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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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1 **Brief assessment of male depression in clinical care:**

2 **Validation of the Male Depression Risk Scale Short Form in a cross-sectional study of**

3 **Australian men**

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20 **Word Count:** 3670

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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

2

Strengths and limitations of this study:

- This is the first study to explore the psychometric properties 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.

- Diagnosis of depression was not verified by clinical interview.

- Field trials of the MDRS-7 are needed to demonstrate the utility of the tool in primary care settings.

Introduction

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

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

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100   primary care within the previous 12 months [15, 16]. Similarly, findings from the UK

101   demonstrate that whilst males are overall less likely to attend primary care compared to

102   females, attendance rates in men and women with comparable underlying morbidities,

103   including depression, are similar [17]. Furthermore, findings from a population study of

104   health care contacts among Canadian suicide decedents in Toronto also demonstrated that

105   over 60% (*n* = 1792) of men who died by suicide accessed professional mental health care in

106   the year before their death [18]. These findings highlight the essential role of primary care

107   physicians in identifying depression and suicide risk in men in order to facilitate effective

108   treatment [19].

109   Growing interest in gender-sensitive assessment of men's depression has seen the

110   development of male-specific screening tools to identify symptoms that align with men's

111   socialisation and gender norm processes [e.g., 20, 21, 22]. One recently developed and

112   widely validated measure for assessing externalising symptoms in men is the Male

113   Depression Risk Scale (MDRS-22) [23]. The MDRS-22 consists of 22 items assessing six

114   symptom domains including emotion suppression, drug use, alcohol use, anger and

115   aggression, somatic symptoms, and risk-taking [23]. Recently, Zajac and colleagues [24]

116   demonstrated that this tool, used in conjunction with a measure of prototypic major

117   depression symptoms (PHQ-9), was able to stratify men into three distinct risk groups: (i)

118   prototypic symptoms (consistent with current MDD diagnostic criteria), (ii) externalising

119   symptoms consistent with masculine socialisation, and (iii) mixed depressive symptoms,

120   reflecting both internalised and externalised symptomology. Further analyses showed that

121   men in the externalising only group—men who are arguably missed when using measures of

122   internalising symptoms—were at significantly increased risk of suicide compared to non-

123   depressed men. Moreover, those with elevated externalised and prototypic symptomology

124   were at highest risk of mental illness as well as suicide [24], highlighting the potential of

125   early identification and intervention benefits of leveraging male-specific tools in primary

126   care settings.

127   Two-stage screening methods are commonly used in primary care, and have been

128   shown to be effective for increasing the recognition of depression [25]. However, many

129   primary care physicians report that time is a limiting factor in their capacity to

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130 comprehensively assess psychological issues, including depression [19, 26], despite

131 management of common mental disorders rating as a top reason for general practice

132 attendance [27]. To help address this issue, brief screening tools consisting of 15 items or

133 less are often used, given their completion time is usually just a couple of minutes [28].

134 Examples include the Patient Health Questionnaire (PHQ-9) [29], the Kessler Psychological

135 Distress Scale (K10) [30], and the Beck Depression Inventory for Primary Care (BDI-PC) [31].

136   To date, the MDRS-22 has demonstrated excellent psychometric properties as well

137 as the ability to detect different groups of men who may be at increased risk of suicide and

138 mental illness [e.g., 24, 32, 33]. However, given time constraints in primary care settings, the

139 length of the current MDRS-22 is arguably impractical [12]. The purpose of the present

140 study was to develop a short form of the MDRS-22 to facilitate its use as a screening tool in

141 busy and time-pressured health care settings. We also aimed to establish an initial set of

142 cut-off scores for interpretive purposes, as well as examine current and longitudinal risk of

143 suicidality and mental illness in subgroups. Furthermore, as adherence to masculine gender

144 norms has been found to decline as men get older [34], younger and older males were

145 examined separately to examine the utility of the tool across age groups.

146

147   **Method**

148 **Participants and procedure**

149   This cross-sectional study included baseline data from a community sample of 514

150 younger males aged 18 to 64 years (M = 45.46, SD = 14.52) and 444 older males aged 65 to

151 93 years (M = 72.75, SD = 5.86). A subset of respondents (n = 167 younger males; n = 173

152 older males) participated in the follow-up component. On average, 35 weeks (M = 247.94

153 days, SD = 24.47 days) elapsed between the provision of T1 and T2. The mean age for the

154 overall sample was 58.11 years (SD = 17.73). Eligible participants were Australian male

155 residents over the age of 18 years who considered themselves fluent in English. Participants

156 were recruited via paid advertisements displayed to Australian members of the Facebook

157 social networking site (n = 609; 63.6%) and through promotion of the study to community

158 organisations (e.g., Rotary, Men's Shed). Time 1 (T1) data were collected between August

159 and November 2019 using an online questionnaire. However, participants from local

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160   community organisations were provided with the option to complete a paper version of the

161   survey to ensure inclusivity and accessibility of the sample and *n* = 5 participants completed

162   a paper version. Ethics approval was obtained from the University of Adelaide Human

163   Research Ethics Committee and the CSIRO Health and Medical Human Research Ethics

164   Committee (approval number H-2019-109). All participants provided informed consent.

165   Reporting adhered to the STROBE cross-sectional guidelines.

166

167   **Public involvement**

168   Participants were not involved in the design or conduct of this research; however,

169   participants could nominate to receive updates on the results of the study.

