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Brief assessment of male depression in clinical care: Validation of the Male Depression Risk Scale Short Form in a cross-sectional study of Australian men

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4 1 **Brief assessment of male depression in clinical care:**
5 2 **Validation of the Male Depression Risk Scale Short Form in a cross-sectional study of**
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7 3 **Australian men**
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12 Danielle Herreen^{1,2*}, Simon Rice^{3,4}, & Ian Zajac²
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15
16 8 ¹ School of Psychology, University of Adelaide, Adelaide, SA 5000 Australia

17
18 9 ² Health & Biosecurity, Commonwealth Scientific & Industrial Research Organisation
19
20 10 (CSIRO), Adelaide, SA 5000, Australia

21
22 11 ³ Orygen, Parkville, VIC 3052, Australia

23
24 12 ⁴ Centre for Youth Mental Health, The University of Melbourne, Melbourne, VIC 3052,
25
26 13 Australia

27
28
29 15 * Corresponding author information: Danielle Herreen, School of Psychology, University of
30
31 16 Adelaide, Adelaide, SA 5000, Australia (email: danielle.herreen@adelaide.edu.au)
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Abstract

Objectives: To develop and validate a short form of the Male Depression Risk Scale (MDRS-22) for use in primary care, examining sensitivity indices for psychological distress and suicidality.

Design: Cross-sectional study with 8-month follow-up.

Setting: Community-based recruited via an online survey.

Participants: A community sample of younger ($n = 514$; 18-64 years) and older ($n = 444$; 65-93 years) males residing in Australia (M age = 58.11 years, $SD = 17.73$) completed measures of externalising and prototypic depression symptoms. A subset of respondents ($n = 167$ younger males; $n = 173$ older males) provided follow-up data approximately eight months later.

Primary and secondary outcome measures: Participants completed the Male Depression Risk Scale (MDRS-22), Patient Health Questionnaire (PHQ-9), and Kessler Psychological Distress Scale (K10). Probable depression was determined according to PHQ-9 scores ≥ 10 . Suicidality was determined based on a score ≥ 1 on item 9 of the PHQ-9. Probable mental illness was determined based on a K10 score ≥ 25 .

Results: The short form MDRS-22 consisted of seven items (MDRS-7) and captured all of the domains in the original tool. Results demonstrated that externalising symptoms, either alone or in combination with prototypic symptoms were significantly more common than exclusively prototypic symptoms. Participants in the mixed symptom group had significantly higher risk of mental illness and current suicidality. Furthermore, the MDRS-7 was shown to be effective at predicting elevated symptoms of depression at follow-up, after controlling for previous depression diagnoses.

Conclusions: Findings provide preliminary evidence of the potential utility of the MDRS-7 as a screening tool for externalised symptoms associated with major depression in men. Use of the MDRS-7 in primary care settings may facilitate identification of men at-risk of suicide and psychological distress who do not meet cut-off scores for existing measures of major depression symptoms.

Key words: depression, externalising symptoms, short form, men, lifespan, help-seeking

70 **Strengths and limitations of this study:**

- 71 • This is the first study to explore the psychometric properties of the MDRS-7 as a
72 screening tool for externalised symptoms associated with major depression in men.
- 73 • Use of the MDRS-7 in primary care settings may facilitate identification of men at-
74 risk of suicide and psychological distress.
- 75 • Diagnosis of depression was not verified by clinical interview.
- 76 • Field trials of the MDRS-7 are needed to demonstrate the utility of the tool in
77 primary care settings.

79 **Introduction**

80 Major depressive disorder (MDD) is a common psychiatric condition and the leading
81 cause of disability worldwide [1, 2]. MDD is twice as prevalent in women than men [3] and
82 severe depression is known to significantly increase the risk of suicide [4]. Although men are
83 less likely to be diagnosed with a depressive disorder [5], they are three times more likely to
84 die by suicide compared to women [6]. Current approaches to the diagnosis of depression
85 (e.g., as per ICD-11 or DSM-5 diagnostic criteria) emphasise symptoms including persistent
86 sadness, loss of interest or pleasure in previously enjoyable activities, as well as changes in
87 affect, cognition, and neurovegetative functioning [7, 8]. However, a growing number of
88 studies suggest that a significant proportion of men suffering from depression might
89 experience a distinct phenotype [9-11]. Congruent with masculine role norms, this male-
90 typical phenotype includes anger, substance misuse, emotion suppression, and risk-taking
91 domains [10, 12]. However, these putative symptoms are not included in standard
92 diagnostic criteria or screening measures, and it has been suggested that this might account
93 in part for the under-diagnosis of male depression cases, and therefore under-recognition of
94 (and treatment for) men at heightened risk of suicide [13].

95 Whilst men are often regarded as being less likely to seek help than women, recent
96 statistics largely do not support this claim. In Australia, it has been estimated that in the
97 general population, around 89% of men attend primary care annually [14]. Among men
98 experiencing mental health difficulties, annual primary care attendance is similarly high with
99 estimates of 80% up to 96% of men with symptoms of depression reporting a visit to

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3 100 primary care within the previous 12 months [15, 16]. Similarly, findings from the UK
4
5 101 demonstrate that whilst males are overall less likely to attend primary care compared to
6
7 102 females, attendance rates in men and women with comparable underlying morbidities,
8
9 103 including depression, are similar [17]. Furthermore, findings from a population study of
10
11 104 health care contacts among Canadian suicide decedents in Toronto also demonstrated that
12
13 105 over 60% ($n = 1792$) of men who died by suicide accessed professional mental health care in
14
15 106 the year before their death [18]. These findings highlight the essential role of primary care
16
17 107 physicians in identifying depression and suicide risk in men in order to facilitate effective
18
19 108 treatment [19].

20 109 Growing interest in gender-sensitive assessment of men's depression has seen the
21
22 110 development of male-specific screening tools to identify symptoms that align with men's
23
24 111 socialisation and gender norm processes [e.g., 20, 21, 22]. One recently developed and
25
26 112 widely validated measure for assessing externalising symptoms in men is the Male
27
28 113 Depression Risk Scale (MDRS-22) [23]. The MDRS-22 consists of 22 items assessing six
29
30 114 symptom domains including emotion suppression, drug use, alcohol use, anger and
31
32 115 aggression, somatic symptoms, and risk-taking [23]. Recently, Zajac and colleagues [24]
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34 116 demonstrated that this tool, used in conjunction with a measure of prototypic major
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36 117 depression symptoms (PHQ-9), was able to stratify men into three distinct risk groups: (i)
37
38 118 prototypic symptoms (consistent with current MDD diagnostic criteria), (ii) externalising
39
40 119 symptoms consistent with masculine socialisation, and (iii) mixed depressive symptoms,
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42 120 reflecting both internalised and externalised symptomology. Further analyses showed that
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44 121 men in the externalising only group—men who are arguably missed when using measures of
45
46 122 internalising symptoms—were at significantly increased risk of suicide compared to non-
47
48 123 depressed men. Moreover, those with elevated externalised and prototypic symptomology
49
50 124 were at highest risk of mental illness as well as suicide [24], highlighting the potential of
51
52 125 early identification and intervention benefits of leveraging male-specific tools in primary
53
54 126 care settings.

55 127 Two-stage screening methods are commonly used in primary care, and have been
56
57 128 shown to be effective for increasing the recognition of depression [25]. However, many
58
59 129 primary care physicians report that time is a limiting factor in their capacity to
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3 130 comprehensively assess psychological issues, including depression [19, 26], despite
4
5 131 management of common mental disorders rating as a top reason for general practice
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7 132 attendance [27]. To help address this issue, brief screening tools consisting of 15 items or
8
9 133 less are often used, given their completion time is usually just a couple of minutes [28].
10
11 134 Examples include the Patient Health Questionnaire (PHQ-9) [29], the Kessler Psychological
12
13 135 Distress Scale (K10) [30], and the Beck Depression Inventory for Primary Care (BDI-PC) [31].

14 136 To date, the MDRS-22 has demonstrated excellent psychometric properties as well
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16 137 as the ability to detect different groups of men who may be at increased risk of suicide and
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18 138 mental illness [e.g., 24, 32, 33]. However, given time constraints in primary care settings, the
19
20 139 length of the current MDRS-22 is arguably impractical [12]. The purpose of the present
21
22 140 study was to develop a short form of the MDRS-22 to facilitate its use as a screening tool in
23
24 141 busy and time-pressured health care settings. We also aimed to establish an initial set of
25
26 142 cut-off scores for interpretive purposes, as well as examine current and longitudinal risk of
27
28 143 suicidality and mental illness in subgroups. Furthermore, as adherence to masculine gender
29
30 144 norms has been found to decline as men get older [34], younger and older males were
31
32 145 examined separately to examine the utility of the tool across age groups.
33

146 147 **Method**

148 **Participants and procedure**

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38 149 This cross-sectional study included baseline data from a community sample of 514
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40 150 younger males aged 18 to 64 years ($M = 45.46$, $SD = 14.52$) and 444 older males aged 65 to
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42 151 93 years ($M = 72.75$, $SD = 5.86$). A subset of respondents ($n = 167$ younger males; $n = 173$
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44 152 older males) participated in the follow-up component. On average, 35 weeks ($M = 247.94$
45
46 153 days, $SD = 24.47$ days) elapsed between the provision of T1 and T2. The mean age for the
47
48 154 overall sample was 58.11 years ($SD = 17.73$). Eligible participants were Australian male
49
50 155 residents over the age of 18 years who considered themselves fluent in English. Participants
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52 156 were recruited via paid advertisements displayed to Australian members of the Facebook
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54 157 social networking site ($n = 609$; 63.6%) and through promotion of the study to community
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56 158 organisations (e.g., Rotary, Men's Shed). Time 1 (T1) data were collected between August
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58 159 and November 2019 using an online questionnaire. However, participants from local

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3 160 community organisations were provided with the option to complete a paper version of the
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5 161 survey to ensure inclusivity and accessibility of the sample and $n = 5$ participants completed
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7 162 a paper version. Ethics approval was obtained from the University of Adelaide Human
8
9 163 Research Ethics Committee and the CSIRO Health and Medical Human Research Ethics
10
11 164 Committee (approval number H-2019-109). All participants provided informed consent.
12
13 165 Reporting adhered to the STROBE cross-sectional guidelines.
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15 166

16 167 **Public involvement**

17
18 168 Participants were not involved in the design or conduct of this research; however,
19
20 169 participants could nominate to receive updates on the results of the study.
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23 171 **Measures**

24 25 172 26 27 173 ***Demographics***

28
29 174 Participants reported their age, gender, relationship status, employment status, level
30
31 175 of education, and household income.
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33 176

34 177 ***Male Depression Risk Scale (MDRS-22)***

35
36 178 Externalising depression symptoms were assessed by the Male Depression Risk Scale
37
38 179 (MDRS-22) [23]. The MDRS-22 contains twenty-two self-report items designed to assess six
39
40 180 broad domains of externalising and male-specific depression symptoms present in the last
41
42 181 month including anger and aggression, drug use, alcohol use, emotion suppression, risk-
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44 182 taking, and somatic symptoms using the response format of 5-point Likert scale ranging
45
46 183 from 0 (*none of the time*), 1 (*a little of the time*), 2 (*some of the time*), 3 (*most of the time*),
47
48 184 and 4 (*all of the time*). Cronbach's alphas for the MDRS are reported in Table 3 for both age
49
50 185 groups and for the overall sample and are considered adequate.
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52 186

53 187 ***The Patient Health Questionnaire (PHQ-9)***

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55 188 The Patient Health Questionnaire (PHQ-9) [29] is a self-report depression screening tool for
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57 189 use in primary care that assesses nine symptoms consistent with the DSM-5 diagnostic
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3 190 criteria for major depressive disorder [7]. Participants endorse how often they have
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5 191 experienced each symptom (e.g., “*Feeling down, depressed, or hopeless*”) during the
6
7 192 preceding two-week period using a 4-point Likert scale ranging from 0 (*not at all*) to 3
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9 193 (*almost every day*). A score of 10 and above is indicative of clinically significant depressive
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11 194 symptoms [35]. In addition to utilising total PHQ-9 scores, we used item 9 as a measure of
12
13 195 suicidality: “Over the past two weeks, how often have you been bothered by thoughts that
14
15 196 you would be better off dead, or of hurting yourself in some way?”. We deemed those who
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17 197 scored 1 or more on this item to be currently experiencing suicidal ideation. Internal
18
19 198 consistency of the PHQ-9 in the present study for the overall sample was high ($\alpha = .93$).
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20 199

21 200 ***Kessler Psychological Distress Scale (K10)***

22 201 The Kessler Psychological Distress Scale (K10) [30] is a widely used measure in both research
23
24 202 and primary care settings [36]. It comprises ten questions assessing a person’s negative
25
26 203 emotional state in the preceding 30 days (e.g., “*About how often did you feel so nervous*
27
28 204 *that nothing could calm you down*”). Responses are based on a 5-point Likert scale ranging
29
30 205 from 1 (*none of the time*) to 5 (*all of the time*). In addition to examining K10 total scores, we
31
32 206 created a binary variable with scores ≥ 25 indicating probable mental illness, consistent with
33
34 207 published cut-off scores for the K10 [37]. Internal consistency of the K10 in this study for the
35
36 208 overall sample was high ($\alpha = .95$).
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38 209

39 210 **Statistical analyses**

40 211 Data for the present study was analysed using IBM SPSS Statistics (Version 26.0)
41
42 212 except for the Confirmatory Factor Analysis undertaken in JASP [Version 0.13.1; 38]. A total
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44 213 of 1114 participants commenced the study. However, 156 participants were not included in
45
46 214 the analyses due to substantial missing data. Thus, $N = 958$ participants who provided
47
48 215 complete data for the items comprising the MDRS-22 were included in the item reduction
49
50 216 process described below. Of this sample, $n = 29$ did not provide complete data for the PHQ-
51
52 217 9 or K10 items. Thus, models using these variables comprised $n = 929$ participants.

53 218 Various recommendations exist for the selection of items for short-form surveys [39,
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55 219 40]. Broadly speaking, the focus is on selecting items with maximum variability and which

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3 220 retain the theorised underlying construct—as well as sub-domains—measured by the long-
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5 221 form scale. Therefore, we calculated descriptive (means, standard deviation (*SD*), and
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7 222 skewness) and relational statistics (correlations) for each item (see Table 2). Items were
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9 223 scored for each statistic (i.e., largest *SD*, strongest correlation etc) and summed across the
10
11 224 statistical indices to derive a total score for each item. Best performing items were subject
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13 225 to Exploratory Factor Analysis with Maximum Likelihood Estimation performed within each
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15 226 age group, and in the combined sample. Parallel Analysis consisting of 1,000 permutations
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17 227 of the original raw data was used to determine thresholds for retaining factors. Stability of
18
19 228 this solution was then established using Confirmatory Factor Analysis of Time 2 Data ($n =$
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21 229 340). Fit indices reported include: comparative fit index (CFI); the Tucker-Lewis index (TLI);
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23 230 the root mean square error of approximation (RMSEA); and the standardized root mean
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25 231 residual (SRMR). Interpretation of these indices were guided by the recommendations of Hu
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27 232 & Bentler [41].

