active coping, acceptance, planning and positive reframing has even been suggested to increase survival 14.

Despite the evidence for the positive or negative impact of individual coping strategies, little is known about association between demographic and disease characteristics and the strategies patients turn to. One study by Montel and colleagues with 49 MND patients showed that age affected the use of emotional support, venting, positive reframing, planning, and humour, and that acceptance, positive reframing and humour were used more with increasing disease duration; onset type and functional status also showed some associations with strategy utilisation 15. Other studies have not found any correlations of strategy use with demographic characteristics or have found changes in these over time 10,12. The conflicting evidence may be due to the small sample sizes or the different instruments used in these studies. In order to increase the understanding of overall coping strategy use in MND patients and which factors affect the probability of an individual turning to a certain strategy, we address these questions using a very large population sample in the UK who completed the generic and broad ‘Coping Orientations to Problems Experienced’ (COPE60) questionnaire 16.

 Methods

Data Collection

Participants with MND/ALS, diagnosed according to El Escorial World Federation of Neurology criteria for the diagnosis of amyotrophic lateral sclerosis17, were recruited into the ongoing Trajectories of Outcomes in Neurological Conditions (TONiC) study from specialist clinics across the United Kingdom. Cases with a family history of MND/ALS were eligible as were patients with only lower motor neuron (LMN) signs in 2 or more regions, or with progressive primary lateral sclerosis without spinal LMN signs, provided a consultant neurologist specialising in MND/ALS had confirmed the diagnosis.

Participants were excluded if they were unable to give informed consent or unable to complete self-report questionnaires even with help from a scribe.

Following informed consent, participants completed a questionnaire pack, which could be done with the assistance of a caregiver acting as scribe if the patient could not write. Demographic and disease-specific data, as well as a range of patient reported measures, were collected in the pack. Demographic data included age, sex and marital status, where ‘single’, ‘widowed’ and ‘divorced’ were combined to ‘not married’. Disease specific data included time since diagnosis (‘disease duration’), onset type and functional ability in the limb, bulbar and respiratory domains captured by the ALS Functional Rating Scale Revised (ALSFRS-R)18. Confirmation of the clinical diagnosis, onset type and disease duration were additionally collected from a health care professional familiar with the patient's case. Ethical approval was granted from the relevant local research committees (reference 11/NW/0743). In this study we analysed data collected between November 2013 and October 2015.

Coping

Amongst the patient reported measures was the Coping Orientations to Problems Experienced (COPE60)16 inventory, which was used in this study to assess ‘dispositional coping’, i.e. the extent to which the respondents usually use certain coping strategies as opposed to ‘situational’ coping which would reflect how individuals cope with a specific situation. The inventory consists of 15 scales with 4 items each and includes problem focused coping strategies (active coping, planning, suppression of competing activities, restraint, seeking of instrumental social support), emotion focused coping strategies (seeking of emotional social support, positive reinterpretation and growth, acceptance, denial, turning to religion) and other coping strategies (focus on and venting of emotions, behavioural disengagement, emotional disengagement, humour, substance use). Table S1 in the Supplementary Material defines each of the 15 strategies. Test--retest reliability of this scale has been reported to be between .42 and .89 at 6 weeks and from .46 to .86 at 8 weeks16.

Participants report their responses to each item on a 4-point Likert scale (1 = I usually don't do this at all, 2 = I usually do this a little bit, 3 = I usually do this a medium amount, 4 = I usually do this a lot). The responses to the four items of any one scale are summated such that the use of each coping strategy is scored 0-12. For statistical analysis we collapsed these scores into 5 groups (‘Not at all’, ‘A little’, ‘More than a little’, ‘A moderate amount’, ‘A lot’) in order to ensure that groups weremore reasonably populated (see Figure 1).

Data Analysis

Overall coping strategy use was assessed using the following summary measures: mode, median, 25% and 75% percentiles, minimum and maximum value.