170

171   **Measures**

172

173   ***Demographics***

174   Participants reported their age, gender, relationship status, employment status, level

175   of education, and household income.

176

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

178   Externalising depression symptoms were assessed by the Male Depression Risk Scale

179   (MDRS-22) [23]. The MDRS-22 contains twenty-two self-report items designed to assess six

180   broad domains of externalising and male-specific depression symptoms present in the last

181   month including anger and aggression, drug use, alcohol use, emotion suppression, risk-

182   taking, and somatic symptoms using the response format of 5-point Likert scale ranging

183   from 0 (*none of the time*), 1 (*a little of the time*), 2 (*some of the time*), 3 (*most of the time*),

184   and 4 (*all of the time*). Cronbach's alphas for the MDRS are reported in Table 3 for both age

185   groups and for the overall sample and are considered adequate.

186

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

188   The Patient Health Questionnaire (PHQ-9) [29] is a self-report depression screening tool for

189   use in primary care that assesses nine symptoms consistent with the DSM-5 diagnostic

6

190 criteria for major depressive disorder [7]. Participants endorse how often they have

191 experienced each symptom (e.g., "*Feeling down, depressed, or hopeless*") during the

192 preceding two-week period using a 4-point Likert scale ranging from 0 (*not at all*) to 3

193 (*almost every day*). A score of 10 and above is indicative of clinically significant depressive

194 symptoms [35]. In addition to utilising total PHQ-9 scores, we used item 9 as a measure of

195 suicidality: "Over the past two weeks, how often have you been bothered by thoughts thar

196 you would be better off dead, or of hurting yourself in some way?". We deemed those who

197 scored 1 or more on this item to be currently experiencing suicidal ideation. Internal

198 consistency of the PHQ-9 in the present study for the overall sample was high (α = .93).

199

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

201 The Kessler Psychological Distress Scale (K10) [30] is a widely used measure in both research

202 and primary care settings [36]. It comprises ten questions assessing a person's negative

203 emotional state in the preceding 30 days (e.g., "*About how often did you feel so nervous*

204 *that nothing could calm you down*"). Responses are based on a 5-point Likert scale ranging

205 from 1 (*none of the time*) to 5 (*all of the time*). In addition to examining K10 total scores, we

206 created a binary variable with scores ≥ 25 indicating probable mental illness, consistent with

207 published cut-off scores for the K10 [37]. Internal consistency of the K10 in this study for the

208 overall sample was high (α = .95).

209

Statistical analyses

211 Data for the present study was analysed using IBM SPSS Statistics (Version 26.0)

212 except for the Confirmatory Factor Analysis undertaken in JASP [Version 0.13.1; 38]. A total

213 of 1114 participants commenced the study. However, 156 participants were not included in

214 the analyses due to substantial missing data. Thus, *N* = 958 participants who provided

215 complete data for the items comprising the MDRS-22 were included in the item reduction

216 process described below. Of this sample, *n* = 29 did not provide complete data for the PHQ-

217 9 or K10 items. Thus, models using these variables comprised *n* = 929 participants.

218 Various recommendations exist for the selection of items for short-form surveys [39,

219 40]. Broadly speaking, the focus is on selecting items with maximum variability and which

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220 retain the theorised underlying construct—as well as sub-domains—measured by the long-

221 form scale. Therefore, we calculated descriptive (means, standard deviation (*SD*), and

222 skewness) and relational statistics (correlations) for each item (see Table 2). Items were

223 scored for each statistic (i.e., largest *SD*, strongest correlation etc) and summed across the

224 statistical indices to derive a total score for each item. Best performing items were subject

225 to Exploratory Factor Analysis with Maximum Likelihood Estimation performed within each

226 age group, and in the combined sample. Parallel Analysis consisting of 1,000 permutations

227 of the original raw data was used to determine thresholds for retaining factors. Stability of

228 this solution was then established using Confirmatory Factor Analysis of Time 2 Data (*n* =

229 340). Fit indices reported include: comparative fit index (CFI); the Tucker-Lewis index (TLI);

230 the root mean square error of approximation (RMSEA); and the standardized root mean

231 residual (SRMR). Interpretation of these indices were guided by the recommendations of Hu

232 & Bentler [41].