27 233 In order to demonstrate clinical utility of the reduced item scale, cut-off scores were
28
29 234 determined for Low (0 – 5), Moderate (6 – 7), Severe (8 – 12) and Extremely severe (13+)
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31 235 symptom severity groups. These scores corresponded to cut-off percentiles representing
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33 236 differing degrees of increased risk of recent suicide attempt previously identified for the
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35 237 MDRS-22 [33]. Individuals were then classified into depression groups using the MDRS-7 in
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37 238 combination with the PHQ-9 as follows: not depressed (PHQ-9 < 10 and MDRS-7 ≤ 5),
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39 239 prototypical depression features (PHQ-9 ≥ 10 and MDRS-7 ≤ 5), mixed features (PHQ-9 ≥ 10
40
41 240 and MDRS-7 > 5) and externalising features (PHQ-9 < 10 and MDRS-7 > 5). In addition, the
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43 241 K10 was used to determine those individuals suffering a moderate mental illness (K10 ≥ 25)
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45 242 from those without a mental illness (K10 < 25), and current suicidality was ascribed based
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47 243 on scores ≥ 1 on PHQ-9 item 9: “Over the past two weeks, how often have you been
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49 244 bothered by thoughts that you would be better off dead, or of hurting yourself in some
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51 245 way?”. Finally, Generalised linear models (GLMs) were used to examine differences in K10
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53 246 and PHQ-9 scores across the MDRS-7 categories to determine risk of mental illness and
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55 247 current suicidality and to examine risk of Depression at Time 2 (PHQ-9 ≥ 10). Assumptions of
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57 248 GLMs were considered through inspection of scatter plots and histograms of residuals and
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59 249 predicted values, with model results reported as standardised betas.

Results

Sample characteristics

Table 1 presents the characteristics of the study participants at T1. As expected, there was a higher proportion of older participants who reported themselves as married/de-facto or widowed/divorced/separated, in comparison to younger men. Regarding education, the majority of older participants completed year 11 or below, whilst the proportion of participants completing a Bachelor's degree was higher in the younger sample. In addition, household income appeared to be higher in younger compared to older men, consistent with the majority of the older sample reporting themselves as being retired.

Insert Table 1 about here

Item reduction

Descriptive and relational statistics for each of the MDRS-22 items across younger and older age groups are displayed in Supplementary Table 1. For the emotion suppression, alcohol use, somatic symptoms, and drug use domains, a single highest scoring item emerged congruent across age groups. For the anger and aggression domain, two different items were retained because of their performance across the age groups. Finally, although two risk-taking items scored equally well in the younger group, only one of those showed sensitivity within the older age group and only this item was retained, resulting in a total selection of seven items for the short form scale covering all of the original MDRS-22 domains.

Factor analysis of these seven items revealed the presence of a single underlying domain that satisfied criteria determined by the parallel analysis; eigenvalues were required to exceed 1.16. As shown in Table 2, all items demonstrated a moderate-to-strong loading on the underlying component except for those measuring alcohol and drug use, which loaded weakly. When modelling these 7-items using CFA at Time 2, the initial solution

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3 280 specifying all items loading on a single latent MDRS-7 factor was not quite adequate [$\chi^2(14)$
4 = 62.23 $p < .001$, CFI = 0.96, TLI = .94, RMSEA = 0.10 (.077-.128), SRMR = .10]. However,
5 281
6
7 282 allowing the errors of the two items assessing anger and physical aggression to covary
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9 283 resulted in excellent model fit [$\chi^2(13) = 28.08$ $p = .04$, CFI = 0.99, TLI = .98, RMSEA = .059
10 284 (.028-.089), SRMR = .085].
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16 287 Insert Table 2 about here
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21 290 *Cut-off scores for the short scale*

23 291 The proportion of men in each of the different MDRS-7 symptom severity categories
24 292 are shown in Supplementary Figure 1 for the total sample, and by age group. As can be
25 293 seen, older men appear more likely to be in the 'low' category of symptoms, and less likely
26 294 to be in the 'severe' or 'extremely severe' categories compared to younger males. Figure 1
27 295 shows the effect of age and MDRS-7 categories on prototypic depression (PHQ-9) and
28 296 psychological distress (K10). For PHQ-9, there were significant differences between all
29 297 MDRS-7 groups [$f(3, 921) = 208.04$, $p < .001$] and between age groups [$f(1, 921) = 28.45$, $p <$
30 298 $.001$], with no significant interaction between MDRS-7 and age [$f(3, 921) = 0.45$, $p = .71$]. For
31 299 the K10, results were similar: significant differences between all MDRS-7 groups [$f(3,921) =$
32 300 190.93 , $p < .001$] and between younger and older men [$f(1,921) = 34.77$, $p < .001$], but no
33 301 interaction between MDRS-7 and age [$f(3, 921) = 0.43$, $p = .73$].
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47 304 Insert Figure 1 about here
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52 307 *Clinical utility of the MDRS-7*

54 308 The proportion of males according to depressive classification type is shown in
55 309 Supplementary Figure 2. Externalised-only depression affected approximately 10% of

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2
3 310 younger and older males, whilst prototypical and mixed depressive symptoms were more
4
5 311 common in younger males. Table 3 shows the risk of mental illness and suicidality compared
6
7 312 to non-depressed participants within each age group after controlling for a previous
8
9 313 diagnosis of depression. All classifications were associated with both outcome measures.
10
11 314 Individuals with mixed symptoms undoubtedly have the highest risk of suicidality and
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13 315 mental illness.

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16 317

18 318 Insert Table 3 about here

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23 321 A final GLM considered the likelihood of being classified as depressed at follow-up
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25 322 based on responses to the PHQ-9 (i.e., score ≥ 10). MDRS-7 category was entered as a
26
27 323 predictor controlling for PHQ-9 scores at time 1, previous diagnosis of depression and age.
28
29 324 As shown in Table 4, PHQ scores at time 1 were significantly associated with increased risk
30
31 325 of depression at time 2 although age and prior diagnoses were not significantly associated.
32
33 326 Those classified as having moderate MDRS-7 symptoms at time 1 were significantly more
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35 327 likely than those in the low symptom category to be classified as depressed at Time 2, whilst
36
37 328 the severe and extremely severe categories were not associated with increased risk.

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42 331 Insert Table 4 about here

44 332

45 333 Discussion

47 334 Clinical reports and emergent empirical work suggest that men's depression may be
48
49 335 under-detected as a result of prototypic screening tools that may be insensitive to men's
50
51 336 gender role socialisation [11, 13, 42]. The Male Depression Risk Scale (MDRS-22) assesses
52
53 337 male-specific, externalised symptoms of depression, such as substance misuse, risk-taking,
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55 338 and anger. However, in its current 22-item form, it is impractical for rapid use in primary
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57 339 care, particularly when used alongside traditional depression screening tools [12]. The

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2
3 340 present research aimed to derive a short form of the MDRS-22, examine its psychometric
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5 341 properties and relationship with psychological distress and depression in order to
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7 342 demonstrate its utility as a potential screening tool in primary and other health care
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9 343 settings.

10 344 The short form derived herein comprises seven items, representing 1 item for each of
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12 345 the original MDRS domains including emotion suppression, risk-taking, substance use, drug
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14 346 use, somatic symptoms, and two items for the anger and aggression domain, based on
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16 347 criteria including variability within items, the item's relationship to its original MDRS domain
17
18 348 but also with the overall MDRS score. Five of the seven items demonstrated moderate-to-
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20 349 strong loadings on a single underlying construct presumed to reflect the male depression
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22 350 phenotype, whilst two items assessing alcohol and drug use loaded weakly. This likely
23
24 351 reflects the reduced variability of participant responses on these items, with most
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26 352 participants reporting that these items applied to them none, or a little of the time.
27
28 353 However, despite these lower loadings, items that tap these behaviours are important to
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30 354 retain given that substance use is an important marker of depression and suicidality in men
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32 355 and particularly those who adhere to masculine norms [42, 43].

33 356 In the present study, externalising symptoms, either alone or in combination with
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35 357 prototypic symptoms, were found to be significantly more common than exclusively
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37 358 prototypic symptoms. Approximately 10% of younger and older males were found to
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39 359 present with uniquely externalising symptoms, whilst approximately 40% of younger males
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41 360 and 10% of older males presented with mixed symptoms. These findings are consistent with
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43 361 previous research using the MDRS-22 [24] and highlights the potential utility of the MDRS-7
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45 362 for detecting additional cases of men at risk. These men are a subset who score below
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47 363 threshold on traditional prototypic measures, but whose degree of externalised behaviours
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49 364 may be problematic. Furthermore, despite the absence of clinically elevated prototypic
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51 365 symptoms, both younger and older males in the mixed symptom group had a significantly
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53 366 higher risk of a mental illness after controlling for a previous diagnosis of depression,
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55 367 demonstrating unequivocally that this represents a unique group of at-risk men
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57 368 experiencing psychological distress. Similarly, both younger and older males in the mixed
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59 369 symptom group had a significantly elevated risk of suicidality. These findings are consistent
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3 370 with research by Zajac and colleagues [24] and highlight the clinical importance of
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5 371 considering a broad range of potential presentations of depression in men, all of which are
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7 372 associated with increased risk of poor outcomes.

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9 373 The MDRS-7 was also shown to be effective at predicting depression at a later time
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11 374 point, suggesting a possible prodromal effect. These findings are consistent with those by
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13 375 [44] who demonstrated that externalising symptoms predicted a future depressive episode
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15 376 in men. Hence, our findings may reflect early symptom expression, or even attempts of men
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17 377 to cope with what has the potential to develop into a threshold depressive disorder. This
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19 378 further highlights the potential value of screening for externalising symptoms to facilitate
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21 379 early intervention and prevention of further mental health issues [45]. In addition, given the
22
23 380 externalised nature of male-typical symptoms of depression, it is important to note that
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25 381 these symptoms not only affect men's health and wellbeing but also the health wellbeing of
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27 382 their families, friends, and communities [13, 46, 47]. Hence the better identification and
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29 383 management of male depression is likely to have substantial public health implications.

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385 **Clinical implications**

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33 386 There is an urgent need for health services and providers to utilise more sensitive
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35 387 diagnostic tools as a means of improving the detection of depression and psychological
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37 388 distress in males and addressing the high rates of male suicide [13]. The use of brief tools
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39 389 such as the MDRS-7 may assist with detecting unique cases of men who would score below
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41 390 threshold on measures such as the PHQ-9. However, an added benefit of using this scale
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43 391 alongside prototypic measures, is the ability to detect men presenting with mixed
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45 392 symptomology whose risk of suicide and poor mental health outcomes is significantly
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47 393 elevated. Therefore, the clinical utility of this measure may extend beyond screening and
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49 394 detection and into the therapy setting where it is necessary to determine, monitor, and
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51 395 manage differing degrees of suicidality.

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397 **Limitations and future research**

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55 398 The methodology adopted in this study is not without limitations. The use of an
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57 399 online community sample of Australian males limits the generalisability of the findings to

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3 400 other populations. Future research should examine the psychometric properties of the
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5 401 MDRS-7 with additional populations, including clinical samples of men presenting to primary
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7 402 care. In addition, as data was self-report, diagnosis of depression could not be verified at
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9 403 clinical interview. The results of this study would be strengthened by a more rigorous
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11 404 assessment of psychopathology and comorbidity. It is also important to acknowledge that
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13 405 this study used a single item from the PHQ-9 to examine current suicidal ideation.
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15 406 Therefore, there is a need for additional research to examine the relationship between the
16
17 407 MDRS-7 and other measures of suicidality, including recent suicide attempt.
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409 **Conclusion**

21 410 The present study provides important information on the development and
22
23 411 validation of the MDRS-7. Specifically, this study demonstrates that the MDRS-7 is a valid
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25 412 and reliable measure of externalising and male-typical depression symptoms in both
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27 413 younger and older men in terms of its psychometric properties as well as its sensitivity to
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29 414 prototypic depression symptoms, psychological distress, and suicidality. Use of male-specific
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31 415 measures of depression such as the MDRS-7 may improve the detection of depression and
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33 416 suicide risk in men, and adjunctive use (alongside established prototypical scales such as the
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35 417 PHQ-9) may contribute to improved public health outcomes.
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37

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41
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43
44

45 422 **Author contributions**

46 423 D.H., S.R., and I.Z. developed the study concept. D.H. and I.Z. performed the data analyses.
47
48 424 D.H. drafted the paper and S.R. and I.Z. provided critical revisions. All authors approved the
49
50 425 final version of the paper for submission.
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52

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57
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Table 1. Sociodemographic characteristics of participants at Time 1

Variable	Younger men (< 65)	Older men (≥ 65)
<i>n</i>	514	444
Age range	18-64	65-93
Age, <i>M</i> (<i>SD</i>)	45.5 (14.5)	72.8 (5.9)
Relationship status, <i>n</i> (%)		
Single (never married)	119 (23.2)	12 (2.7)
Widowed/divorced/separated	70 (13.6)	95 (21.4)
Married/de-facto	323 (62.8)	334 (75.2)
Prefer not to say	2 (0.4)	3 (0.7)
Employment status, <i>n</i> (%)		
Employed full-time	227 (44.2)	22 (5.0)
Employed part-time	38 (7.4)	18 (4.1)
Employed casually	67 (13.0)	14 (3.2)
Not employed or unpaid work	97 (18.9)	13 (2.9)
Retired	73 (14.2)	375 (84.5)

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 431 influence on the design of the study and collection, analysis, or interpretation of data or in
 432 writing the manuscript.

434 **Ethics approval**

435 Ethics approval was obtained from the University of Adelaide Human Research Ethics
 436 Committee and the CSIRO Health and Medical Human Research Ethics Committee (approval
 437 number H-2019-109). All participants provided informed consent.

439 **Competing interests**

440 The authors declare that they have no competing interests.

442 **Data sharing statement**

443 Data is available upon reasonable request.

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3	Prefer not to say	12 (2.3)	2 (0.5)
4	Household income, <i>n</i> (%)		
5	<\$35,000	139 (27.0)	143 (32.2)
6	\$35,000-\$65,000	92 (17.9)	159 (35.8)
7	\$65,000-\$105,000	100 (19.5)	80 (18.0)
8	\$105,000-\$160,000	97 (18.9)	31 (7.0)
9	>\$160,000	65 (12.6)	12 (2.7)
10	Prefer not to say	21 (4.1)	19 (4.3)
11	Highest level of education, <i>n</i> (%)		
12	Year 11 or below	50 (9.7)	83 (18.7)
13	Year 12	52 (10.1)	49 (11.0)
14	Certificate/diploma	156 (30.4)	133 (30.0)
15	Bachelor's degree	139 (27.0)	76 (17.1)
16	Graduate certificate/diploma	44 (8.6)	39 (8.8)
17	Postgraduate degree	72 (14.0)	56 (12.6)
18	Prefer not to say	1 (0.2)	8 (1.8)

Note. Time 2 *n*'s (younger men = 167; older men = 173).

% may not equal 100% due to rounding.

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448 Table 2. Item loadings derived from Principal Components Analysis, and Cronbach's Reliability Alpha

Domains	Items	18-64	65+	Overall	Time 2
Emotion Suppression	I bottled up my negative feelings	0.53	0.61	0.60	0.65
Alcohol Use	I needed alcohol to help me unwind	0.29	0.30	0.34	0.38
Somatic Symptoms	I had unexplained aches and pains	0.42	0.44	0.46	0.64
Aggression	I overreacted to situations with aggressive behaviour	0.68	0.74	0.69	0.30
Anger	It was difficult to manage my anger	0.76	0.73	0.74	0.65
Drug Use	Using drugs provided temporary relief	0.22	0.31	0.28	0.47
Risk-Taking	I stopped caring about the consequences of my actions	0.47	0.50	0.52	0.77
	<i>Eigenvalue</i>	2.52	2.73	2.71	
	<i>Variance explained (%)</i>	36.00	38.90	38.80	
	<i>Cronbach's alpha</i>	.69	.73	.73	
	<i>Correlation with MDRS-22</i>	.94	.94	.94	
	<i>Short form re-test reliability</i>	.70	.69	.70	
	<i>M (SD)</i>	5.9 (4.0)	3.5 (3.4)	4.8 (3.9)	

449 Note. Time 2 loadings derived using Confirmatory Factor Analysis (CFA) in the combined sample.

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451 Table 3. Odds of mental illness and current suicidality controlling for previous diagnosis of
 452 depression

		Not depressed	Prototypical depression	Externalised depression	Mixed depression
18-64	Depressed group, <i>n</i>	193	71	49	187
	Moderate mental illness, <i>n</i> (%)	11 (6%)	56 (79%)	10 (20%)	163 (87%)
	OR (95% CI)	1	54.77 (23.5 - 127.9)	4.24 (1.7 - 10.9)	95.23 (44.8 - 202.2)
	Suicidality, <i>n</i> (%)	13 (7%)	43 (61%)	9 (18%)	137 (73%)
	OR (95% CI)	1	19.01 (9.0 - 40.0)	3.1 (1.2 - 7.7)	33.2 (17.2 - 64.2)
65+	Depressed group, <i>n</i>	310	20	45	54
	Moderate mental illness, <i>n</i> (%)	5 (2%)	8 (40%)	6 (13%)	36 (67%)
	OR (95% CI)	1	30.24 (8.3 - 109.6)	8.0 (2.3 - 27.7)	106.01 (36.8 - 305.1)
	Suicidality, <i>n</i> (%)	19 (6%)	8 (40%)	11 (24%)	41 (76%)
	OR (95% CI)	1	8.3 (3.0 - 23.5)	4.5 (1.9 - 10.3)	43.2 (19.7 - 94.8)

453 *Note.* OR for previous depression diagnosis not shown.