Rasch analysis19 was applied to the ordinal response data of the ALSFRS-R in order to arrive at interval level scales for the three domains: bulbar, limb and respiratory.

Ordinal logistic regression with cumulative logits was used to assess the associations of coping strategy use with demographic and disease specific characteristics. Proportional odds were assumed where this agreed with the available data. The proportional odds assumption was tested using a likelihood ratio test with a cut-off for significance at p<0.01 and, where the test was significant, the parameter estimates for the different levels were investigated to ensure that the proportional odds assumption was only rejected if there were clear differences in the effect of the covariate on strategy usage at the different levels and a clear trend was recognisable. This was done to ensure that the assumption of proportional odds was only rejected if there was strong evidence against it.

Univariable ordinal logistic regression was carried out initially. For coping strategies where one or more covariates were statistically significant at the 5% level, a multiple ordinal logistic regression model was developed using forward selection. In all cases, significance was assessed using a likelihood ratio test.

The statistical analysis was conducted using R version 3.3.1 and the vglm function of the VGAM package20 with the ‘cumulative’ and ‘reverse=TRUE’ VGAM family function options. Only complete cases were included in the analysis.

Results

267 individuals completed the quastionnaire pack, which included the COPE60, of which 233 participants had complete coping and covariate data. Missing data was primarily an issue in the disease specific information (see Table 1); coping data was incomplete in 5 individuals. Table 1 shows the demographics and disease characteristics of the study population.

Overall coping strategy use

While every strategy was used to some extent, frequency of use varied widely. The most commonly used strategy was *Acceptance*, with 79% of the individuals endorsing usage with a 6 or more on a scale from 0 to 12, including 16% of the study population who endorsed it with the maximum score of 12. This was followed by *Active Coping, Planning* and *Positive Re-interpretation and growth*. The least used strategies were *Substance Use*, for which 82% reported use as 0, *Turning to religion* and *Denial*. Table 2 shows summaries of the overall usage of the 15 different coping strategies. *Associations with demographic and disease specific characteristics*

There was no evidence against the proportional odds assumptions for any of the coping strategies. Results from the univariable and multivariable regression analyses are given as odds ratios with 95% profile likelihood confidence intervals (Tables 3 and 4). Likelihood ratio test p-values from the univariable regression are given in Table S2 in the Supplementary Material.

Problem-focussed strategies

*Active coping* was used more by those with better bulbar function (1.08 (95%CI: 1.01, 1.16)). The use of *Restraint* was associated with both sex and functional ability in the respiratory domain. Females were 1.79 (95%CI: 1.08, 2.95) times as likely as males to use this strategy at higher levels and there was less usage of *Restraint* with increasing functional ability in the respiratory domain (0.868 (95%CI: 0.771, 0.977)). Similarly, *Seeking of instrumental social support* was used at higher levels by females compared to males (1.83 (95%CI: 1.13, 2.97)). The use of *Planning* and *Suppression of competing activities* were not found to be significantly associated with any of the covariates tested.

Emotion-focussed strategies

In the univariable analysis, *Seeking of emotional social support* was found to be associated with sex and disease duration. However, in the multiple regression marital status was found to be significantly associated with *Seeking of emotional social support* after sex was adjusted for, whereas disease duration was no longer a predictor. Females were 2.38 (95%CI: 1.44, 3.94) times as likely to report *Seeking emotional social support* at higher levels compared to males, and married individuals were 2.07 (95%CI: 1.15, 3.72) times as likely to utilise this strategy at higher levels compared to individuals without a spouse. The utilisation of *Positive re-interpretation and growth* and *Denial* were found to increase with greater functional ability in the motor domain (1.06 (95%CI: 1.01, 1.1) and 1.07(95%CI: 1.02, 1.12), respectively). *Turning to religion* was found to be utilised at higher levels with increasing age (1.04(95%CI: 1.01, 1.06)). There was no evidence that the use of *Acceptance* is associated with any of the covariates tested here.