233 In order to demonstrate clinical utility of the reduced item scale, cut-off scores were

234 determined for Low (0 – 5), Moderate (6 – 7), Severe (8 – 12) and Extremely severe (13+)

235 symptom severity groups. These scores corresponded to cut-off percentiles representing

236 differing degrees of increased risk of recent suicide attempt previously identified for the

237 MDRS-22 [33]. Individuals were then classified into depression groups using the MDRS-7 in

238 combination with the PHQ-9 as follows: not depressed (PHQ-9 < 10 and MDRS-7 ≤ 5),

239 prototypical depression features (PHQ-9 ≥ 10 and MDRS-7 ≤ 5), mixed features (PHQ-9 ≥ 10

240 and MDRS-7 > 5) and externalising features (PHQ-9 < 10 and MDRS-7 > 5). In addition, the

241 K10 was used to determine those individuals suffering a moderate mental illness (K10 ≥ 25)

242 from those without a mental illness (K10 < 25), and current suicidality was ascribed based

243 on scores ≥ 1 on PHQ-9 item 9: "Over the past two weeks, how often have you been

244 bothered by thoughts that you would be better off dead, or of hurting yourself in some

245 way?". Finally, Generalised linear models (GLMs) were used to examine differences in K10

246 and PHQ-9 scores across the MDRS-7 categories to determine risk of mental illness and

247 current suicidality and to examine risk of Depression at Time 2 (PHQ-9 ≥ 10). Assumptions of

248 GLMs were considered through inspection of scatter plots and histograms of residuals and

249 predicted values, with model results reported as standardised betas.

8

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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280 specifying all items loading on a single latent MDRS-7 factor was not quite adequate [$\chi^2(14)$

281 = 62.23 $p < .001$, CFI = 0.96, TLI = .94, RMSEA = 0.10 (.077-.128), SRMR = .10]. However,

282 allowing the errors of the two items assessing anger and physical aggression to covary

283 resulted in excellent model fit [$\chi^2(13)$ = 28.08 $p = .04$, CFI = 0.99, TLI = .98, RMSEA = .059

284 (.028-.089), SRMR = .085].

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287   Insert Table 2 about here

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290 *Cut-off scores for the short scale*

291   The proportion of men in each of the different MDRS-7 symptom severity categories

292 are shown in Supplementary Figure 1 for the total sample, and by age group. As can be

293 seen, older men appear more likely to be in the 'low' category of symptoms, and less likely

294 to be in the 'severe' or 'extremely severe' categories compared to younger males. Figure 1

295 shows the effect of age and MDRS-7 categories on prototypic depression (PHQ-9) and

296 psychological distress (K10). For PHQ-9, there were significant differences between all

297 MDRS-7 groups [f(3, 921) = 208.04, $p < .001$] and between age groups [f(1, 921) = 28.45, $p <$

298 .001], with no significant interaction between MDRS-7 and age [f(3, 921) = 0.45, $p = .71$]. For

299 the K10, results were similar: significant differences between all MDRS-7 groups [f(3,921) =

300 190.93, $p < .001$] and between younger and older men [f(1,921) = 34.77, $p < .001$], but no

301 interaction between MDRS-7 and age [f(3, 921) = 0.43, $p = .73$].

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304   Insert Figure 1 about here

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307 *Clinical utility of the MDRS-7*

308   The proportion of males according to depressive classification type is shown in

309 Supplementary Figure 2. Externalised-only depression affected approximately 10% of

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310 younger and older males, whilst prototypical and mixed depressive symptoms were more

311 common in younger males. Table 3 shows the risk of mental illness and suicidality compared

312 to non-depressed participants within each age group after controlling for a previous

313 diagnosis of depression. All classifications were associated with both outcome measures.

314 Individuals with mixed symptoms undoubtedly have the highest risk of suicidality and

315 mental illness.

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317 --

318   Insert Table 3 about here

319 --

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321   A final GLM considered the likelihood of being classified as depressed at follow-up

322 based on responses to the PHQ-9 (i.e., score ≥ 10). MDRS-7 category was entered as a

323 predictor controlling for PHQ-9 scores at time 1, previous diagnosis of depression and age.

324 As shown in Table 4, PHQ scores at time 1 were significantly associated with increased risk

325 of depression at time 2 although age and prior diagnoses were not significantly associated.

326 Those classified as having moderate MDRS-7 symptoms at time 1 were significantly more

327 likely than those in the low symptom category to be classified as depressed at Time 2, whilst

328 the severe and extremely severe categories were not associated with increased risk.