454 Mental illness defined as K10 \geq 25.

455 Suicidality defined as \geq 1 on PHQ-9 item 9.

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468 Table 4. Odds of being classified as depressed at follow up

Outcome: Depressed (PHQ-9 \geq 10) at Time 2 ($n = 340$)			
	OR	CI	
Age (older)	1.39	0.671	2.875
Previous depression diagnosis (yes)	1.97	0.945	4.119
PHQ-9 T1	1.25**	1.158	1.342
Moderate (MDRS-7)	2.76**	1.185	6.437
Severe (MDRS-7)	1.74	0.679	4.458
Extremely severe (MDRS-7)	1.44	0.258	8.051

Note. Reference category = low symptoms.

** $p < .01$.

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3 482 Figure 1. Effect of age and MDRS-7 category on prototypic depression symptoms
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5 483 (PHQ-9) and psychological distress (K10)
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9 485 **References**

- 10
11 486 1. Friedrich, M.J., *Depression is the leading cause of disability around the world*. JAMA,
12
13 487 2017. **317**(15): p. 1517-1517.
14
15 488 2. Costantini, L., et al., *Screening for depression in primary care with Patient Health*
16
17 489 *Questionnaire-9 (PHQ-9): A systematic review*. Journal of Affective Disorders, 2021.
18
19 490 **279**: p. 473-483.
20
21 491 3. World Health Organization, *Depression and Other Common Mental Disorders: Global*
22
23 492 *Health Estimates*, W.H. Organization, Editor. 2017, World Health Organization:
24
25 493 Geneva.
26
27 494 4. Chesney, E., G.M. Goodwin, and S. Fazel, *Risks of all-cause and suicide mortality in*
28
29 495 *mental disorders: A meta-review*. World Psychiatry, 2014. **13**(2): p. 153-160.
30
31 496 5. Mauvais-Jarvis, F., et al., *Sex and gender: modifiers of health, disease, and medicine*.
32
33 497 The Lancet, 2020. **396**(10250): p. 565-582.
34
35 498 6. World Health Organization, *Preventing suicide: A global imperative*. 2014, World
36
37 499 Health Organization: Geneva.
38
39 500 7. American Psychiatric Association, *Diagnostic and statistical manual of mental*
40
41 501 *disorders: DSM-5*. fifth ed. 2013, Arlington, VA: American Psychiatric Association.
42
43 502 8. World Health Organization, *International classification of diseases for mortality and*
44
45 503 *morbidity statistics 2018*.
46
47 504 9. Whittle, E.L., et al., *Men, Depression, and Coping: Are We on the Right Path?*
48
49 505 *Psychology of men & masculinity*, 2015. **16**(4): p. 426-438.
50
51 506 10. Cavanagh, A., et al., *Symptom endorsement in men versus women with a diagnosis of*
52
53 507 *depression: A differential item functioning approach*. International Journal of Social
54
55 508 *Psychiatry*, 2016. **62**(6): p. 549-559.
56
57 509 11. Martin, L.A., H.W. Neighbors, and D.M. Griffith, *The experience of symptoms of*
58
59 510 *depression in men vs women: Analysis of the National Comorbidity Survey*
60
511 *Replication*. JAMA Psychiatry, 2013. **70**(10): p. 1100-6.

- 1
2
3 512 12. Rice, S.M., et al., *Male-Type and Prototypal Depression Trajectories for Men*
4 513 *Experiencing Mental Health Problems*. Int J Environ Res Public Health, 2020. **17**(19).
5
6
7 514 13. Call, J.B. and K. Shafer, *Gendered Manifestations of Depression and Help Seeking*
8 *Among Men*. American Journal of Men's Health, 2015. **12**(1): p. 41-51.
9 515
10 516 14. Australian Bureau of Statistics, *Health Service Usage and Health Related Actions,*
11 *Australia, 2014-15 (Cat. No. 4364.0.55.002)*. 2017, Australian Bureau of Statistics:
12 517
13
14 518
15
16 519 15. Australian Institute of Family Studies, *Mental health of Australian males: Depression,*
17 *suicidality and loneliness*. 2020.
18 520
19 521 16. Martin, S., et al., *Effect of depression on health service utilisation in men: a*
20 *prospective cohort study of Australian men aged 35 to 80 years*. BMJ Open, 2021.
21 522
22 523 **11**(3): p. e044893.
23
24 524 17. Wang, Y., et al., *Do men consult less than women? An analysis of routinely collected*
25 *UK general practice data*. BMJ Open, 2013. **3**(8): p. e003320.
26 525
27 526 18. Schaffer, A., et al., *Population-based analysis of health care contacts among suicide*
28 *decedents: identifying opportunities for more targeted suicide prevention strategies*.
29 527
30 528 World Psychiatry, 2016. **15**(2): p. 135-145.
31
32 529 19. Lakkis, N.A. and D.M. Mahmassani, *Screening instruments for depression in primary*
33 *care: A concise review for clinicians*. Postgraduate Medicine, 2015. **127**(1): p. 99-106.
34 530
35 531 20. Brownhill, S., et al., *'For men only'. A mental health prompt list in primary care*.
36 *Australian family physician*, 2003. **32**(6): p. 443.
37 532
38 533 21. Zierau, F., et al., *The Gotland Male Depression Scale: A validity study in patients with*
39 *alcohol use disorder*. Nordic Journal of Psychiatry, 2002. **56**(4): p. 265-271.
40 534
41 535 22. Magovcevic, M. and M. Addis, *The Masculine Depression Scale: Development and*
42 *psychometric evaluation*. Psychology of Men & Masculinity, 2008. **9**(3): p. 117-132.
43 536
44 537 23. Rice, S.M., et al., *Development and preliminary validation of the male depression risk*
45 *scale: Furthering the assessment of depression in men*. Journal of Affective Disorders,
46 538
47 539 2013. **151**(3): p. 950-958.
48
49
50
51
52
53
54
55
56
57
58
59
60

- 1
2
3 540 24. Zajac, I.T., et al., *Suicide risk, psychological distress and treatment preferences in men*
4 541 *presenting with prototypical, externalising and mixed depressive symptomology.*
5 542 *Journal of Mental Health, 2020: p. 1-8.*
6
7 543 25. Ferenchick, E.K., P. Ramanuj, and H.A. Pincus, *Depression in primary care: part 1—*
8 544 *screening and diagnosis.* BMJ, 2019. **365**: p. l794.
9
10 545 26. Hutton, C. and J. Gunn, *Do longer consultations improve the management of*
11 546 *psychological problems in general practice? A systematic literature review.* BMC
12 547 *Health Services Research, 2007. 7(1): p. 71.*
13
14 548 27. The Royal Australian College of General Practitioners, *General Practice: Health of the*
15 549 *Nation 2018.* 2018: East Melbourne, Vic.
16
17 550 28. Mitchell, A.J. and J.C. Coyne, *Do ultra-short screening instruments accurately detect*
18 551 *depression in primary care? A pooled analysis and meta-analysis of 22 studies.* The
19 552 *British journal of general practice : the journal of the Royal College of General*
20 553 *Practitioners, 2007. 57(535): p. 144-151.*
21
22 554 29. Kroenke, K., R.L. Spitzer, and J.B. Williams, *The PHQ-9: Validity of a brief depression*
23 555 *severity measure.* *Journal of General Internal Medicine, 2001. 16(9): p. 606-613.*
24
25 556 30. Kessler, R.C., et al., *Short screening scales to monitor population prevalences and*
26 557 *trends in non-specific psychological distress.* *Psychological Medicine, 2002. 32(6): p.*
27 558 *959-976.*
28
29 559 31. Beck, A.T., et al., *Screening for major depression disorders in medical inpatients with*
30 560 *the Beck Depression Inventory for Primary Care.* *Behaviour Research and Therapy,*
31 561 *1997. 35(8): p. 785-791.*
32
33 562 32. Rice, S.M., et al., *Externalizing depression symptoms among Canadian males with*
34 563 *recent suicidal ideation: A focus on young men.* *Early Intervention in Psychiatry,*
35 564 *2019. 13(2): p. 308-313.*
36
37 565 33. Rice, S.M., et al., *Validity of the Male Depression Risk Scale in a representative*
38 566 *Canadian sample: sensitivity and specificity in identifying men with recent suicide*
39 567 *attempt.* *J Ment Health, 2019. 28(2): p. 132-140.*
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
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- 1
2
3 568 34. Herreen, D., et al., *Associations between conformity to masculine norms and*
4 *depression: age effects from a population study of Australian men.* BMC Psychology,
5 569
6 *2021. 9(1): p. 32.*
7 570
8
9 571 35. Kroenke, K., et al., *The Patient Health Questionnaire somatic, anxiety, and depressive*
10 *symptom scales: A systematic review.* General Hospital Psychiatry, 2010. **32(4): p.
11 572
12 *345-359.*
13 573
14 574 36. Stolk, Y., I. Kaplan, and J. Szwarc, *Clinical use of the Kessler psychological distress*
15 *scales with culturally diverse groups.* International Journal of Methods in Psychiatric
16 575
17 *Research, 2014. 23(2): p. 161-183.*
18 576
19 577 37. Australian Bureau of Statistics, *National Health Survey: Users' guide 2014-2015 (Cat.*
20 *No. 4363.0).* 2019, Australian Bureau of Statistics: Canberra.
21 578
22
23 579 38. JASP Team, *JASP (Version 0.13.1).* 2020.
24 580
25 580 39. Pather, S. and C.S. Uys, *Using scale reduction techniques for improved quality of*
26 *survey information.* South African journal of information management, 2008. **10(3).**
27 581
28
29 582 40. Stanton, J.M., et al., *Issues and strategies for reducing the length of self-report*
30 *scales.* Personnel psychology, 2002. **55(1): p. 167-194.**
31 583
32
33 584 41. Hu, L.t. and P.M. Bentler, *Cutoff criteria for fit indexes in covariance structure*
34 *analysis: Conventional criteria versus new alternatives.* Structural Equation Modeling:
35 585
36 *A Multidisciplinary Journal, 1999. 6(1): p. 1-55.*
37 586
38 587 42. Addis, M.E., *Gender and depression in men.* Clinical Psychology: Science & Practice,
39 588
40 *2008. 15(3): p. 153-168.*
41 589
42 589 43. Coleman, D., *Traditional masculinity as a risk factor for suicidal ideation: Cross-*
43 *sectional and prospective evidence from a study of young adults.* Archives of Suicide
44 590
45 *Research, 2015. 19(3): p. 366-384.*
46 591
47 592 44. Kendler, K.S. and C.O. Gardner, *Sex differences in the pathways to major depression:*
48 *a study of opposite-sex twin pairs.* Am J Psychiatry, 2014. **171(4): p. 426-35.**
49 593
50
51 594 45. Hetrick, S.E., et al., *Early Identification and Intervention in Depressive Disorders*
52 *Towards a Clinical Staging Model.* Psychotherapy and Psychosomatics, 2008. **77(5):**
53 595
54 *p. 263-270.*
55 596
56
57
58
59
60**

- 1
2
3 597 46. Rice, S.M., et al., *Longitudinal sex differences of externalising and internalising*
4 depression symptom trajectories: Implications for assessment of depression in men
5 598 *from an online study*. International Journal of Social Psychiatry, 2015. **61**(3): p. 236-
6 599 240.
7 600
8
9 601 47. Wilson, S. and C.E. Durbin, *Effects of paternal depression on fathers' parenting*
10 602 *behaviors: A meta-analytic review*. Clinical Psychology Review, 2010. **30**(2): p. 167-
11 603 180.
12 604
13 605
14 606
15 607
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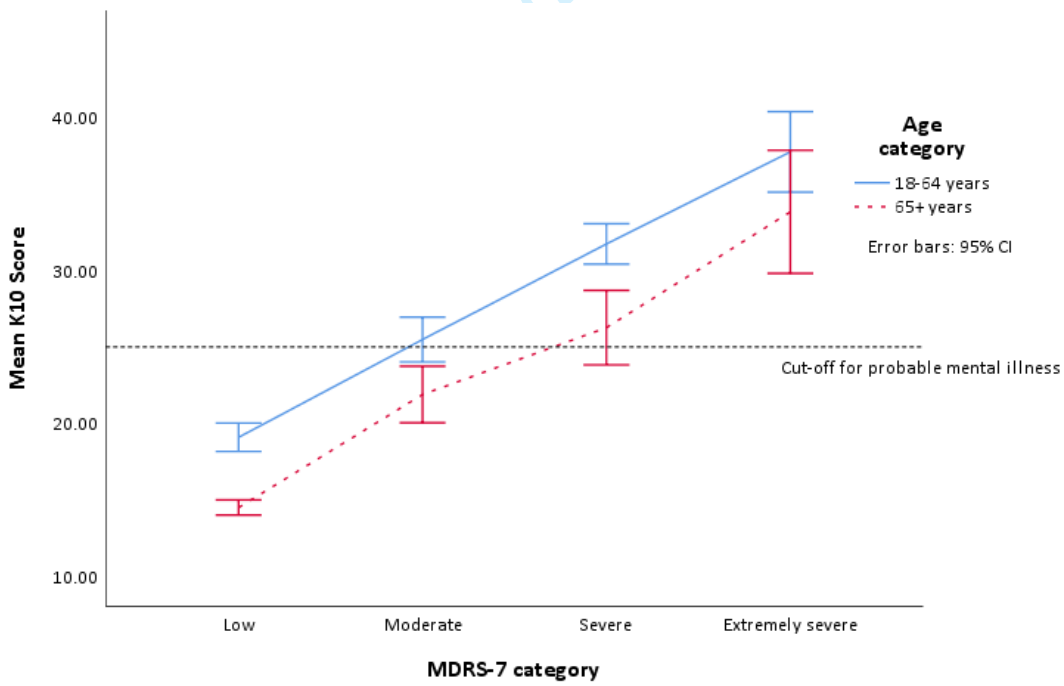
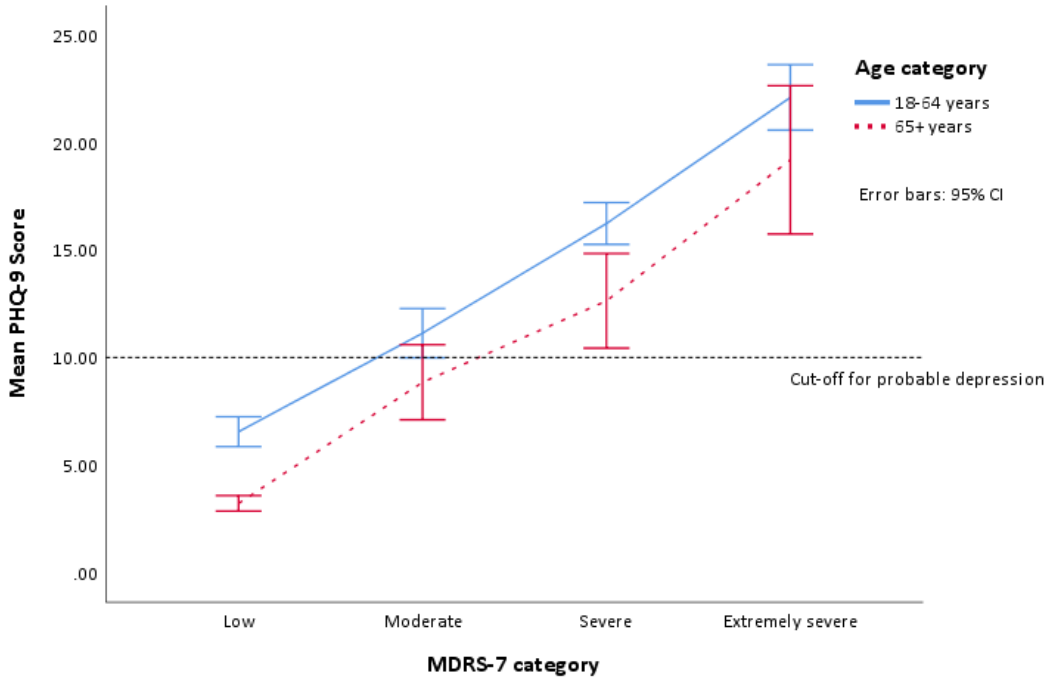
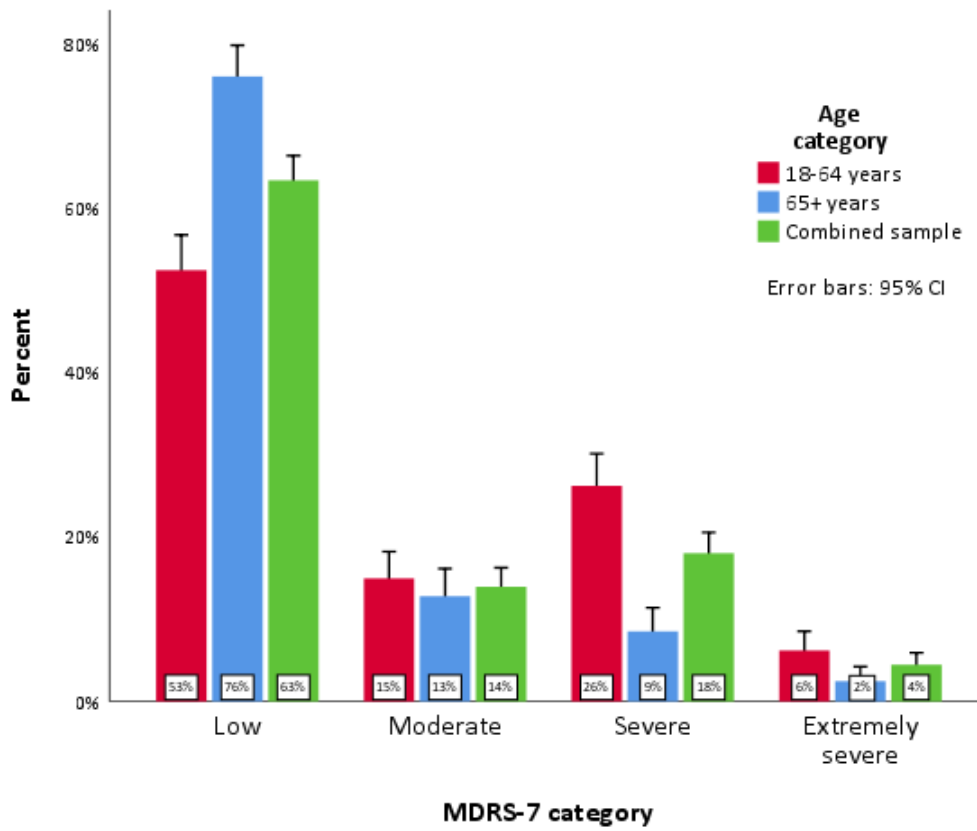