Other strategies

The utilisation of *Focus on and venting of emotions* was found to be associated with sex, age and functional ability in the bulbar domain. Venting was used less with increasing age and better bulbar function (0.964 (95%CI: 0.943, 0.985) and 0.91(95%CI: 0.848, 0.976), respectively). Females were 2.63 (95%CI: 1.6, 4.35) times as likely to use this strategy at higher levels compared to males. *Behavioural and Mental disengagement* were used more by females compared to males (2.05 (95%CI: 1.24, 3.37) and 2.62 (95%CI: 1.58, 4.33), respectively). *Mental disengagement* was used less with longer disease duration (0.795 (95%CI: 0.647, 0.976)). *Substance use* was found to be strongly associated with onset type; limb onset patients were 3.06 (95%CI: 1.15, 8.14) times as likely to use it at higher levels compared to bulbar onset patients. The number of individuals with respiratory onset disease was too low to be able to assess differences in usage compared to bulbar onset. There was no evidence that the utilisation of *Humour* is associated with any of the covariates tested here.

Discussion

This is by far the largest study undertaken to assess the strategies which patients use to cope with the physical and psychological challenges of MND. It demonstrates that people with MND draw on a very diverse repertoire of strategies, varying from those considered positive and beneficial, such as *Acceptance*, to those typically considered maladaptive, such as *Substance abuse*.

The original work on the COPE60 posited “acceptance to be particularly important in circumstances in which the stressor is something that must be accommodated to”16; the current inability to cure or slow MND makes it an exemplar of a stressor which must be accommodated to. In this study *Acceptance* is the most frequently used strategy, in keeping with results from a French population studied by Montel et al.15 Coping through acceptance has been shown to predict more positive adjustment to the diagnosis of cancer 21, and to reduce anxiety and depression in multiple sclerosis22. In chronic pain from muscular dystrophy, multiple sclerosis, post-polio syndrome, or spinal cord injury, pain acceptance related to less emotional distress 23.

While there are many different patterns of use of the different coping strategies, our results show that use of different strategies is significantly associated with factors which are readily evident in clinical care. An individual’s sex was particularly strongly associated with the use of different coping strategies, which reflects the sex differences in coping behaviour found in other studies (see 24 for a review). Other factors include demographic variables, such as age and marital status, and disease characteristics, such as limb or bulbar onset. Understanding of this can help the clinical team appreciate which coping strategies may be more readily accessed by the patient.

We found that females are more likely to *Seek emotional social support* and to *Seek instrumental social support*, i.e. assistance or information about what to do. Social support in MND has been associated with better quality of life 25, so these significant gender differences in use of social support may imply gender differences in behaviours supporting quality of life. However, the reality may be more nuanced. In common with much previous research, the COPE60 addresses in-person social support, and may under-estimate seeking social support through new means such as social media or the internet, which have been shown to be more frequently used for support seeking by males 26.

In this study, females were more than twice as likely to report greater use of coping strategies that may be maladaptive; these are *Behavioural* and *Mental disengagement*, which refer respectively to withdrawing from efforts to achieve a difficult task or psychological disengagement from the task, and *Focus on and venting of emotions*. Greater use of behavioural disengagement has been associated with depression in multiple sclerosis 27 and with a worsening of quality of life in patients with systemic lupus erythematosus 28. Increased use of disengagement and venting of emotions has also been associated with higher levels of depression, anxiety and worse general well-being in patients with end-stage lung disease 29 and with increased levels of anxiety in MND 12. It has been suggested that the negative effects of disengagement on psychological well-being may be mediated by an individual’s perceived control of the situation 30. In a study with chronic pain patients Burri et al. found that the use of *Focus on and venting of emotions* was associated with worse feelings of helplessness as well as increased depression and anxiety 31. The evidence that disengagement is associated with worse outcomes provides vindication for MND/ALS team approaches which seek to engage patients in care decisions, the data from this study shows that females may require more support and encouragement to do this.