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331   Insert Table 4 about here

332

333   **Discussion**

334   Clinical reports and emergent empirical work suggest that men's depression may be

335 under-detected as a result of prototypic screening tools that may be insensitive to men's

336 gender role socialisation [11, 13, 42]. The Male Depression Risk Scale (MDRS-22) assesses

337 male-specific, externalised symptoms of depression, such as substance misuse, risk-taking,

338 and anger. However, in its current 22-item form, it is impractical for rapid use in primary

339 care, particularly when used alongside traditional depression screening tools [12]. The

11

340 present research aimed to derive a short form of the MDRS-22, examine its psychometric

341 properties and relationship with psychological distress and depression in order to

342 demonstrate its utility as a potential screening tool in primary and other health care

343 settings.

344   The short form derived herein comprises seven items, representing 1 item for each of

345 the original MDRS domains including emotion suppression, risk-taking, substance use, drug

346 use, somatic symptoms, and two items for the anger and aggression domain, based on

347 criteria including variability within items, the item's relationship to its original MDRS domain

348 but also with the overall MDRS score. Five of the seven items demonstrated moderate-to-

349 strong loadings on a single underlying construct presumed to reflect the male depression

350 phenotype, whilst two items assessing alcohol and drug use loaded weakly. This likely

351 reflects the reduced variability of participant responses on these items, with most

352 participants reporting that these items applied to them none, or a little of the time.

353 However, despite these lower loadings, items that tap these behaviours are important to

354 retain given that substance use is an important marker of depression and suicidality in men

355 and particularly those who adhere to masculine norms [42, 43].

356   In the present study, externalising symptoms, either alone or in combination with

357 prototypic symptoms, were found to be significantly more common than exclusively

358 prototypic symptoms. Approximately 10% of younger and older males were found to

359 present with uniquely eternalising symptoms, whilst approximately 40% of younger males

360 and 10% of older males presented with mixed symptoms. These findings are consistent with

361 previous research using the MDRS-22 [24] and highlights the potential utility of the MDRS-7

362 for detecting additional cases of men at risk. These men are a subset who score below

363 threshold on traditional prototypic measures, but whose degree of externalised behaviours

364 may be problematic. Furthermore, despite the absence of clinically elevated prototypic

365 symptoms, both younger and older males in the mixed symptom group had a significantly

366 higher risk of a mental illness after controlling for a previous diagnosis of depression,

367 demonstrating unequivocally that this represents a unique group of at-risk men

368 experiencing psychological distress. Similarly, both younger and older males in the mixed

369 symptom group had a significantly elevated risk of suicidality. These findings are consistent

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370 with research by Zajac and colleagues [24] and highlight the clinical importance of

371 considering a broad range of potential presentations of depression in men, all of which are

372 associated with increased risk of poor outcomes.

373   The MDRS-7 was also shown to be effective at predicting depression at a later time

374 point, suggesting a possible prodromal effect. These findings are consistent with those by

375 [44] who demonstrated that externalising symptoms predicted a future depressive episode

376 in men. Hence, our findings may reflect early symptom expression, or even attempts of men

377 to cope with what has the potential to develop into a threshold depressive disorder. This

378 further highlights the potential value of screening for externalising symptoms to facilitate

379 early intervention and prevention of further mental health issues [45]. In addition, given the

380 externalised nature of male-typical symptoms of depression, it is important to note that

381 these symptoms not only affect men's health and wellbeing but also the health wellbeing of

382 their families, friends, and communities [13, 46, 47]. Hence the better identification and

383 management of male depression is likely to have substantial public health implications.

384

Clinical implications

386   There is an urgent need for health services and providers to utilise more sensitive

387 diagnostic tools as a means of improving the detection of depression and psychological

388 distress in males and addressing the high rates of male suicide [13]. The use of brief tools

389 such as the MDRS-7 may assist with detecting unique cases of men who would score below

390 threshold on measures such as the PHQ-9. However, an added benefit of using this scale

391 alongside prototypic measures, is the ability to detect men presenting with mixed

392 symptomology whose risk of suicide and poor mental health outcomes is significantly

393 elevated. Therefore, the clinical utility of this measure may extend beyond screening and

394 detection and into the therapy setting where it is necessary to determine, monitor, and

395 manage differing degrees of suicidality.

396

Limitations and future research

398   The methodology adopted in this study is not without limitations. The use of an

399 online community sample of Australian males limits the generalisability of the findings to

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400 other populations. Future research should examine the psychometric properties of the

401 MDRS-7 with additional populations, including clinical samples of men presenting to primary

402 care. In addition, as data was self-report, diagnosis of depression could not be verified at

403 clinical interview. The results of this study would be strengthened by a more rigorous

404 assessment of psychopathology and comorbidity. It is also important to acknowledge that

405 this study used a single item from the PHQ-9 to examine current suicidal ideation.