Figure 1. Effect of age and MDRS-7 category on prototypic depression symptoms (PHQ-9) and psychological distress (K10)

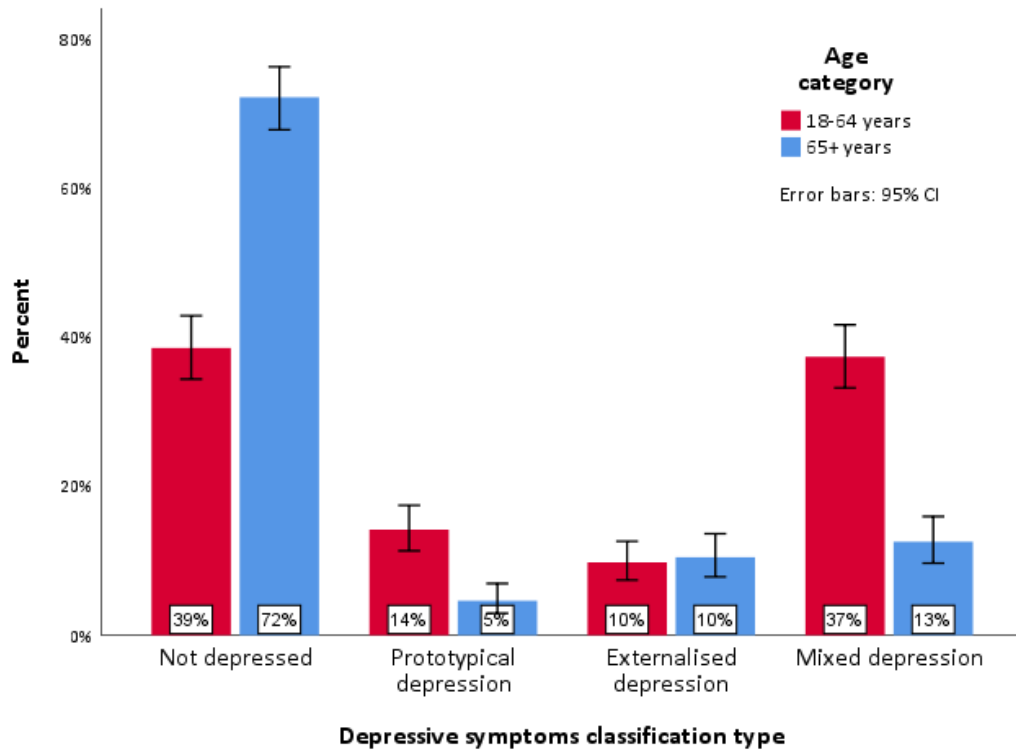
Supplementary Table 1. Descriptive and relational statistics for MDRS-22 items across younger and older age groups

Domain	Item	Younger males							Older males						
		<i>M</i>	<i>SD</i>	Skew	Total(<i>r</i>)	Domain(<i>r</i>)	Otherdomains(<i>r</i>)	Itemscore	<i>M</i>	<i>SD</i>	Skew	Total(<i>r</i>)	Domain(<i>r</i>)	Otherdomains(<i>r</i>)	Itemscore
Emotion Suppression	I tried to ignore feeling down	1.77	1.12	0.08	0.61	0.76	0.49	0	1.34	1.26	0.51	0.57	0.77	0.42	0
	I bottled up my negative feelings	1.93	1.16	0.00	0.64	0.86	0.54	4	1.28	1.15	0.58	0.73	0.86	0.58	3
	I covered up my difficulties	1.90	1.18	-0.04	0.64	0.85	0.50	1	1.21	1.21	0.64	0.71	0.84	0.55	0
	I had to work things out by myself	2.39	1.19	-0.32	0.46	0.68	0.36	1	1.96	1.36	-0.04	0.58	0.72	0.40	3
Alcohol Use	I drank more alcohol than usual	0.80	1.09	1.23	0.60	0.89	0.37	1	0.48	0.88	2.10	0.59	0.91	0.38	0
	I stopped feeling so bad while drinking	0.81	1.14	1.22	0.57	0.86	0.37	0	0.39	0.91	2.51	0.58	0.88	0.41	1
	I needed alcohol to help me unwind	0.92	1.16	1.10	0.60	0.94	0.37	4	0.52	0.93	2.01	0.61	0.94	0.37	5
	I needed to have easy access to alcohol	0.54	0.99	1.92	0.59	0.87	0.38	1	0.44	0.91	2.16	0.59	0.91	0.39	0
Somatic Symptoms	I had more heartburn than usual	0.60	0.91	1.48	0.39	0.65	0.33	0	0.38	0.71	1.88	0.50	0.70	0.41	0
	I had regular headaches	0.90	1.04	1.05	0.50	0.75	0.43	0	0.40	0.79	2.24	0.54	0.77	0.43	0
	I had stomach pains	0.72	0.90	1.06	0.54	0.75	0.44	1	0.38	0.76	2.32	0.57	0.77	0.46	1
	I had unexplained aches and pains	1.05	1.13	0.79	0.52	0.78	0.47	4	0.74	0.93	1.16	0.57	0.78	0.48	6
Anger & Aggression	I overreacted to situations with aggressive behaviour	0.59	0.82	1.42	0.51	0.83	0.46	2	0.41	0.70	1.79	0.56	0.85	0.50	4
	I verbally lashed out at others without being provoked	0.28	0.61	2.53	0.41	0.77	0.38	0	0.16	0.45	3.42	0.44	0.74	0.36	0
	I was verbally aggressive to others	0.34	0.64	2.14	0.45	0.83	0.38	0	0.20	0.49	2.82	0.41	0.80	0.33	0
	It was difficult to manage my anger	0.58	0.84	1.49	0.56	0.84	0.50	3	0.31	0.64	2.33	0.57	0.81	0.53	2
Drug Use	I sought out drugs	0.32	0.79	2.63	0.47	0.94	0.36	2	0.11	0.43	4.85	0.33	0.89	0.25	1
	I used drugs to cope	0.32	0.80	2.78	0.47	0.94	0.34	2	0.07	0.35	5.59	0.31	0.82	0.24	0
	Using drugs provided temporary relief	0.33	0.84	2.70	0.47	0.95	0.34	4	0.11	0.44	4.76	0.39	0.90	0.31	6
Risk-Taking	I drove dangerously or aggressively	0.33	0.66	2.04	0.32	0.67	0.35	0	0.12	0.37	3.12	0.32	0.61	0.29	1
	I stopped caring about the consequences of my actions	0.54	0.87	1.69	0.55	0.82	0.48	3	0.21	0.59	3.24	0.54	0.83	0.49	5
	I took unnecessary risks	0.38	0.70	1.94	0.55	0.84	0.52	3	0.15	0.45	3.19	0.47	0.82	0.43	0



Supplementary Figure 1. Proportion of participants within MDRS-7 categories

Note. Low (0 – 5), Moderate (6 – 7), Severe (8 – 12), Extremely severe (13+).



Supplementary Figure 2. Proportion of participants according to depressive symptoms classification type

Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

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	Reporting Item	Page Number
Title and abstract		
Title	#1a Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction		
Background / rationale	#2 Explain the scientific background and rationale for the investigation being reported	4-6
Objectives	#3 State specific objectives, including any prespecified hypotheses	6
Methods		

1	Study design	#4	Present key elements of study design early in the paper	6
2				
3	Setting	#5	Describe the setting, locations, and relevant dates,	6
4			including periods of recruitment, exposure, follow-up,	
5			and data collection	
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8	Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods	6
9			of selection of participants.	
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13		#7	Clearly define all outcomes, exposures, predictors,	6-9
14			potential confounders, and effect modifiers. Give	
15			diagnostic criteria, if applicable	
16				
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18	Data sources /	#8	For each variable of interest give sources of data and	6-9
19	measurement		details of methods of assessment (measurement).	
20			Describe comparability of assessment methods if there	
21			is more than one group. Give information separately for	
22			for exposed and unexposed groups if applicable.	
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27	Bias	#9	Describe any efforts to address potential sources of	6
28			bias	
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31	Study size	#10	Explain how the study size was arrived at	8-9
32				
33	Quantitative	#11	Explain how quantitative variables were handled in the	8-9
34	variables		analyses. If applicable, describe which groupings were	
35			chosen, and why	
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39	Statistical	#12a	Describe all statistical methods, including those used to	8-9
40	methods		control for confounding	
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43	Statistical	#12b	Describe any methods used to examine subgroups and	8-9
44	methods		interactions	
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47	Statistical	#12c	Explain how missing data were addressed	8-9
48	methods			
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51	Statistical	#12d	If applicable, describe analytical methods taking	N/A
52	methods		account of sampling strategy	
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55	Statistical	#12e	Describe any sensitivity analyses	N/A
56	methods			
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Results

Participants	#13a	Report numbers of individuals at each stage of study— eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for exposed and unexposed groups if applicable.	8-9
Participants	#13b	Give reasons for non-participation at each stage	N/A
Participants	#13c	Consider use of a flow diagram	N/A
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	9-10
Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	8-9
Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	N/A
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included all estimates are reported in tables	All estimates are reported in Tables
Main results	#16b	Report category boundaries when continuous variables were categorized	8-9
Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	N/A

Discussion

1	Key results	#18	Summarise key results with reference to study objectives	12-15
2				
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5	Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	14
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10	Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	12-15
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16	Generalisability	#21	Discuss the generalisability (external validity) of the study results	14
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20	Other			
21	Information			
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24	Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	N/A
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BMJ Open

Brief assessment of male depression in clinical care: Validation of the Male Depression Risk Scale Short Form in a cross-sectional study of Australian men

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4 1 **Brief assessment of male depression in clinical care:**
5 2 **Validation of the Male Depression Risk Scale Short Form in a cross-sectional study of**
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7 3 **Australian men**
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12 Danielle Herreen^{1,2*}, Simon Rice^{3,4}, & Ian Zajac²
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15
16 8 ¹ School of Psychology, University of Adelaide, Adelaide, SA 5000 Australia

17
18 9 ² Health & Biosecurity, Commonwealth Scientific & Industrial Research Organisation
19
20 10 (CSIRO), Adelaide, SA 5000, Australia

21
22 11 ³ Orygen, Parkville, VIC 3052, Australia

23
24 12 ⁴ Centre for Youth Mental Health, The University of Melbourne, Melbourne, VIC 3052,
25
26 13 Australia

27
28
29 15 * Corresponding author information: Danielle Herreen, School of Psychology, University of
30
31 16 Adelaide, Adelaide, SA 5000, Australia (email: danielle.herreen@adelaide.edu.au)
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Abstract

Objectives: To develop and validate a short form of the Male Depression Risk Scale (MDRS-22) for use in primary care, examining associations with prototypic depression symptoms, psychological distress, and suicidality.

Design: Cross-sectional study with 8-month follow-up.

Setting: Community-based.

Participants: A community sample of younger ($n = 510$; 18-64 years) and older ($n = 439$; 65-93 years) males residing in Australia (M age = 58.09 years, $SD = 17.77$) participated in the study. A subset of respondents ($n = 159$ younger males; $n = 169$ older males) provided follow-up data approximately eight months later.

Primary and secondary outcome measures: Quantitative data were obtained through a survey comprising a range of validated measures, including the Male Depression Risk Scale (MDRS-22), the Patient Health Questionnaire (PHQ-9), and the Kessler Psychological Distress Scale (K10). The MDRS-22 was refined using exploratory and confirmatory factor analysis in line with best practice guidelines. ANOVAs and generalised linear models were conducted to explore relationships between variables.

Results: The short form MDRS-22 consisted of seven items (MDRS-7) and captured all of the domains in the original tool. Participants with mixed symptoms (PHQ-9 ≥ 10 and MDRS-7 > 5) had significantly higher risk of mental illness (K10 ≥ 25) and current suicidality (PHQ-9 item 9 ≥ 1) than those with exclusively prototypic symptoms. Furthermore, the MDRS-7 was shown to be effective at predicting elevated symptoms of depression at follow-up, after controlling for previous depression diagnoses.