*Restraint* refers to coping through holding back attempts to act until their use appears opportune. We found that females use this strategy to a greater extent than males but whether this reflects self-control or lack of confidence to act remains uncertain. Patients with worse respiratory function also use *Restraint*. Patients using *Restraint* may benefit from discussion and advice from professionals to help them decide whether they can act and when.

In keeping with previous research, both religion15 32 and venting of emotions9 were little used but our larger sample size allowed detection of clear age differences in use of these coping strategies; religion was used more with increasing age and venting of emotions less. We did not find other differences in strategy use by age, unlike earlier work with a smaller sample size (n=49) which found that emotional support, venting, positive reframing, planning and humour were used more by patients aged under 55 years.

Use of particular coping strategies is constrained by the patient’s ability to successfully employ a strategy, which may be influenced by their personal situation or disability. We found that the capacity for *Seeking emotional social support* is strengthened by having a partner; married people were over twice as likely to use this strategy at higher levels compared to people of the same sex who are not married. Patients with better motor function were more likely to use *Positive re-interpretation and growth*, where the situation is depicted in a positive light; and *Denial*, where the situation is not acknowledged; both strategies are more viable for patients with less impaired function and greater independence. For those who retain the ability to speak, it is easier to access the coping strategies of *Active coping* through negotiating problem-solving behaviours. While *Substance Use* was rarely cited as a coping strategy, if used it related to alcohol excess and was over 3 times more common in limb compared to bulbar onset patients.

The current cross-sectional results do not allow us to formally assess any causal links between demographic or disease characteristics and coping strategy utilisation. Neither can we determine whether use of coping strategies changes over time, but the influence of disability may be anticipated to alter with disease progression. Earlier work found that longer disease duration was correlated with acceptance, positive reframing and humour 15, which the authors suggested might reflect patients adjusting to the condition. Our analysis shows that with longer disease duration patients are less able to mentally disengage as a means of coping, and are more likely to turn to religion, though overall use of religion for coping remains infrequent.

Awareness of these associations of clinical characteristics with use of different coping strategies will enable clinicians to target input more effectively. Males and individuals without a partner were less likely to seek in-person social support and may therefore benefit from information and advice on different forms of support such as traditional support groups or social media. Females were more likely to disengage and focus on or vent their emotions and may therefore benefit from active efforts by the clinical care team to engage them in decision making. Females and individuals with worse respiratory function had a greater tendency to utilise restraint and may benefit from advice from professionals to help them decide whether and how they can act, and when. Consideration of these data should also remind clinicians that not all strategies are feasible for all people with MND due to their personal situations or the disabilities arising from their disease; examples are positive reinterpretation and denial which were utilised to a much lesser extent by individuals with higher levels of motor impairment.

While people with ALS/MND use a wide range of coping strategies to address the stresses of the illness, patients with particular demographic or disease profiles are more likely to utilise certain strategies. Some of these strategies may be considered maladaptive as they are linked to worse outcomes; patients who are more likely to use such strategies may benefit from more careful monitoring and may need additional support and where available, skilled psychological input to attempt to adapt behaviours and coping strategy use.

Acknowledgements

We thank the participants and their families for their invaluable contributions; the research and clinical staff for recruitment, and the TONiC team. We thank the members of the TONiC study group: A. Al-Chalabi (King’s College London, London, UK), G. Burke (Queen Alexandra Hospital, Portsmouth, UK), D.J. Dick (Norfolk & Norwich University Hospital, Norwich, UK), J. Ealing (Salford Royal Foundation Trust, Manchester, UK), T. Majeed (Lancashire Teaching Hospitals, Preston, UK), A. Pinto (Wessex Neurological Centre, UK), K. Talbot (Nuffield Department of Clinical Neurosciences, University of Oxford, UK). CJM acknowledges support from the NIHR Sheffield Biomedical Research Centre (BRC).