406 Therefore, there is a need for additional research to examine the relationship between the

407 MDRS-7 and other measures of suicidality, including recent suicide attempt.

408

409 **Conclusion**

410 The present study provides important information on the development and

411 validation of the MDRS-7. Specifically, this study demonstrates that the MDRS-7 is a valid

412 and reliable measure of externalising and male-typical depression symptoms in both

413 younger and older men in terms of its psychometric properties as well as its sensitivity to

414 prototypic depression symptoms, psychological distress, and suicidality. Use of male-specific

415 measures of depression such as the MDRS-7 may improve the detection of depression and

416 suicide risk in men, and adjunctive use (alongside established prototypical scales such as the

417 PHQ-9) may contribute to improved public health outcomes.

418

422 **Author contributions**

423 D.H., S.R., and I.Z. developed the study concept. D.H. and I.Z. performed the data analyses.

424 D.H. drafted the paper and S.R. and I.Z. provided critical revisions. All authors approved the

425 final version of the paper for submission.

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Table 1. Sociodemographic characteristics of participants at Time 1

Variable	Younger men (< 65)	Older men (≥ 65)
n	514	444
Age range	18-64	65-93
Age, *M* (*SD*)	45.5 (14.5)	72.8 (5.9)
Relationship status, *n* (%)		
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, *n* (%)		
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)

433

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.

438

439 **Competing interests**

440 The authors declare that they have no competing interests.

441

442 **Data sharing statement**

443 Data is available upon reasonable request.

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Prefer not to say	12 (2.3)	2 (0.5)
Household income, *n* (%)		
<$35,000	139 (27.0)	143 (32.2)
$35,000-$65,000	92 (17.9)	159 (35.8)
$65,000-$105,000	100 (19.5)	80 (18.0)
$105,000-$160,000	97 (18.9)	31 (7.0)
>$160,000	65 (12.6)	12 (2.7)
Prefer not to say	21 (4.1)	19 (4.3)
Highest level of education, *n* (%)		
Year 11 or below	50 (9.7)	83 (18.7)
Year 12	52 (10.1)	49 (11.0)
Certificate/diploma	156 (30.4)	133 (30.0)
Bachelor's degree	139 (27.0)	76 (17.1)
Graduate certificate/diploma	44 (8.6)	39 (8.8)
Postgraduate degree	72 (14.0)	56 (12.6)
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
	Eigenvalue	2.52	2.73	2.71	
	Variance explained (%)	36.00	38.90	38.80	
	Cronbach's alpha	.69	.73	.73	
	Correlation with MDRS-22	.94	.94	.94	
	Short form re-test reliability	.70	.69	.70	
	M (SD)	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, *n*	193	71	49	187
	Moderate mental illness, *n* (%)	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, *n* (%)	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, *n*	310	20	45	54
	Moderate mental illness, *n* (%)	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, *n* (%)	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 ≥ 25.
455   Suicidality defined as ≥ 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 ≥ 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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482   Figure 1. Effect of age and MDRS-7 category on prototypic depression symptoms

483   (PHQ-9) and psychological distress (K10)