Conclusions: Findings provide preliminary evidence of the potential utility of the MDRS-7 as a screening tool for externalised and male-type symptoms associated with major depression in men. Field trials of the MDRS-7 in primary care settings may facilitate identification of men at risk of suicide and psychological distress who do not meet cut-off scores for existing measures of major depression symptoms.

Key words: depression, externalising symptoms, short form, men, lifespan, help-seeking

70 **Strengths and limitations of this study:**

- 71 • This is the first study to explore the psychometric properties of the MDRS-7 as a
72 screening tool for externalised and male-type symptoms associated with major
73 depression in men.
- 74 • Use of the MDRS-7 in primary care settings may facilitate identification of men at risk
75 of suicide and psychological distress.
- 76 • Diagnosis of depression was not verified by clinical interview.
- 77 • Field trials of the MDRS-7 are needed to demonstrate the utility of the tool in
78 primary care settings.

80 **Introduction**

81 Major depressive disorder (MDD) is a common psychiatric condition and the leading
82 cause of disability worldwide [1, 2]. MDD is twice as prevalent in women than men [3] and
83 severe depression is known to significantly increase the risk of suicide [4]. Although men are
84 less likely to be diagnosed with a depressive disorder [5], they are three times more likely to
85 die by suicide compared to women [6]. Current approaches to the diagnosis of depression
86 (e.g., as per ICD-11 or DSM-5 diagnostic criteria) emphasise symptoms including persistent
87 sadness, loss of interest or pleasure in previously enjoyable activities, as well as changes in
88 affect, cognition, and neurovegetative functioning [7, 8]. However, a growing number of
89 studies suggest that a significant proportion of men suffering from depression might
90 experience a distinct phenotype [9-11]. Congruent with masculine role norms, this male-
91 typical phenotype includes anger, substance misuse, emotion suppression, and risk-taking
92 domains [10, 12]. However, these putative symptoms are not included in standard
93 diagnostic criteria or screening measures, and it has been suggested that this might account
94 in part for the under-diagnosis of male depression cases, and therefore under-recognition of
95 (and treatment for) men at heightened risk of suicide [13].

96 Whilst men are often regarded as being less likely to seek help than women, recent
97 statistics largely do not support this claim. In Australia, around 89% of men attend primary
98 care annually [14]. Among men experiencing mental health difficulties, annual primary care
99 attendance is similarly high with estimates of 80% to 96% of men with symptoms of

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3 100 depression reporting a visit to primary care within the previous 12 months [15, 16].
4
5 101 Similarly, findings from the UK demonstrate that whilst males are overall less likely to attend
6
7 102 primary care compared to females, attendance rates in men and women with comparable
8
9 103 underlying morbidities, including depression, are similar [17]. Furthermore, findings from a
10
11 104 population study of healthcare contacts among Canadian suicide decedents in Toronto
12
13 105 demonstrated that over 60% ($n = 1792$) of men who died by suicide accessed professional
14
15 106 mental health care in the year before their death [18]. These findings highlight the essential
16
17 107 role of primary care physicians in identifying depression and suicide risk in men in order to
18
19 108 facilitate effective treatment [19].

20 109 Growing interest in gender-sensitive assessment of men's depression has seen the
21
22 110 development of male-specific screening tools to identify symptoms that align with men's
23
24 111 socialisation and gender norm processes [e.g., 20, 21, 22]. One recently developed and
25
26 112 widely validated measure for assessing externalising and male-type symptoms in men is the
27
28 113 Male Depression Risk Scale (MDRS-22) [23]. The MDRS-22 consists of 22 items assessing six
29
30 114 symptom domains including emotion suppression, drug use, alcohol use, anger and
31
32 115 aggression, somatic symptoms, and risk-taking [23]. Recently, Zajac and colleagues [24]
33
34 116 demonstrated that this tool, used in conjunction with a measure of prototypic depression
35
36 117 symptoms (PHQ-9), was able to stratify men into three distinct risk groups: (i) prototypic
37
38 118 symptoms (consistent with current MDD diagnostic criteria), (ii) externalising symptoms
39
40 119 consistent with masculine socialisation, and (iii) mixed depressive symptoms, reflecting both
41
42 120 internalised and externalised symptomology. Further analyses showed that men in the
43
44 121 externalising only group—men who are arguably missed when using measures of
45
46 122 internalising symptoms—were at significantly increased risk of suicide compared to non-
47
48 123 depressed men. Moreover, those with elevated externalised and prototypic symptomology
49
50 124 were at highest risk of mental illness as well as suicide [24], highlighting the potential early
51
52 125 identification and intervention benefits of leveraging male-specific tools in primary care
53
54 126 settings.

55 127 Two-stage screening methods are commonly used in primary care, and have been
56
57 128 shown to be effective for increasing the recognition of depression [25]. However, many
58
59 129 primary care physicians report that time is a limiting factor in their capacity to
60

1
2
3 130 comprehensively assess psychological issues, including depression [19, 26], despite
4
5 131 management of common mental disorders rating as a top reason for general practice
6
7 132 attendance [27]. To help address this issue, brief screening tools consisting of 15 items or
8
9 133 less are often used, given their completion time is usually just a couple of minutes [28].
10
11 134 Examples include the Patient Health Questionnaire (PHQ-9) [29], the Kessler Psychological
12
13 135 Distress Scale (K10) [30], and the Beck Depression Inventory for Primary Care (BDI-PC) [31].

14 136 To date, the MDRS-22 has demonstrated excellent psychometric properties as well
15
16 137 as the ability to detect different groups of men who may be at increased risk of suicide and
17
18 138 mental illness [e.g., 24, 32, 33]. However, given time constraints in primary care settings, the
19
20 139 length of the current MDRS-22 is arguably impractical [12]. The purpose of the present
21
22 140 study was to develop a short form of the MDRS-22 to facilitate its use as a screening tool in
23
24 141 busy and time-pressured health care settings. We also aimed to establish an initial set of
25
26 142 cut-off scores for interpretive purposes. If the MDRS short form is to have clinical utility, it
27
28 143 needs to be able to identify broader aspects of psychopathology. Thus, a secondary aim was
29
30 144 to explore current and longitudinal risk of suicidality and mental illness by adopting a
31
32 145 previously utilised categorisation according to cut-off scores on the MDRS and the widely
33
34 146 used PHQ-9, which assesses prototypic depression symptoms [24]. Furthermore, as
35
36 147 adherence to masculine gender norms has been found to decline as men get older [34],
37
38 148 younger and older males were examined separately to examine the utility of the tool across
39
40 149 age groups.

150 151 **Method**

152 **Participants and procedure**

153 This cross-sectional study included baseline data from a community sample of 510
154 younger males aged 18 to 64 years ($M = 45.43$, $SD = 14.56$) and 439 older males aged 65 to
155 93 years ($M = 72.79$, $SD = 5.88$). A subset of respondents ($n = 159$ younger males; $n = 169$
156 older males) participated in the follow-up component. On average, 35 weeks ($M = 248.56$
157 days, $SD = 24.59$ days) elapsed between the provision of Time 1 and Time 2. The mean age
158 for the overall sample was 58.09 years ($SD = 17.77$). Eligible participants were Australian
159 male residents over the age of 18 years who considered themselves fluent in English.

1
2
3 160 Participants were recruited via paid advertisements displayed to Australian members of the
4
5 161 Facebook social networking site ($n = 601$; 63.3%) and through promotion of the study to
6
7 162 community organisations (e.g., Rotary, Men's Shed). Time 1 data were collected between
8
9 163 August and November 2019 using an online questionnaire. However, participants from local
10
11 164 community organisations were provided with the option to complete a paper version of the
12
13 165 survey to ensure inclusivity and accessibility of the sample and $n = 5$ participants completed
14
15 166 a paper version. Ethics approval was obtained from the University of Adelaide Human
16
17 167 Research Ethics Committee and the CSIRO Health and Medical Human Research Ethics
18
19 168 Committee (approval number H-2019-109). All participants provided informed consent.
20
21 169 Reporting adhered to the STROBE cross-sectional guidelines. Table 1 presents a summary of
22
23 170 the characteristics of the study participants at Time 1 and Time 2.
24

171 172 **Public involvement**

173 Participants were not involved in the design or conduct of this research; however,
174 participants could nominate to receive updates on the results of the study.
175

176 **Measures**

177 178 ***Demographics***

179 Participants reported their age, gender, relationship status, employment status, level
180 of education, and household income. They also reported whether they had previously been
181 diagnosed with depression.
182

183 ***Male Depression Risk Scale (MDRS-22)***

184 Externalising and male-type depression symptoms were assessed by the Male
185 Depression Risk Scale (MDRS-22) [23]. The MDRS-22 contains twenty-two self-report items
186 designed to assess six broad domains of externalising and male-type depression symptoms
187 present in the last month including anger and aggression, drug use, alcohol use, emotion
188 suppression, risk-taking, and somatic symptoms using the response format of 5-point Likert
189 scale ranging from 0 (*none of the time*), 1 (*a little of the time*), 2 (*some of the time*), 3 (*most*

1
2
3 190 *of the time*), and 4 (*all of the time*). Cronbach's alphas for the MDRS are reported in Table 2
4
5 191 for both age groups and for the overall sample and are considered adequate.
6
7 192

193 ***The Patient Health Questionnaire (PHQ-9)***

194 The Patient Health Questionnaire (PHQ-9) [29] is a self-report depression screening
195 tool for use in primary care that assesses nine symptoms consistent with the DSM-5
196 diagnostic criteria for major depressive disorder [7]. Participants endorse how often they
197 have experienced each symptom (e.g., "*Feeling down, depressed, or hopeless*") during the
198 preceding two-week period using a 4-point Likert scale ranging from 0 (*not at all*) to 3
199 (*almost every day*). A score of 10 and above is indicative of clinically significant depressive
200 symptoms [35]. In addition to utilising total PHQ-9 scores, we used item 9 as a measure of
201 suicidality: "Over the past two weeks, how often have you been bothered by thoughts that
202 you would be better off dead, or of hurting yourself in some way?". We deemed those who
203 scored 1 or more on this item to be currently experiencing suicidal ideation. Internal
204 consistency of the PHQ-9 in the present study for the overall sample was high ($\alpha = .93$).
205

206 ***Kessler Psychological Distress Scale (K10)***

207 The Kessler Psychological Distress Scale (K10) [30] is a widely used measure in both
208 research and primary care settings [36]. It comprises ten questions assessing a person's
209 negative emotional state in the preceding 30 days (e.g., "*About how often did you feel so*
210 *nervous that nothing could calm you down*"). Responses are based on a 5-point Likert scale
211 ranging from 1 (*none of the time*) to 5 (*all of the time*). In addition to examining K10 total
212 scores, we created a binary variable with scores ≥ 25 indicating probable mental illness,
213 consistent with published cut-off scores for the K10 [37]. Internal consistency of the K10 in
214 this study for the overall sample was high ($\alpha = .95$).
215

216 **Analytic sample**

217 A total of 1114 participants commenced the study. However, 156 participants were
218 not included in the analyses due to substantial missing data. Thus, $N = 949$ participants who
219 provided complete data for the items comprising the MDRS-22 were included in the item

220 reduction process described below. Of this sample, $n = 29$ did not provide complete data for
221 the PHQ-9 or K10 items. Thus, models using these variables comprised $n = 920$ participants.

222

223 **Statistical analyses**

224 Data for the present study were analysed using IBM SPSS Statistics (Version 26.0)
225 except for the confirmatory factor analysis (CFA) undertaken in JASP [Version 0.13.1; 38].
226 Various recommendations exist for the selection of items for short-form surveys including
227 both Rasch analysis [39] and descriptive approaches [40, 41]. Broadly speaking, the focus is
228 on selecting items with maximum variability and which retain the theorised underlying
229 construct—as well as sub-domains—measured by the long-form scale. Therefore, we
230 calculated descriptive (means, standard deviation (*SD*), and skewness) and relational
231 statistics (correlations) for each item (see Supplementary Table 1). Items were then scored
232 based on each statistic within its corresponding domain (i.e., largest *SD*, strongest
233 correlation etc) and summed across the different descriptive indices to derive a total
234 performance score for each item. Parallel Analysis consisting of 1,000 permutations of the
235 original raw data was used to determine thresholds for retaining factors. Exploratory factor
236 analysis (EFA) of the best performing items was performed with maximum likelihood
237 estimation within each age group, and in the combined sample. Stability of this solution was
238 then established using CFA of Time 2 Data ($n = 328$). Fit indices reported include:
239 comparative fit index (CFI); the Tucker-Lewis index (TLI); the root mean square error of
240 approximation (RMSEA); and the standardised root mean residual (SRMR). Interpretation of
241 these indices were guided by the recommendations of Hu & Bentler [42].

242 In order to investigate the clinical utility of the reduced item scale, cut-off scores
243 were determined for Low (0 – 5), Moderate (6 – 7), Severe (8 – 12) and Extremely severe
244 (13+) symptom severity groups. The corresponding cumulative percentiles (cum%) at the
245 upper boundaries of these categories were: Low (cum% = 63.5), Moderate (cum% = 77.5%),
246 Severe (cum% = 95.5), Extremely severe (cum% = 100.0). These category scores were
247 determined using previously reported cumulative percentiles that represented differing
248 degrees of increased risk of recent suicide attempt for the MDRS-22 [33]. A 2x2 ANOVA was
249 conducted to explore the effect of age group differences and MDRS-7 symptom categories

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2
3 250 on prototypic depression (PHQ-9) and psychological distress (K10). We classified individuals
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5 251 into depression groups using the MDRS-7 in combination with the PHQ-9 based on previous
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7 252 research [24] with groups referred to as: not depressed (PHQ-9 < 10 and MDRS-7 ≤ 5),
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9 253 prototypic depression features (PHQ-9 ≥ 10 and MDRS-7 ≤ 5), mixed features (PHQ-9 ≥ 10
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11 254 and MDRS-7 > 5), and externalising and male-type features (PHQ-9 < 10 and MDRS-7 > 5). In
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13 255 addition, we used the K10 to determine those individuals suffering a moderate mental
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15 256 illness (K10 ≥ 25) from those without a mental illness (K10 < 25), and current suicidality was
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17 257 ascribed based on scores ≥ 1 on PHQ-9 item 9: “Over the past two weeks, how often have
18
19 258 you been bothered by thoughts that you would be better off dead, or of hurting yourself in
20
21 259 some way?”. Based on these classifications, generalised linear models (GLMs) were used to
22
23 260 determine risk of mental illness and suicidality based on depressive symptom groupings
24
25 261 whilst controlling for previous diagnosis of depression. An additional GLM examined risk of
26
27 262 depression at Time 2 (PHQ-9 ≥ 10) as a function of MDRS-7 categories at Time 1.
28
29 263 Assumptions of GLMs were considered through inspection of scatter plots and histograms of
30
31 264 residuals and predicted values, with model results reported as standardised betas.
32
33 265

32 266 **Results**

34 267 *Sample characteristics*

36 268 Table 1 presents the characteristics of the participants at Time 1 and Time 2. As
37
38 269 expected, there was a higher proportion of older participants who reported themselves as
39
40 270 married/de-facto or widowed/divorced/separated, in comparison to younger men.
41
42 271 Regarding education, the majority of older participants completed year 11 or below, whilst
43
44 272 the proportion of participants completing a Bachelor’s degree was higher in the younger
45
46 273 sample. In addition, household income appeared to be higher in younger compared to older
47
48 274 men, consistent with the majority of the older sample reporting themselves as being retired.
49
50 275 Comparisons with 2016 Australian Census data indicate that participants in the current
51
52 276 study were more likely to be married or in a de-facto relationship (63.1% vs 58.1%), more
53
54 277 likely to have completed a Bachelor Degree level or above (49.8% vs 22.0%), and less likely
55
56 278 to be employed full-time (44.5% vs 57.7%) compared to the Australian population [43]. This
57
58 279 likely reflects the trend towards older males in the current study. Sample characteristics at

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3 280 Time 1 and Time 2 were mostly comparable, with a higher proportion of participants at
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5 281 Time 2 retired.
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Insert Table 1 about here

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15
16 287 *Item reduction*

17
18 288 Descriptive and relational statistics for each of the MDRS-22 items across younger
19
20 289 and older age groups are displayed in Supplementary Table 1. For the emotion suppression,
21
22 290 alcohol use, somatic symptoms, and drug use domains, a single highest scoring item
23
24 291 emerged congruent across age groups. For the anger and aggression domain, two different
25
26 292 items were retained because of their performance across the age groups. Finally, although
27
28 293 two risk-taking items scored equally well in the younger group, only one of these loaded
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30 294 within the older age group, and only this item was retained. This resulted in a total selection
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32 295 of seven items for the short form scale covering all of the original MDRS-22 domains.