Funding details

This work was supported by the MS Society, the MNDA, the NIHR CLRN, the Neurological Disability Fund 4530, and unrestricted grants from Biogen, Genzyme, Merck, Novartis, Roche and Teva.

Conflict of interest

The authors report no conflicts of interest.

Data availability statement:

The data that support the findings of this study are available from the corresponding author upon reasonable request. The data are not publicly available due to privacy or ethical restrictions.

References

1. Wijesekera LC, Leigh PN. Amyotrophic lateral sclerosis. *Orphanet J Rare Dis.* 2009;4:3.

2. Musaro A. Understanding ALS: new therapeutic approaches. *FEBS J.* 2013;280(17):4315-4322.

3. Goldstein LH, Atkins L, Leigh PN. Correlates of Quality of Life in people with motor neuron disease (MND). *Amyotroph Lateral Scler Other Motor Neuron Disord.* 2002;3(3):123-129.

4. Chio A, Gauthier A, Montuschi A, et al. A cross sectional study on determinants of quality of life in ALS. *J Neurol Neurosurg Psychiatry.* 2004;75(11):1597-1601.

5. Matuz T, Birbaumer N, Hautzinger M, Kubler A. Coping with amyotrophic lateral sclerosis: an integrative view. *J Neurol Neurosurg Psychiatry.* 2010;81(8):893-898.

6. Matuz T, Birbaumer N, Hautzinger M, Kubler A. Psychosocial adjustment to ALS: a longitudinal study. *Front Psychol.* 2015;6:1197.

7. Gibbons C, Thornton E, Ealing J, et al. The impact of fatigue and psychosocial variables on quality of life for patients with motor neuron disease. *Amyotroph Lateral Scler Frontotemporal Degener.* 2013;14(7-8):537-545.

8. Folkman S, Lazarus RS. The relationship between coping and emotion: implications for theory and research. *Soc Sci Med.* 1988;26(3):309-317.

9. Jakobsson Larsson B, Nordin K, Askmark H, Nygren I. Coping strategies among patients with newly diagnosed amyotrophic lateral sclerosis. *J Clin Nurs.* 2014;23(21-22):3148-3155.

10. Tramonti F, Bongioanni P, Fanciullacci C, Rossi B. Balancing between autonomy and support: coping strategies by patients with amyotrophic lateral sclerosis. *J Neurol Sci.* 2012;320(1-2):106-109.

11. Hogg KE, Goldstein LH, Leigh PN. The psychological impact of motor neurone disease. *Psychol Med.* 1994;24(3):625-632.

12. Lee JN, Rigby SA, Burchardt F, Thornton EW, Dougan C, Young CA. Quality of life issues in motor neurone disease: the development and validation of a coping strategies questionnaire, the MND Coping Scale. *J Neurol Sci.* 2001;191(1-2):79-85.

13. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand.* 1983;67(6):361-370.

14. Montel S, Albertini L, Desnuelle C, Spitz E. The impact of active coping strategies on survival in ALS: the first pilot study. *Amyotroph Lateral Scler.* 2012;13(6):599-601.

15. Montel S, Albertini L, Spitz E. Coping strategies as related to medical and demographic data in amyotrophic lateral sclerosis. *Acta Neurol Scand.* 2012;125(2):136-141.

16. Carver CS, Scheier MF, Weintraub JK. Assessing coping strategies: a theoretically based approach. *J Pers Soc Psychol.* 1989;56(2):267-283.

17. Brooks BR. El Escorial World Federation of Neurology criteria for the diagnosis of amyotrophic lateral sclerosis. Subcommittee on Motor Neuron Diseases/Amyotrophic Lateral Sclerosis of the World Federation of Neurology Research Group on Neuromuscular Diseases and the El Escorial "Clinical limits of amyotrophic lateral sclerosis" workshop contributors. *J Neurol Sci.* 1994;124 Suppl:96-107.