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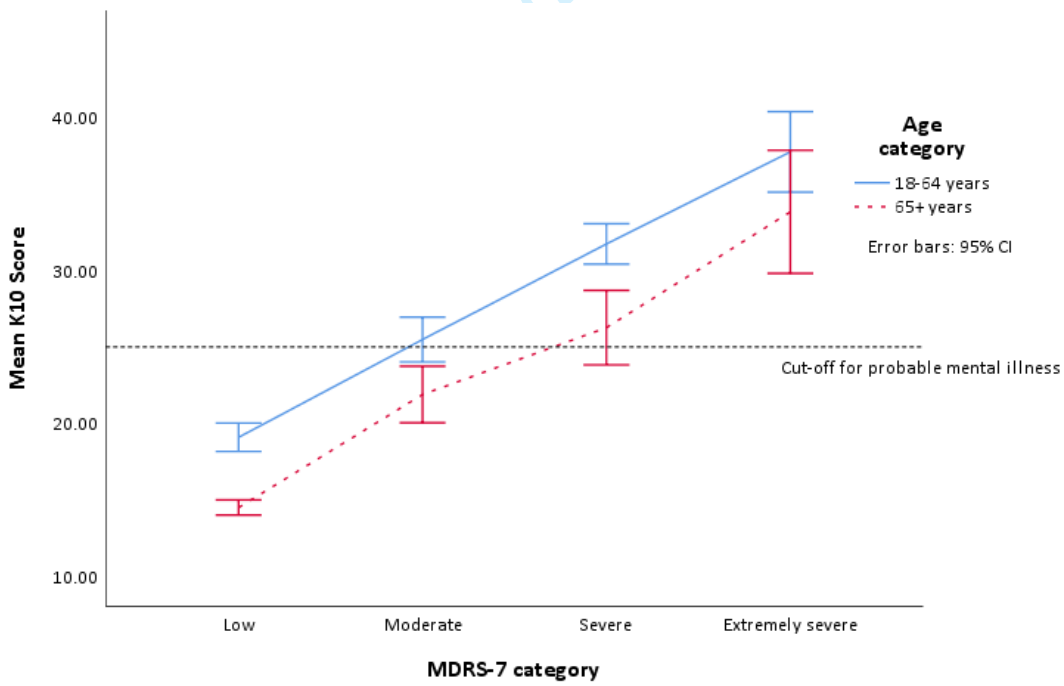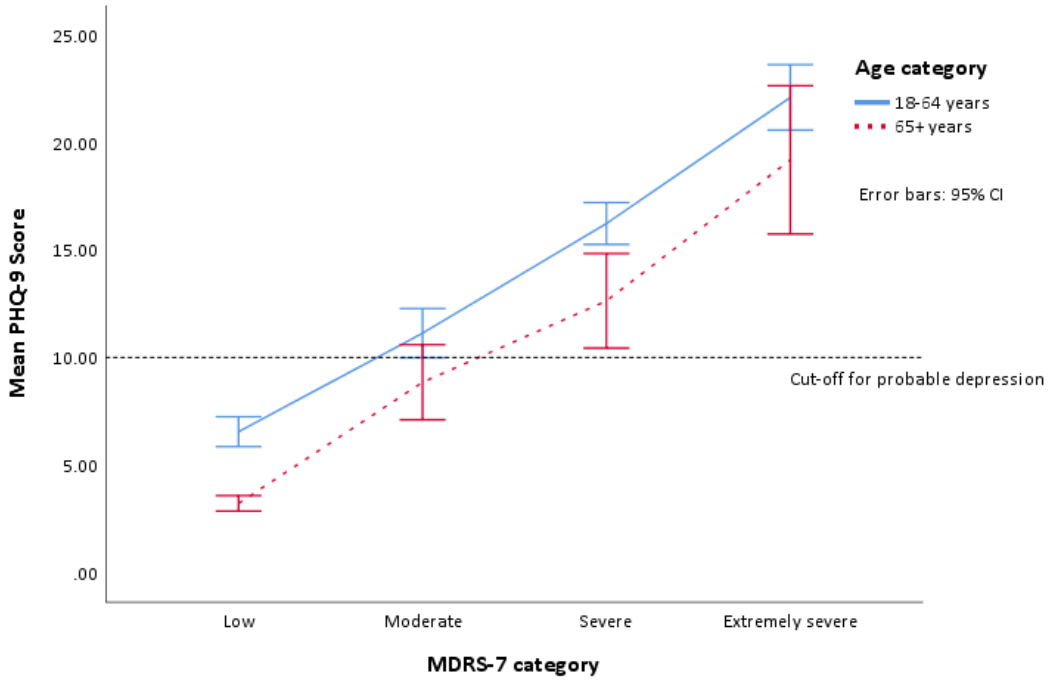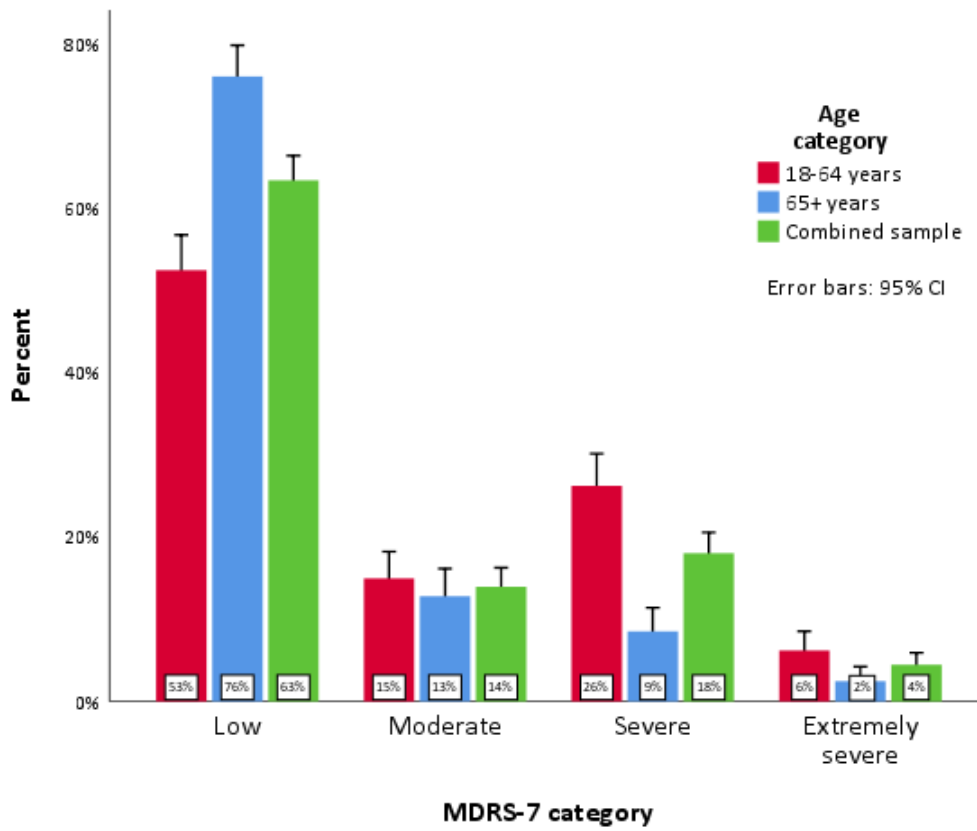49
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Figure 1. Effect of age