33 296 Factor analysis of these seven items revealed the presence of a single underlying
34
35 297 domain that satisfied criteria determined by the parallel analysis; eigenvalues were required
36
37 298 to exceed 1.16. As shown in Table 2, all items demonstrated a moderate-to-strong loading
38
39 299 on a single underlying factor except for those measuring alcohol and drug use, which loaded
40
41 300 moderately. When modelling these 7-items using CFA at Time 2, the initial solution
42
43 301 specifying all items loading on a single latent MDRS-7 factor was not quite adequate [$\chi^2(14)$
44
45 302 = 65.85 $p < .001$, CFI = 0.96, TLI = 0.94, RMSEA = 0.11 (0.08, 0.13), SRMR = 0.10]. However,
46
47 303 allowing the errors of the two items assessing anger and physical aggression to covary
48
49 304 resulted in acceptable model fit [$\chi^2(13) = 29.04$ $p \leq .01$, CFI = 0.99, TLI = .98, RMSEA = 0.06
50
51 305 (0.03, 0.09), SRMR = 0.09].

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Insert Table 2 about here

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3 310 *Cut-off scores for the short scale*
4

5 311 The proportion of men in each of the different MDRS-7 symptom severity categories
6
7 312 are shown in Supplementary Figure 1 for the total sample, and by age group. As can be
8
9 313 seen, older men appear more likely to be in the 'low' category of symptoms, and less likely
10
11 314 to be in the 'severe' or 'extremely severe' categories compared to younger males. Figure 1
12
13 315 shows the effect of age and MDRS-7 categories on prototypic depression (PHQ-9) and
14
15 316 psychological distress (K10). For PHQ-9, there were significant differences between all
16
17 317 MDRS-7 groups [$F(3, 912) = 208.05, p < .001$] and between age groups [$F(1, 912) = 26.76, p <$
18
19 318 $.001$], with no significant interaction between MDRS-7 and age [$F(3, 912) = 0.59, p = .625$].
20
21 319 For the K10, results were similar: significant differences between all MDRS-7 groups [$F(3,$
22
23 320 $912) = 188.95, p < .001$] and between younger and older men [$F(3, 912) = 33.05, p < .001$],
24
25 321 but no interaction between MDRS-7 and age [$F(3, 912) = 0.44, p = .719$].
26
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29 324 Insert Figure 1 about here
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33 326

34 327 *Clinical utility of the MDRS-7*
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36 328 The proportion of males according to depressive classification type is shown in
37
38 329 Supplementary Figure 2. Externalised and male-type depression affected approximately 10%
39
40 330 of younger and older males, whilst prototypic and mixed depressive symptoms were more
41
42 331 common in younger males. Table 3 shows the risk of mental illness and suicidality compared
43
44 332 to non-depressed participants within each age group after controlling for a previous
45
46 333 diagnosis of depression. All classifications were associated with both outcome measures.
47
48 334 Individuals with mixed symptoms have the highest risk of suicidality and mental illness.
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53 337 Insert Table 3 about here
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3 340 A final GLM considered the likelihood of being classified as depressed at follow-up
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5 341 based on responses to the PHQ-9 at Time 2 (i.e., score ≥ 10). MDRS-7 category was entered
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7 342 as a predictor controlling for PHQ-9 scores at Time 1, previous diagnosis of depression and
8
9 343 age. As shown in Table 4, PHQ scores at Time 1 were significantly associated with increased
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11 344 risk of depression at Time 2 although age and prior diagnoses were not significantly
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13 345 associated. Those classified as having moderate MDRS-7 symptoms at Time 1 were
14
15 346 significantly more likely than those in the low symptom category to be classified as
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17 347 depressed at Time 2, whilst the severe and extremely severe categories were not associated
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19 348 with increased risk.
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24 351 Insert Table 4 about here
25 352 -----
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27 353 Discussion

29 354 Clinical reports and emergent empirical work suggest that men's depression may be
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31 355 under-detected as a result of prototypic screening tools that may be insensitive to men's
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33 356 gender role socialisation [11, 13, 44]. The Male Depression Risk Scale (MDRS-22) assesses
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35 357 externalised and male-type symptoms of depression, such as substance misuse, risk-taking,
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37 358 and anger. However, in its current 22-item form, it is impractical for rapid use in primary
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39 359 care, particularly when used alongside traditional depression screening tools [12]. The
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41 360 present research aimed to derive a short form of the MDRS-22, examine its psychometric
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43 361 properties and relationships with psychological distress, depression, and suicidal ideation in
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45 362 order to demonstrate its utility as a potential screening tool in primary and other health
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47 363 care settings.

47 364 The short form derived herein comprises seven items, representing 1 item for each
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49 365 of the original MDRS domains including emotion suppression, risk-taking, substance use,
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51 366 drug use, somatic symptoms, and two items for the anger and aggression domain, based on
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53 367 criteria including variability within items, the item's relationship to its original MDRS domain
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55 368 but also with the overall MDRS score. Of particular importance is our finding that the
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57 369 correlation between the MDRS-7 and the original MDRS-22 was near perfect ($r = .94$). Five
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3 370 of the seven items demonstrated moderate-to-strong loadings on a single underlying
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5 371 construct presumed to reflect the male depression phenotype, whilst two items assessing
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7 372 alcohol and drug use loaded moderately. This likely reflects the reduced variability of
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9 373 participant responses on these items, with most participants reporting that these items
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11 374 applied to them none, or a little of the time. However, these loadings still exceeded the
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13 375 minimum recommended factor loading of .32 [45]. In addition, items that tap these
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15 376 behaviours are important to retain given that substance use is an important marker of
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17 377 depression and suicidality in men and particularly those who adhere to masculine norms
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19 378 [44, 46]. It is nonetheless important to note that substance use may reflect a comorbidity
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21 379 [47] or maladaptive coping [48]. These are important questions for future research to
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23 380 explore.

23 381 In the present study, externalising and male-type symptoms, either alone or in
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25 382 combination with prototypic symptoms, were found to be more common than exclusively
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27 383 prototypic symptoms. Approximately 10% of younger and older males were found to
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29 384 present with uniquely externalising and male-type symptoms, whilst 38% of younger males
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31 385 and 13% of older males presented with mixed symptoms. These findings are consistent with
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33 386 previous research using the MDRS-22 [24] and highlight the potential utility of the MDRS-7
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35 387 for detecting additional cases of men at risk. Men with exclusively externalised and male-
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37 388 type depression are a subset who score below threshold on traditional prototypic measures
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39 389 but whom report a degree of externalised behaviours that might be problematic.
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41 390 Furthermore, both younger and older males in the mixed symptom group had increased risk
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43 391 of a mental illness—after controlling for a previous diagnosis of depression—demonstrating
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45 392 unequivocally that this represents a unique group of psychologically distressed, at-risk men.
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47 393 Similarly, both younger and older males in the mixed symptom group had a significantly
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49 394 elevated risk of suicidality. These findings are consistent with research by Zajac and
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51 395 colleagues [24] and highlight the clinical importance of considering a broad range of
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53 396 potential presentations of depression in men, all of which are associated with increased risk
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55 397 of poor outcomes.

54 398 The MDRS-7 was also shown to be effective at predicting depression at a later time
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56 399 point, suggesting a possible prodromal effect. These findings are consistent with those by

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3 400 Kendler and colleagues [49] who demonstrated that externalising and male-type symptoms
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5 401 predicted a future depressive episode in men. Hence, our findings may reflect early
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7 402 symptom expression, or even attempts of men to cope with what has the potential to
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9 403 develop into a threshold depressive disorder. This further highlights the potential value of
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11 404 screening for externalising and male-type symptoms to facilitate early intervention and
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13 405 prevention of further mental health issues [50]. In addition, given the externalised nature of
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15 406 male-typical symptoms of depression, it is important to note that these symptoms not only
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17 407 affect men's health and wellbeing but also the health wellbeing of their families, friends,
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19 408 and communities [13, 51, 52]. Hence the better identification and management of male
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21 409 depression is likely to have substantial public health implications.
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410

411 **Clinical implications**

412 There is an urgent need for health services and providers to utilise more sensitive
413 diagnostic tools as a means of improving the detection of depression and psychological
414 distress in males and addressing the high rates of male suicide [13]. The use of brief tools
415 such as the MDRS-7 may assist with detecting unique cases of men who would score below
416 threshold on measures such as the PHQ-9. However, an added benefit of using this scale
417 alongside prototypic measures, is the ability to detect men presenting with mixed
418 symptomology whose risk of suicide and poor mental health outcomes is significantly
419 elevated. Therefore, the clinical utility of this measure may extend beyond screening and
420 detection and into the therapy setting where it is necessary to determine, monitor, and
421 manage differing degrees of suicidality.

422

423 **Limitations and suggestions for future research**

424 The methodology adopted in this study is not without limitations. The majority of
425 participants were recruited online, which may limit the generalisability of the findings to
426 other populations [53]. Future research should examine measurement invariance according
427 to factors such as education level, income, and cultural background. There was also a trend
428 towards older males in the current sample. However, items retained in the MDRS-7 were
429 those that performed best in both younger and older males to ensure the measure was

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3 430 appropriate across the lifespan. Future research should examine the psychometric
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5 431 properties of the MDRS-7 with additional populations, including clinical samples of men
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7 432 across the lifespan presenting to primary care. In addition, as data was self-report, diagnosis
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9 433 of depression could not be verified at clinical interview. The results of this study would be
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11 434 strengthened by a more rigorous assessment of psychopathology and comorbidity. It is also
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13 435 important to acknowledge that this study used a single item from the PHQ-9 to examine
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15 436 current suicidal ideation. Therefore, there is a need for additional research to examine the
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17 437 relationship between the MDRS-7 and other measures of suicidality, including recent suicide
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19 438 attempt.

20 439

21 440 **Conclusion**

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23 441 The present study provides important preliminary information on the development
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25 442 and validation of the MDRS-7. Specifically, this study provides emerging support for the
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27 443 validity and reliability of the MDRS-7 as a measure of externalising and male-type
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29 444 depression symptoms in both younger and older men in terms of its psychometric
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31 445 properties as well as its relationship to prototypic depression symptoms, psychological
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33 446 distress, and suicidality. Use of male-specific measures of depression such as the MDRS-7
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35 447 may improve the detection of depression and suicide risk in men, and adjunctive use
36
37 448 (alongside established prototypic scales such as the PHQ-9) may contribute to improved
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39 449 public health outcomes.

40 450

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43
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45 454 **Author contributions**

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47
48
49 455 D.H., S.R., and I.Z. developed the study concept. D.H. and I.Z. performed the data analyses.
50
51 456 D.H. drafted the paper and S.R. and I.Z. provided critical revisions. All authors approved the
52
53 457 final version of the paper for submission.

54 458

Table 1. Sociodemographic characteristics of participants

Variable	Younger men (< 65)		Older men (≥ 65)	
	Time 1 (n = 510)	Time 2 (n = 159)	Time 1 (n = 439)	Time 2 (n = 169)
Age range	18-64		65-93	
Age, <i>M</i> (<i>SD</i>)	45.43 (14.56)		72.79 (5.88)	
Relationship status, <i>n</i> (%)				
Single (never married)	118 (23.1)	27 (17.0)	12 (2.7)	6 (3.6)
Widowed/divorced/separated	68 (13.3)	19 (11.9)	92 (21.0)	44 (26.0)
Married/de-facto	322 (63.1)	113 (71.1)	332 (75.6)	119 (70.4)
Prefer not to say	2 (0.4)	0 (0.0)	3 (0.7)	0 (0.0)
Employment status, <i>n</i> (%)				

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 463 influence on the design of the study and collection, analysis, or interpretation of data or in
 464 writing the manuscript.

466 Ethics approval

467 Ethics approval was obtained from the University of Adelaide Human Research Ethics
 468 Committee and the CSIRO Health and Medical Human Research Ethics Committee (approval
 469 number H-2019-109). All participants provided informed consent.

471 Competing interests

472 The authors declare that they have no competing interests.

474 Data sharing statement

475 Data is available upon reasonable request.

Employed full-time	227 (44.5)	66 (41.5)	22 (5.0)	5 (3.0)
Employed part-time	37 (7.3)	11 (6.9)	18 (4.1)	4 (2.4)
Employed casually	67 (13.1)	19 (11.9)	14 (3.2)	5 (3.0)
Not employed or unpaid work	94 (18.4)	24 (15.1)	13 (3.0)	7 (4.1)
Retired	73 (14.3)	39 (24.5)	370 (84.3)	148 (87.6)
Prefer not to say	12 (2.4)	0 (0.0)	2 (0.5)	0 (0.0)
Household income, <i>n</i> (%)				
<\$35,000	136 (26.7)	28 (17.6)	141 (32.1)	51 (30.2)
\$35,000-\$65,000	91 (17.8)	32 (20.1)	156 (35.5)	55 (32.5)
\$65,000-\$105,000	100 (19.6)	44 (27.7)	80 (18.2)	29 (17.2)
\$105,000-\$160,000	97 (19.0)	26 (16.4)	31 (7.1)	15 (8.9)
>\$160,000	65 (12.7)	20 (12.6)	12 (2.7)	4 (2.4)
Prefer not to say	21 (4.1)	9 (5.7)	19 (4.3)	15 (8.9)
Highest level of education, <i>n</i> (%)				
Year 11 or below	49 (9.6)	11 (6.9)	81 (18.5)	23 (13.6)
Year 12	52 (10.2)	10 (6.3)	48 (10.9)	17 (10.1)
Certificate/diploma	154 (30.2)	55 (34.6)	133 (30.3)	50 (29.6)
Bachelor's degree	139 (27.3)	44 (27.7)	74 (16.9)	34 (20.1)
Graduate certificate/diploma	43 (8.4)	15 (9.4)	39 (8.9)	20 (11.8)
Postgraduate degree	72 (14.1)	23 (14.5)	56 (12.8)	22 (13.0)
Prefer not to say	1 (0.2)	1 (0.6)	8 (1.8)	3 (1.8)

Note. % may not equal 100% due to rounding.