18. Cedarbaum JM, Stambler N, Malta E, et al. The ALSFRS-R: a revised ALS functional rating scale that incorporates assessments of respiratory function. BDNF ALS Study Group (Phase III). *J Neurol Sci.* 1999;169(1-2):13-21.

19. Rasch G. Probabilistic models for some intelligence and achievement tests. *Copenhagen: Danish Institute for Educational Research.* 1960.

20. Yee TW. The VGAM Package for Categorical Data Analysis. *J Stat Softw.* 2010;32(10):1-34.

21. Stanton AL, Danoff-Burg S, Huggins ME. The first year after breast cancer diagnosis: hope and coping strategies as predictors of adjustment. *Psychooncology.* 2002;11(2):93-102.

22. Chalk HM. Mind over matter: cognitive - behavioral determinants of emotional distress in multiple sclerosis patients. *Psychol Health Med.* 2007;12(5):556-566.

23. Kratz AL, Hirsh AT, Ehde DM, Jensen MP. Acceptance of pain in neurological disorders: associations with functioning and psychosocial well-being. *Rehabil Psychol.* 2013;58(1):1-9.

24. Tamres LK, Janicki D, Helgeson VS. Sex differences in coping behavior: A meta-analytic review and an examination of relative coping. *Pers Soc Psychol Rev.* 2002;6(1):2-30.

25. Lule D, Pauli S, Altintas E, et al. Emotional adjustment in amyotrophic lateral sclerosis (ALS). *J Neurol.* 2012;259(2):334-341.

26. Rife SC, Kerns KA, Updegraff JA. Seeking support in response to social and achievement stressors: A multivenue analysis. *Pers Relationship.* 2016;23(2):364-379.

27. Lode K, Bru E, Klevan G, Myhr KM, Nyland H, Larsen JP. Depressive symptoms and coping in newly diagnosed patients with multiple sclerosis. *Mult Scler.* 2009;15(5):638-643.

28. Rinaldi S, Ghisi M, Iaccarino L, et al. Influence of coping skills on health-related quality of life in patients with systemic lupus erythematosus. *Arthritis Rheum.* 2006;55(3):427-433.

29. Taylor JL, Smith PJ, Babyak MA, et al. Coping and quality of life in patients awaiting lung transplantation. *J Psychosom Res.* 2008;65(1):71-79.

30. Dijkstra MTM, Homan AC. Engaging in Rather than Disengaging from Stress: Effective Coping and Perceived Control. *Frontiers in Psychology.* 2016;7.

31. Burri A, Gebre MB, Bodenmann G. Individual and dyadic coping in chronic pain patients. *J Pain Res.* 2017;10.

32. Hogden A, Greenfield D, Nugus P, Kiernan MC. What influences patient decision-making in amyotrophic lateral sclerosis multidisciplinary care? A study of patient perspectives. *Patient Prefer Adherence.* 2012;6:829-838.

Figures

**Figure 1: Method for collapsing COPE60 outcome scores into groups for analysis**

****

Tables

Table 1: Demographics of the study population

|  |  |  |
| --- | --- | --- |
|  | Summary statistics in the study population | Number of individuals for whom these data are missing |
| N | 233 |  |
| age (mean (sd)) | 64.42 (11.09) | 0 |
| sex = M (N (%)) | 148 (63.5) | 0 |
| status = married (N (%)) | 183 (78.5) | 5 |
| Duration in months since diagnosis (median [IQR]) | 18.10 [8.70, 41.00] | 17 |
| onset\_type  |  | 16 |
|  Bulbar (N (%)) | 61 (26.2) |  |
|  Limb (N (%)) | 169 (72.5) |  |
|  Respiratory (N (%)) | 3 (1.3) |  |
| ALSFRS-R bulbar (median [IQR]) | 8.16 [5.89, 12.00] | 1 |
| ALSFRS-R motor (median [IQR]) | 13.19 [9.85, 16.66] | 1 |
| ALSFRS-R respiratory (median [IQR]) | 11.09 [9.55, 12.00] | 5 |