and MDRS-7 category on prototypic depression symptoms (PHQ-9) and psychological distress (K10)
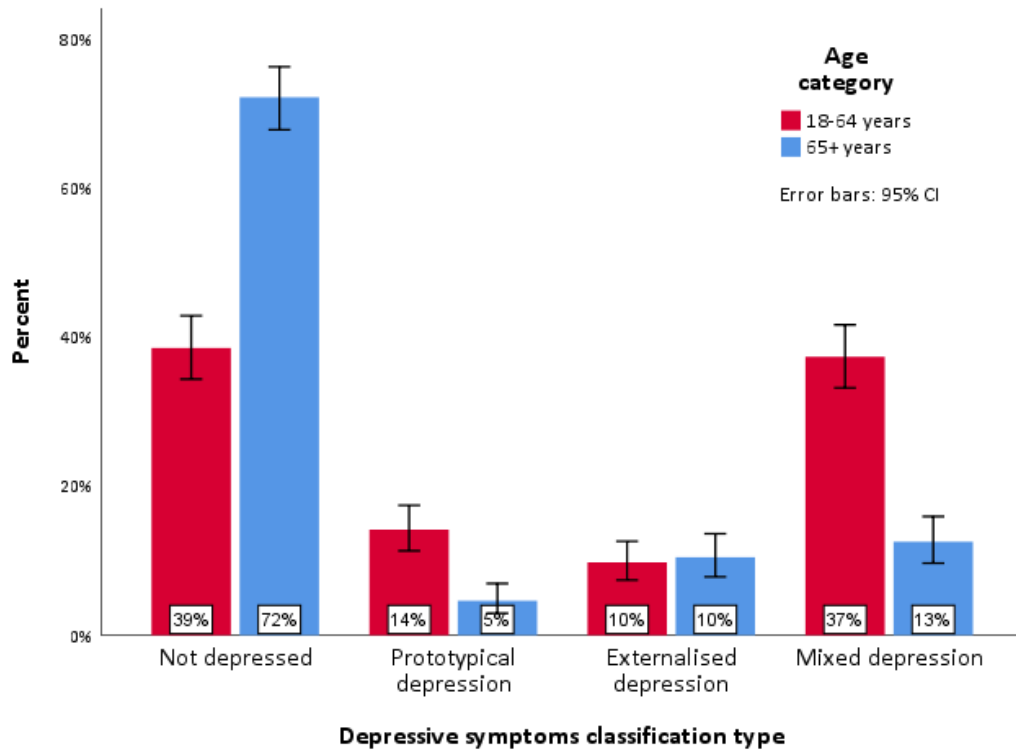
Supplementary Table 1. Descriptive and relational statistics for MDRS-22 items across younger and older age groups