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484 Table 2. Item loadings derived from exploratory factor analysis (maximum likelihood estimation)

Domains	Items	18-64	65+	Overall	Time 2
Emotion Suppression	I bottled up my negative feelings	.67	.72	.71	.68
Alcohol Use	I needed alcohol to help me unwind	.44	.45	.48	.37
Somatic Symptoms	I had unexplained aches and pains	.56	.59	.58	.63
Aggression	I overreacted to situations with aggressive behaviour	.69	.74	.71	.30
Anger	It was difficult to manage my anger	.75	.74	.75	.65
Drug Use	Using drugs provided temporary relief	.36	.44	.42	.44
Risk-Taking	I stopped caring about the consequences of my actions	.63	.62	.65	.80
	<i>Eigenvalue</i>	2.52	2.74	2.72	
	<i>Variance explained (%)</i>	36.04	39.08	38.82	
	<i>Cronbach's alpha</i>	.68	.71	.72	
	<i>Correlation with MDRS-22</i>	.94	.94	.94	
	<i>Short form re-test reliability</i>	.72	.69	.71	
	<i>M (SD)</i>	5.93 (4.04)	3.57 (3.39)	4.84 (3.93)	

485 Note. Time 2 loadings derived using confirmatory factor analysis (CFA) in the combined sample. All correlations were significant at $p < .001$

486 Table 3. Odds of mental illness and current suicidality controlling for previous diagnosis of depression

	Depressed group, <i>n</i>	Moderate mental illness, <i>n</i> (%)	Moderate mental illness, AOR [95% CI]	Suicidality, <i>n</i> (%)	Suicidality, AOR [95% CI]
18-64					
Not depressed	189	11 (6)	1	13 (7)	1
Prototypic depression	69	54 (78)	51.35*** [21.94, 120.18]	42 (61)	18.76*** [8.86, 39.72]
Externalised depression	69	10 (20)	4.09** [1.60, 10.47]	9 (18)	2.99* [1.19, 7.50]
Mixed depression	186	162 (87)	91.35*** [43.00, 194.06]	136 (73)	31.97*** [16.51, 61.90]
65+					
Not depressed	308	5 (2)	1	19 (6)	1
Prototypic depression	20	8 (40)	29.66*** [8.17, 107.670]	8 (40)	8.14*** [2.89, 22.97]
Externalised depression	41	4 (10)	5.37* [1.36, 21.26]	10 (24)	4.34*** [1.83, 10.29]
Mixed depression	54	36 (67)	105.05*** [36.48, 302.50]	41 (76)	42.69*** [19.47, 93.61]

Note. Total *N* = 916 due to 4 respondents not reporting previous depression diagnosis. AOR = adjusted odds ratio. OR for previous depression diagnosis not shown. Moderate mental illness defined as K10 ≥ 25. Suicidality defined as ≥ 1 on PHQ-9 item 9. Not depressed = PHQ-9 < 10 and MDRS-7 ≤ 5; Prototypic depression = PHQ-9 ≥ 10 and MDRS-7 ≤ 5; Externalised depression = PHQ-9 < 10 and MDRS-7 > 5; Mixed depression = PHQ-9 ≥ 10 and MDRS-7 > 5. ****p* < .001, ***p* < .01, **p* < .05.

488 Table 4. Odds of being classified as depressed at follow up

Outcome: Depressed (PHQ-9 \geq 10) at Time 2 ($n = 328$)		
	OR	95% CI
Age (older)	1.46	[0.69, 3.09]
Previous depression diagnosis (yes)	1.87	[0.88, 3.99]
PHQ-9 (Time 1)	1.24***	[1.15, 1.34]
Moderate (MDRS-7)	3.30**	[1.38, 7.90]
Severe (MDRS-7)	2.00	[0.76, 5.28]
Extremely severe (MDRS-7)	1.64	[0.28, 9.54]

Note. Reference category = low symptoms. *** $p < .001$, ** $p < .01$.

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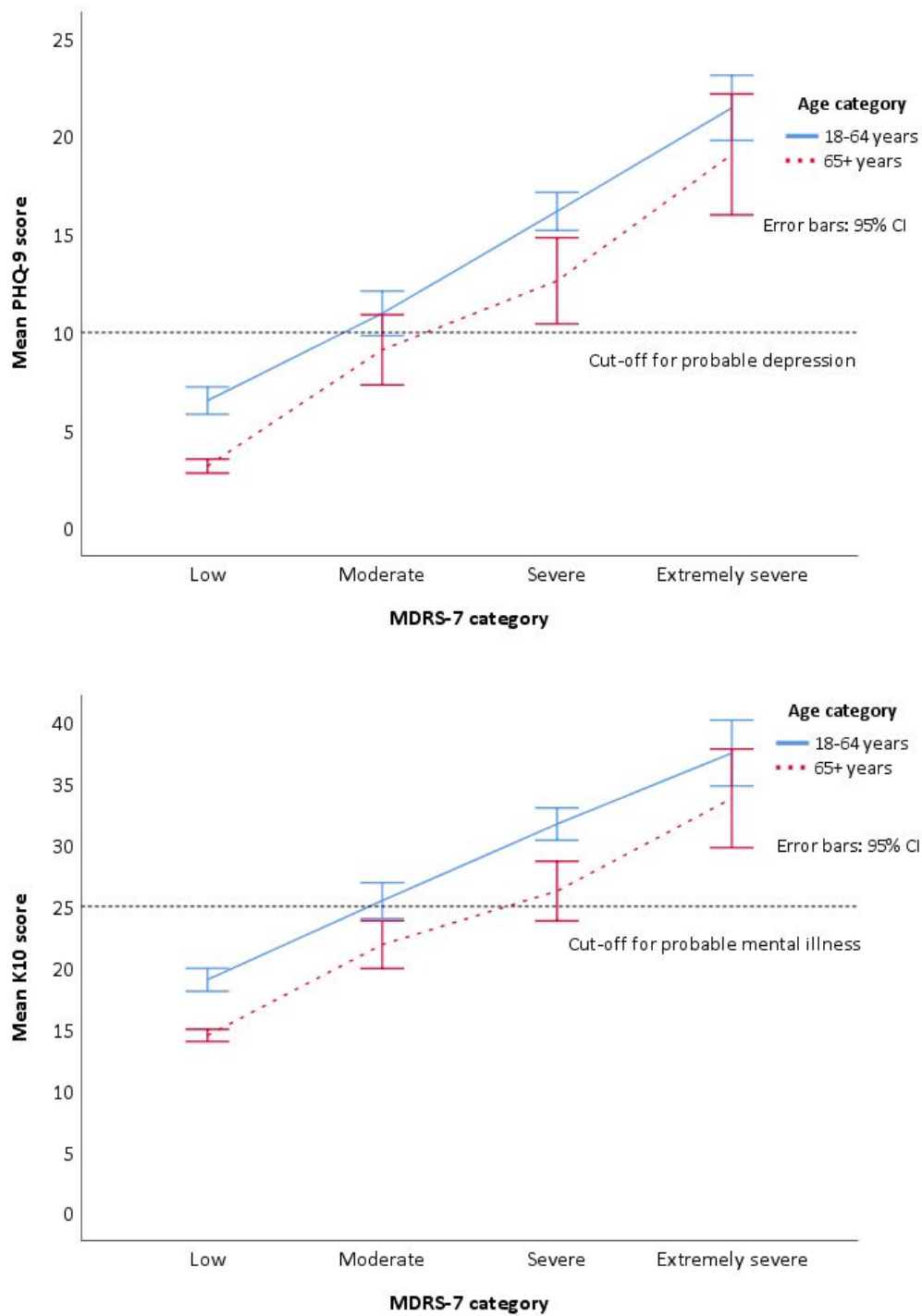
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504 Figure 1. Effect of age and MDRS-7 category on prototypic depression symptoms (PHQ-9)
 505 and psychological distress (K10)

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References

1. Friedrich, M.J., *Depression is the leading cause of disability around the world*. JAMA, 2017. **317**(15): p. 1517-1517.
2. Costantini, L., et al., *Screening for depression in primary care with Patient Health Questionnaire-9 (PHQ-9): A systematic review*. Journal of Affective Disorders, 2021. **279**: p. 473-483.
3. World Health Organization, *Depression and Other Common Mental Disorders: Global Health Estimates*, W.H. Organization, Editor. 2017, World Health Organization: Geneva.
4. Chesney, E., G.M. Goodwin, and S. Fazel, *Risks of all-cause and suicide mortality in mental disorders: A meta-review*. World Psychiatry, 2014. **13**(2): p. 153-160.
5. Mauvais-Jarvis, F., et al., *Sex and gender: Modifiers of health, disease, and medicine*. The Lancet, 2020. **396**(10250): p. 565-582.
6. World Health Organization, *Preventing suicide: A global imperative*. 2014, World Health Organization: Geneva.
7. American Psychiatric Association, *Diagnostic and statistical manual of mental disorders: DSM-5*. fifth ed. 2013, Arlington, VA: American Psychiatric Association.
8. World Health Organization, *International classification of diseases for mortality and morbidity statistics 2018*.
9. Whittle, E.L., et al., *Men, depression, and coping: Are we on the right path?* Psychology of men & masculinity, 2015. **16**(4): p. 426-438.
10. Cavanagh, A., et al., *Symptom endorsement in men versus women with a diagnosis of depression: A differential item functioning approach*. International Journal of Social Psychiatry, 2016. **62**(6): p. 549-559.
11. Martin, L.A., H.W. Neighbors, and D.M. Griffith, *The experience of symptoms of depression in men vs women: Analysis of the National Comorbidity Survey Replication*. JAMA Psychiatry, 2013. **70**(10): p. 1100-6.
12. Rice, S.M., et al., *Male-type and prototypal depression trajectories for men experiencing mental health problems*. Int J Environ Res Public Health, 2020. **17**(19).
13. Call, J.B. and K. Shafer, *Gendered manifestations of depression and help seeking among men*. American Journal of Men's Health, 2018. **12**(1): p. 41-51.
14. Australian Bureau of Statistics, *Health service usage and health related actions, Australia, 2014-15 (Cat. No. 4364.0.55.002)*. 2017, Australian Bureau of Statistics: Canberra.
15. Australian Institute of Family Studies, *Mental health of Australian males: Depression, suicidality and loneliness*. 2020.
16. Martin, S., et al., *Effect of depression on health service utilisation in men: a prospective cohort study of Australian men aged 35 to 80 years*. BMJ Open, 2021. **11**(3): p. e044893.
17. Wang, Y., et al., *Do men consult less than women? An analysis of routinely collected UK general practice data*. BMJ Open, 2013. **3**(8): p. e003320.
18. Schaffer, A., et al., *Population-based analysis of health care contacts among suicide decedents: identifying opportunities for more targeted suicide prevention strategies*. World Psychiatry, 2016. **15**(2): p. 135-145.
19. Lakkis, N.A. and D.M. Mahmassani, *Screening instruments for depression in primary care: A concise review for clinicians*. Postgraduate Medicine, 2015. **127**(1): p. 99-106.
20. Brownhill, S., et al., *'For men only'. A mental health prompt list in primary care*. Australian family physician, 2003. **32**(6): p. 443.
21. Zierau, F., et al., *The Gotland Male Depression Scale: A validity study in patients with alcohol use disorder*. Nordic Journal of Psychiatry, 2002. **56**(4): p. 265-271.
22. Magovcevic, M. and M. Addis, *The Masculine Depression Scale: Development and psychometric evaluation*. Psychology of Men & Masculinity, 2008. **9**(3): p. 117-132.