Table 2: Coping strategy usage summary

 

Table 3: Odds ratios and 95% profile likelihood confidence intervals resulting from the univariable regression analyses. All figures are rounded to 3 significant digits and significant results are highlighted in red.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Sex=male | Age | Marital status=maried | Log(disease duration) | Onset type=Limb | Onset type=Respiratory | ALSFRS-R bulbar | ALSFRS-R motor | ALSFRS-R respiratory |
| Active coping | 0.883(0.544,1.43) | 0.99(0.969,1.01) | 1.01(0.57,1.78) | 1.06(0.869,1.3) | 1.17(0.689,2) | 2.15(0.257,17.9) | 1.08(1.01,1.16) | 1.02(0.979,1.06) | 1.06(0.944,1.19) |
| Restraint | 0.595(0.362,0.977) | 1.02(0.994,1.04) | 0.748(0.42,1.33) | 0.956(0.781,1.17) | 1.24(0.722,2.13) | 3.35(0.399,28.2) | 1.02(0.95,1.09) | 1.01(0.965,1.05) | 0.881(0.784,0.99) |
| Seeking of instrumental social support | 0.547(0.337,0.889) | 0.992(0.972,1.01) | 1.13(0.642,1.98) | 1.05(0.862,1.28) | 0.935(0.553,1.58) | 1.09(0.136,8.73) | 1(0.939,1.07) | 1.01(0.969,1.05) | 1.01(0.901,1.13) |
| planning | 0.844(0.523,1.36) | 0.985(0.964,1.01) | 0.856(0.488,1.5) | 0.998(0.819,1.22) | 1.06(0.625,1.79) | 9.77(0.809,118) | 1.07(0.999,1.14) | 1.03(0.988,1.07) | 1.08(0.967,1.21) |
| Suppression of competing activities | 0.686(0.419,1.12) | 0.997(0.976,1.02) | 1.27(0.712,2.25) | 0.857(0.699,1.05) | 1.01(0.589,1.73) | 1.75(0.206,14.8) | 0.998(0.931,1.07) | 1.04(0.995,1.08) | 0.966(0.861,1.09) |
| Seeking of emotional social support | 0.499(0.307,0.81) | 0.987(0.967,1.01) | 1.58(0.899,2.78) | 0.817(0.669,0.996) | 0.771(0.456,1.3) | 0.966(0.121,7.7) | 1(0.94,1.07) | 1.02(0.976,1.06) | 1.02(0.911,1.14) |
| Positive reinterpretation and growth | 0.775(0.479,1.25) | 0.982(0.962,1) | 0.761(0.433,1.34) | 1.01(0.831,1.24) | 1.14(0.671,1.93) | 1.45(0.18,11.7) | 1.06(0.987,1.13) | 1.06(1.01,1.1) | 1.02(0.913,1.15) |
| Denial | 0.729(0.447,1.19) | 1.01(0.987,1.03) | 0.96(0.541,1.71) | 0.866(0.706,1.06) | 0.817(0.478,1.4) | 0.643(0.0738,5.61) | 1(0.934,1.07) | 1.07(1.02,1.12) | 0.997(0.888,1.12) |
| Turning to religion | 0.628(0.369,1.07) | 1.04(1.01,1.06) | 0.792(0.427,1.47) | 1.22(0.971,1.53) | 0.94(0.521,1.7) | 3.31(0.411,26.6) | 1.01(0.938,1.09) | 1.06(1.01,1.11) | 1.03(0.908,1.18) |
| Acceptance | 0.841(0.517,1.37) | 1(0.98,1.02) | 0.666(0.374,1.19) | 0.93(0.761,1.14) | 1.52(0.895,2.59) | 5.57(0.466,66.6) | 1.04(0.973,1.12) | 0.991(0.95,1.03) | 1(0.893,1.12) |
| Focus on and venting of emotions | 0.36(0.219,0.593) | 0.971(0.95,0.992) | 1.12(0.637,1.98) | 0.922(0.756,1.13) | 0.554(0.325,0.943) | 0.339(0.0404,2.84) | 0.919(0.859,0.984) | 1.01(0.971,1.06) | 1(0.892,1.12) |
| Behavioural disengagement | 0.489(0.297,0.805) | 1.01(0.991,1.03) | 0.763(0.429,1.36) | 1.08(0.882,1.32) | 0.832(0.486,1.42) | 0.283(0.0321,2.5) | 0.942(0.879,1.01) | 0.972(0.932,1.01) | 0.92(0.819,1.03) |
| Mental disengagement | 0.371(0.224,0.614) | 0.981(0.96,1) | 0.802(0.453,1.42) | 0.779(0.635,0.955) | 0.629(0.368,1.08) | 0.481(0.0569,4.07) | 0.944(0.881,1.01) | 1.02(0.975,1.06) | 0.963(0.858,1.08) |
| Substance use | 0.811(0.411,1.6) | 0.972(0.944,1) | 0.692(0.323,1.48) | 1.06(0.799,1.42) | 3.06(1.15,8.14) | 1.48e-06(0,Inf) | 1.09(0.982,1.21) | 0.977(0.921,1.04) | 0.953(0.815,1.11) |
| humour | 1.07(0.666,1.73) | 0.987(0.966,1.01) | 0.767(0.438,1.34) | 1.05(0.861,1.28) | 1.29(0.764,2.18) | 5.24(0.645,42.6) | 1.03(0.964,1.1) | 0.997(0.957,1.04) | 0.993(0.887,1.11) |

Table 4: Odds ratios and 95% profile likelihood confidence intervals resulting from the multiple regression analyses. All figures are rounded to 3 significant digits.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Sex=male | Age | Marital status= married | Disease duration | Onset type=Limb | Onset type=Respiratory | ALSFRS-R bulbar | ALSFRS-R motor | ALSFRS-R respiratory |
| Active coping | - | - | - | - | - | - | 1.08(1.01,1.16) | - | - |
| Restraint | 0.559(0.339,0.924) | - | - | - | - | - | - | - | 0.868(0.771,0.977) |
| Seeking instrumental social support | 0.547(0.337,0.889) | - | - | - | - | - | - | - | - |
| Planning | - | - | - | - | - | - | - | - | - |
| Suppression of competing activities | - | - | - | - | - | - | - | - | - |
| Seeking emotional social support | 0.42(0.254,0.695) | - | 2.07(1.15,3.72) | - | - | - | - | - | - |
| Positive reinterpretation and growth | - | - | - | - | - | - | - | 1.06(1.01,1.1) | - |
| Denial | - | - | - | - | - | - | - | 1.07(1.02,1.12) | - |
| Turning to religion | - | 1.04(1.01,1.06) | - | 1.38(1.08,1.76) | - | - | - | 1.08(1.03,1.14) | - |
| Acceptance | - | - | - | - | - | - | - | - | - |
| Focus on and venting of emotions | 0.38(0.23,0.627) | 0.964(0.943,0.985) | - | - | - | - | 0.91(0.848,0.976) | - | - |
| Behavioural disengagement | 0.489(0.297,0.805) | - | - | - | - | - | - | - | - |
| Mental disengagament | 0.381(0.231,0.631) | - | - | 0.795(0.647,0.976) | - | - | - | - | - |
| Substance use | - | - | - | - | 3.06(1.15,8.14) | 1.48e-06(0,Inf) | - | - | - |
| Humour | - | - | - | - | - | - | - | - | - |