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2
3 557 23. Rice, S.M., et al., *Development and preliminary validation of the Male Depression Risk Scale: Furthering the assessment of depression in men*. Journal of Affective Disorders, 2013. **151**(3): p. 950-958.
- 4 558
5 559
6 560 24. Zajac, I.T., et al., *Suicide risk, psychological distress and treatment preferences in men presenting with prototypical, externalising and mixed depressive symptomology*. Journal of Mental Health, 2020: p. 1-8.
- 7 561
8 562
9 563 25. Ferenchick, E.K., P. Ramanuj, and H.A. Pincus, *Depression in primary care: Part 1—screening and diagnosis*. BMJ, 2019. **365**: p. 1794.
- 10 564
11 565 26. Hutton, C. and J. Gunn, *Do longer consultations improve the management of psychological problems in general practice? A systematic literature review*. BMC Health Services Research, 2007. **7**(1): p. 71.
- 12 566
13 567
14 568 27. The Royal Australian College of General Practitioners, *General Practice: Health of the Nation 2018*. 2018: East Melbourne, Vic.
- 15 569
16 570 28. Mitchell, A.J. and J.C. Coyne, *Do ultra-short screening instruments accurately detect depression in primary care? A pooled analysis and meta-analysis of 22 studies*. The British journal of general practice : the journal of the Royal College of General Practitioners, 2007. **57**(535): p. 144-151.
- 17 571
18 572
19 573 29. Kroenke, K., R.L. Spitzer, and J.B. Williams, *The PHQ-9: Validity of a brief depression severity measure*. Journal of General Internal Medicine, 2001. **16**(9): p. 606-613.
- 20 574
21 575 30. Kessler, R.C., et al., *Short screening scales to monitor population prevalences and trends in non-specific psychological distress*. Psychological Medicine, 2002. **32**(6): p. 959-976.
- 22 576
23 577 31. Beck, A.T., et al., *Screening for major depression disorders in medical inpatients with the Beck Depression Inventory for Primary Care*. Behaviour Research and Therapy, 1997. **35**(8): p. 785-791.
- 24 578
25 579
26 580 32. Rice, S.M., et al., *Externalizing depression symptoms among Canadian males with recent suicidal ideation: A focus on young men*. Early Intervention in Psychiatry, 2019. **13**(2): p. 308-313.
- 27 581
28 582
29 583 33. Rice, S.M., et al., *Validity of the Male Depression Risk Scale in a representative Canadian sample: sensitivity and specificity in identifying men with recent suicide attempt*. J Ment Health, 2019. **28**(2): p. 132-140.
- 30 584
31 585
32 586 34. Herreen, D., et al., *Associations between conformity to masculine norms and depression: Age effects from a population study of Australian men*. BMC Psychology, 2021. **9**(1): p. 32.
- 33 587
34 588 35. Kroenke, K., et al., *The Patient Health Questionnaire somatic, anxiety, and depressive symptom scales: A systematic review*. General Hospital Psychiatry, 2010. **32**(4): p. 345-359.
- 35 589
36 590
37 591 36. Stolk, Y., I. Kaplan, and J. Szwarc, *Clinical use of the Kessler psychological distress scales with culturally diverse groups*. International Journal of Methods in Psychiatric Research, 2014. **23**(2): p. 161-183.
- 38 592
39 593
40 594 37. Australian Bureau of Statistics, *National health survey: Users' guide 2014-2015 (Cat. No. 4363.0)*. 2019, Australian Bureau of Statistics: Canberra.
- 41 595
42 596 38. JASP Team, *JASP (Version 0.13.1)*. 2020.
- 43 597
44 598 39. Uddin, M.N. and F.M.A. Islam, *Psychometric evaluation of the modified Kessler seven-item version (K7) for measuring psychological distress using Rasch analysis: a cross-sectional study in a rural district of Bangladesh*. BMJ open, 2020. **10**(2): p. e034523-e034523.
- 45 599
46 600 40. Pather, S. and C.S. Uys, *Using scale reduction techniques for improved quality of survey information*. South African journal of information management, 2008. **10**(3).
- 47 601
48 602 41. Stanton, J.M., et al., *Issues and strategies for reducing the length of self-report scales*. Personnel psychology, 2002. **55**(1): p. 167-194.
- 49 603
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3 604 42. Hu, L.t. and P.M. Bentler, *Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives*. Structural Equation Modeling: A Multidisciplinary Journal, 1999. **6**(1): p. 1-55.
- 4 605
5 606
6 607 43. Australian Bureau of Statistics, *Census of population and housing - Quickstats, community profiles and datapacks user guide, Australia, 2016 (Cat. No. 2916.0)*. 2017, Australian Bureau of Statistics: Canberra.
- 7 608
8 609
9 610 44. Addis, M.E., *Gender and depression in men*. Clinical Psychology: Science & Practice, 2008. **15**(3): p. 153-168.
- 10 611
11 612 45. DeVellis, R.F., *Scale development: Theory and applications*. 4th ed. Applied social research methods series. Vol. 26. 2016, Thousand Oaks, Calif: Sage Publications.
- 12 613
13 614 46. Coleman, D., *Traditional masculinity as a risk factor for suicidal ideation: Cross-sectional and prospective evidence from a study of young adults*. Archives of Suicide Research, 2015. **19**(3): p. 366-384.
- 14 615
15 616
16 617 47. Macdonald, J.A., et al., *Profiles of Depressive Symptoms and Anger in Men: Associations With Postpartum Family Functioning*. Frontiers in psychiatry, 2020. **11**: p. 578114-578114.
- 17 618
18 619 48. Cavanagh, A., et al., *Differences in the expression of symptoms in men versus women with depression: A systematic review and meta-analysis*. Harvard Review of Psychiatry, 2017. **25**(1): p. 29-38.
- 19 620
20 621
21 622 49. Kendler, K.S. and C.O. Gardner, *Sex differences in the pathways to major depression: a study of opposite-sex twin pairs*. Am J Psychiatry, 2014. **171**(4): p. 426-35.
- 22 623
23 624 50. Hetrick, S.E., et al., *Early identification and intervention in depressive disorders: Towards a clinical staging model*. Psychotherapy and Psychosomatics, 2008. **77**(5): p. 263-270.
- 24 625
25 626 51. Rice, S.M., et al., *Longitudinal sex differences of externalising and internalising depression symptom trajectories: Implications for assessment of depression in men from an online study*. International Journal of Social Psychiatry, 2015. **61**(3): p. 236-240.
- 26 627
27 628
28 629 52. Wilson, S. and C.E. Durbin, *Effects of paternal depression on fathers' parenting behaviors: A meta-analytic review*. Clinical Psychology Review, 2010. **30**(2): p. 167-180.
- 29 630
30 631 53. Choi, I., et al., *Using different Facebook advertisements to recruit men for an online mental health study: Engagement and selection bias*. Internet Interventions, 2017. **8**: p. 27-34.
- 31 632
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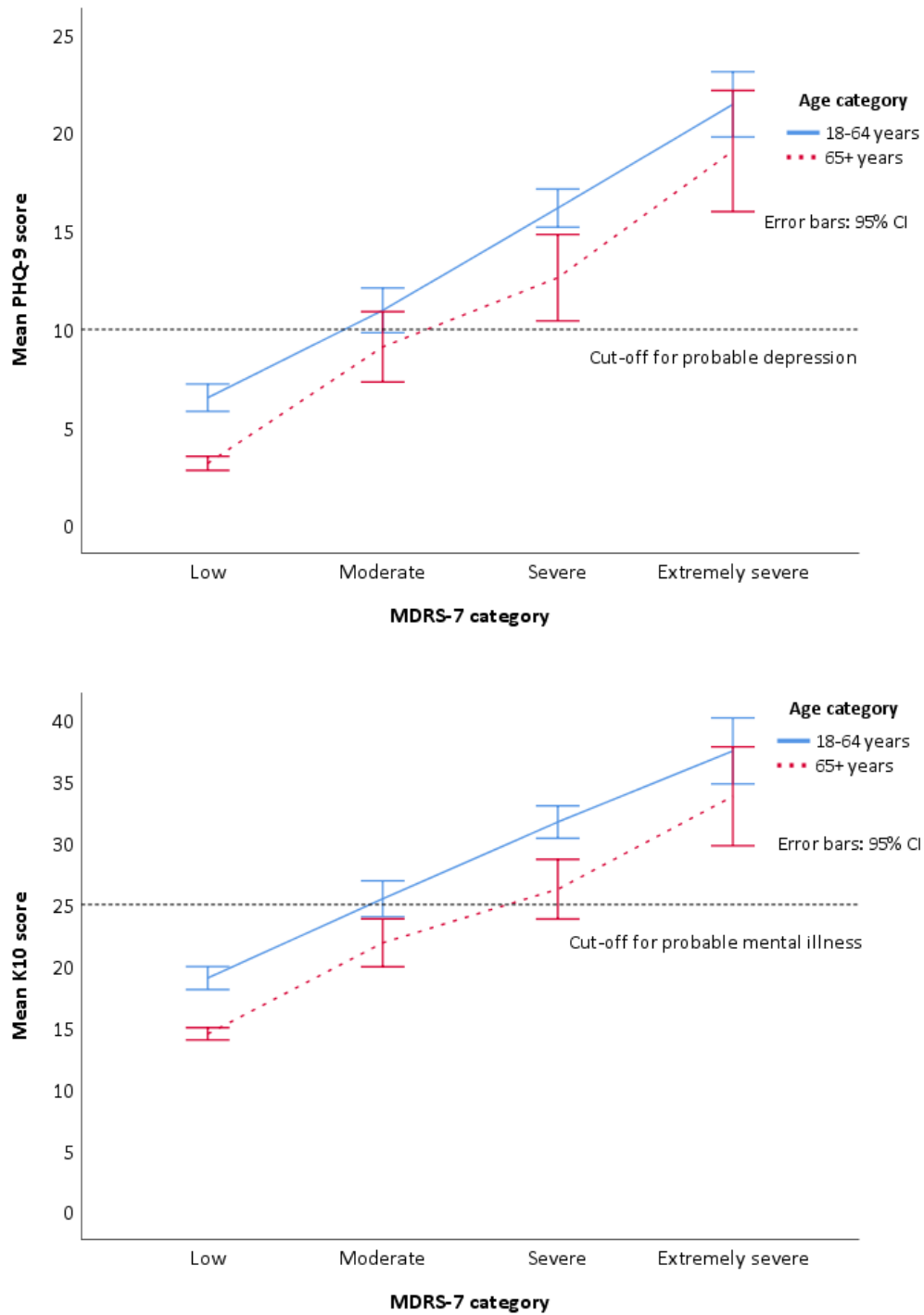
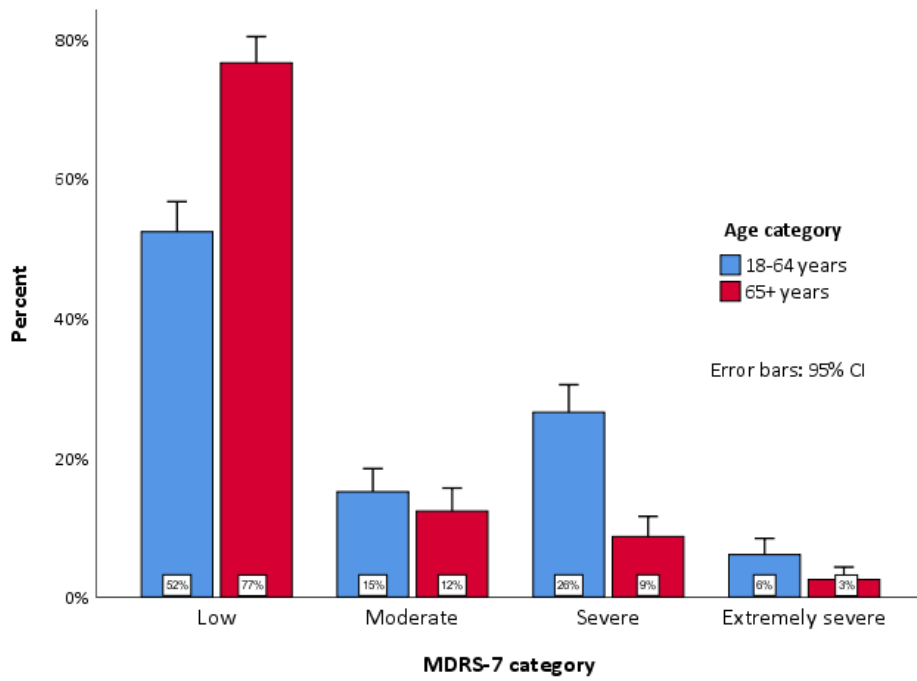


Figure 1. Effect of age and MDRS-7 category on prototypic depression symptoms (PHQ-9) and psychological distress (K10)

Supplementary Table 1. Descriptive and relational statistics for MDRS-22 items across younger and older age groups

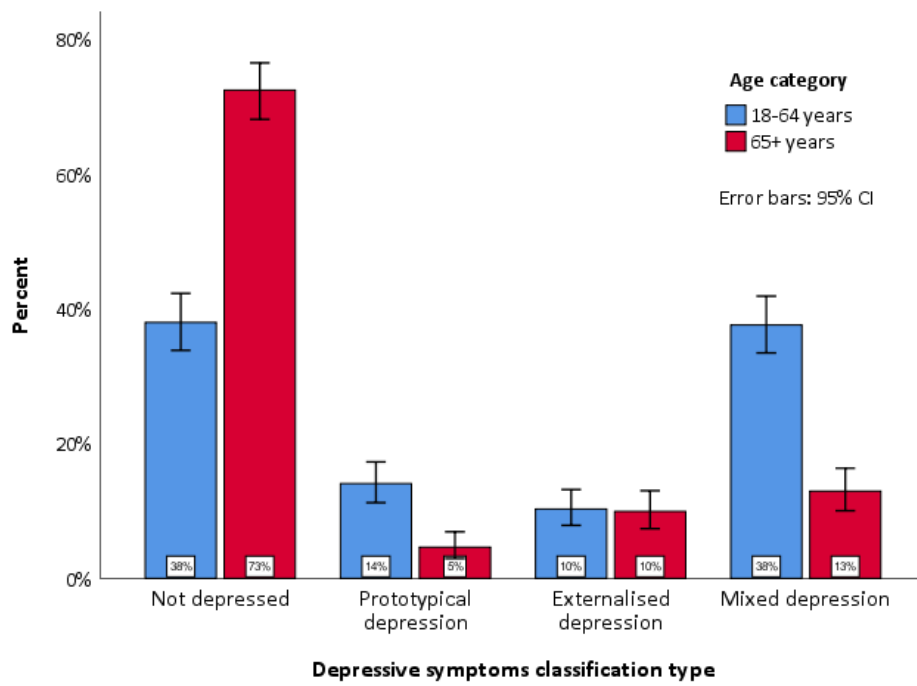
Domain	Item	Younger males							Older males						
		<i>M</i>	<i>SD</i>	Skew	Total(<i>r</i>)	Domain(<i>r</i>)	Other domains(<i>r</i>)	Item score ^a	<i>M</i>	<i>SD</i>	Skew	Total(<i>r</i>)	Domain(<i>r</i>)	Other domains(<i>r</i>)	Item score
Emotion Suppression	I tried to ignore feeling down	1.77	1.12	0.08	.62	.77	.46	1	1.34	1.26	.51	.57	.77	.35	0
	I bottled up my negative feelings	1.93	1.16	0.01	.64	.86	.45	3	1.28	1.15	.58	.73	.86	.52	3
	I covered up my difficulties	1.90	1.18	-0.04	.64	.85	.45	2	1.21	1.21	.63	.72	.84	.51	0
Alcohol Use	I had to work things out by myself	2.38	1.18	-0.31	.46	.68	.29	2	1.95	1.36	.04	.58	.72	.39	3
	I drank more alcohol than usual	0.80	1.09	1.24	.60	.89	.34	2	0.47	0.89	.11	.59	.91	.33	0
	I stopped feeling so bad while drinking	0.80	1.14	1.22	.57	.86	.32	0	0.38	0.92	.51	.58	.88	.33	0
	I needed alcohol to help me unwind	0.92	1.16	1.10	.60	.94	.32	5	0.52	0.94	.02	.61	.94	.34	6
Somatic Symptoms	I needed to have easy access to alcohol	0.53	0.98	1.93	.58	.87	.34	1	0.44	0.91	.17	.59	.91	.33	0
	I had more heartburn than usual	0.60	0.91	1.48	.39	.65	.26	0	0.38	0.71	.87	.50	.70	.38	0
	I had regular headaches	0.89	1.04	1.07	.49	.74	.35	0	0.41	0.79	.23	.54	.77	.42	0
	I had stomach pains	0.72	0.90	1.06	.53	.74	.40	2	0.38	0.76	.33	.57	.77	.45	2
Anger & Aggression	I had unexplained aches and pains	1.05	1.13	0.80	.52	.78	.37	4	0.74	0.93	.19	.57	.78	.44	5
	I overreacted to situations with aggressive behaviour	0.59	0.83	1.41	.52	.83	.38	2	0.41	0.70	.80	.56	.85	.45	4
	I verbally lashed out at others without being provoked	0.28	0.61	2.54	.42	.77	.28	0	0.15	0.45	.44	.45	.75	.34	0
Drug Use	I was verbally aggressive to others	0.34	0.65	2.13	.46	.83	.31	0	0.20	0.49	.85	.41	.80	.28	0
	It was difficult to manage my anger	0.58	0.84	1.48	.56	.84	.42	4	0.31	0.64	.35	.58	.81	.47	2
	I sought out drugs	0.32	0.79	2.64	.47	.94	.30	3	0.11	0.43	.82	.33	.90	.23	4
Risk-Taking	I used drugs to cope	0.32	0.81	2.79	.47	.94	.30	2	0.07	0.36	.55	.31	.83	.23	0
	Using drugs provided temporary relief	0.33	0.84	2.73	.47	.95	.29	4	0.10	0.43	.89	.40	.90	.31	4
	I drove dangerously or aggressively	0.33	0.66	2.04	.33	.67	.24	0	0.12	0.37	.14	.32	.60	.27	1
	I stopped caring about the consequences of my actions	0.54	0.87	1.69	.55	.82	.46	4	0.21	0.59	.26	.54	.83	.47	5
	I took unnecessary risks	0.39	0.70	1.93	.56	.84	.46	3	0.15	0.46	.21	.47	.82	.40	0

^a Items received a score of 0 or 1 (which was summed) for each statistic within its corresponding domain as follows: highest mean; largest *SD*; skew closest to zero; strongest correlation with total score; strongest correlation with domain score; and strongest correlation with other domains.



Supplementary Figure 1. Proportion of participants within MDRS-7 categories

Note. Low (0 – 5), Moderate (6 – 7), Severe (8 – 12), Extremely severe (13+).



Supplementary Figure 2. Proportion of participants according to depressive symptoms classification type

Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the STROBE cross sectional reporting guidelines, and cite them as:

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	Reporting Item	Page Number
Title and abstract		
Title	#1a Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	#1b Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction		
Background / rationale	#2 Explain the scientific background and rationale for the investigation being reported	4-6
Objectives	#3 State specific objectives, including any prespecified hypotheses	6
Methods		

1	Study design	#4	Present key elements of study design early in the paper	6
2				
3	Setting	#5	Describe the setting, locations, and relevant dates,	6
4			including periods of recruitment, exposure, follow-up,	
5			and data collection	
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9	Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods	6
10			of selection of participants.	
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13		#7	Clearly define all outcomes, exposures, predictors,	6-9
14			potential confounders, and effect modifiers. Give	
15			diagnostic criteria, if applicable	
16				
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18	Data sources /	#8	For each variable of interest give sources of data and	6-9
19	measurement		details of methods of assessment (measurement).	
20			Describe comparability of assessment methods if there	
21			is more than one group. Give information separately for	
22			for exposed and unexposed groups if applicable.	
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27	Bias	#9	Describe any efforts to address potential sources of	6
28			bias	
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31	Study size	#10	Explain how the study size was arrived at	8-9
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33	Quantitative	#11	Explain how quantitative variables were handled in the	8-9
34	variables		analyses. If applicable, describe which groupings were	
35			chosen, and why	
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39	Statistical	#12a	Describe all statistical methods, including those used to	8-9
40	methods		control for confounding	
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43	Statistical	#12b	Describe any methods used to examine subgroups and	8-9
44	methods		interactions	
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46				
47	Statistical	#12c	Explain how missing data were addressed	8-9
48	methods			
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51	Statistical	#12d	If applicable, describe analytical methods taking	N/A
52	methods		account of sampling strategy	
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55	Statistical	#12e	Describe any sensitivity analyses	N/A
56	methods			
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Results

Participants	#13a	Report numbers of individuals at each stage of study— eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for exposed and unexposed groups if applicable.	8-9
Participants	#13b	Give reasons for non-participation at each stage	N/A
Participants	#13c	Consider use of a flow diagram	N/A
Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	9-10
Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	8-9
Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	N/A
Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included all estimates are reported in tables	All estimates are reported in Tables
Main results	#16b	Report category boundaries when continuous variables were categorized	8-9
Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	N/A

Discussion

1	Key results	#18	Summarise key results with reference to study objectives	12-15
2				
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5	Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	14
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10	Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	12-15
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16	Generalisability	#21	Discuss the generalisability (external validity) of the study results	14
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20	Other			
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24	Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	N/A
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 31 made by the [EQUATOR Network](#) in collaboration with [Penelope.ai](#)
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