Domain	Item	Younger males							Older males						
		M	SD	Skew	Total(r)	Domain(r)	Other domains(r)	Item score	M	SD	Skew	Total(r)	Domain(r)	Other domains(r)	Item score
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+).

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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 sectionalreporting guidelines, and cite them as:

von Elm E, Altman DG, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.

		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			

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

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 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

Key results	[#18](#)	Summarise key results with reference to study objectives	12-15
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
Interpretation	[#20](#)	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	12-15
Generalisability	[#21](#)	Discuss the generalisability (external validity) of the study results	14

Other Information

| 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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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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1 **Brief assessment of male depression in clinical care:**

2 **Validation of the Male Depression Risk Scale Short Form in a cross-sectional study of**

3 **Australian men**

4

5

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20 **Word Count:** 4170

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Abstract

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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.

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

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Setting: Community-based.

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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.

45

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.

52

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.

59

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.

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

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Strengths and limitations of this study:

- This is the first study to explore the psychometric properties of the MDRS-7 as a screening tool for externalised and male-type 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.

- Diagnosis of depression was not verified by clinical interview.

- Field trials of the MDRS-7 are needed to demonstrate the utility of the tool in primary care settings.

Introduction

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

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

3

100　depression reporting a visit to primary care within the previous 12 months [15, 16].

101　Similarly, findings from the UK demonstrate that whilst males are overall less likely to attend

102　primary care compared to females, attendance rates in men and women with comparable

103　underlying morbidities, including depression, are similar [17]. Furthermore, findings from a

104　population study of healthcare contacts among Canadian suicide decedents in Toronto

105　demonstrated that over 60% (n = 1792) of men who died by suicide accessed professional

106　mental health care in the year before their death [18]. These findings highlight the essential

107　role of primary care physicians in identifying depression and suicide risk in men in order to

108　facilitate effective treatment [19].

109　　　　Growing interest in gender-sensitive assessment of men's depression has seen the

110　development of male-specific screening tools to identify symptoms that align with men's

111　socialisation and gender norm processes [e.g., 20, 21, 22]. One recently developed and

112　widely validated measure for assessing externalising and male-type symptoms in men is the

113　Male Depression Risk Scale (MDRS-22) [23]. The MDRS-22 consists of 22 items assessing six

114　symptom domains including emotion suppression, drug use, alcohol use, anger and

115　aggression, somatic symptoms, and risk-taking [23]. Recently, Zajac and colleagues [24]

116　demonstrated that this tool, used in conjunction with a measure of prototypic depression

117　symptoms (PHQ-9), was able to stratify men into three distinct risk groups: (i) prototypic

118　symptoms (consistent with current MDD diagnostic criteria), (ii) externalising symptoms

119　consistent with masculine socialisation, and (iii) mixed depressive symptoms, reflecting both

120　internalised and externalised symptomology. Further analyses showed that men in the

121　externalising only group—men who are arguably missed when using measures of

122　internalising symptoms—were at significantly increased risk of suicide compared to non-

123　depressed men. Moreover, those with elevated externalised and prototypic symptomology

124　were at highest risk of mental illness as well as suicide [24], highlighting the potential early

125　identification and intervention benefits of leveraging male-specific tools in primary care

126　settings.

127　　　　Two-stage screening methods are commonly used in primary care, and have been

128　shown to be effective for increasing the recognition of depression [25]. However, many

129　primary care physicians report that time is a limiting factor in their capacity to

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130   comprehensively assess psychological issues, including depression [19, 26], despite

131   management of common mental disorders rating as a top reason for general practice

132   attendance [27]. To help address this issue, brief screening tools consisting of 15 items or

133   less are often used, given their completion time is usually just a couple of minutes [28].

134   Examples include the Patient Health Questionnaire (PHQ-9) [29], the Kessler Psychological

135   Distress Scale (K10) [30], and the Beck Depression Inventory for Primary Care (BDI-PC) [31].

136   To date, the MDRS-22 has demonstrated excellent psychometric properties as well

137   as the ability to detect different groups of men who may be at increased risk of suicide and

138   mental illness [e.g., 24, 32, 33]. However, given time constraints in primary care settings, the

139   length of the current MDRS-22 is arguably impractical [12]. The purpose of the present

140   study was to develop a short form of the MDRS-22 to facilitate its use as a screening tool in

141   busy and time-pressured health care settings. We also aimed to establish an initial set of

142   cut-off scores for interpretive purposes. If the MDRS short form is to have clinical utility, it

143   needs to be able to identify broader aspects of psychopathology. Thus, a secondary aim was

144   to explore current and longitudinal risk of suicidality and mental illness by adopting a

145   previously utilised categorisation according to cut-off scores on the MDRS and the widely

146   used PHQ-9, which assesses prototypic depression symptoms [24]. Furthermore, as

147   adherence to masculine gender norms has been found to decline as men get older [34],

148   younger and older males were examined separately to examine the utility of the tool across

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.

5

160   Participants were recruited via paid advertisements displayed to Australian members of the

161   Facebook social networking site (n = 601; 63.3%) and through promotion of the study to

162   community organisations (e.g., Rotary, Men's Shed). Time 1 data were collected between

163   August and November 2019 using an online questionnaire. However, participants from local

164   community organisations were provided with the option to complete a paper version of the

165   survey to ensure inclusivity and accessibility of the sample and n = 5 participants completed

166   a paper version. Ethics approval was obtained from the University of Adelaide Human

167   Research Ethics Committee and the CSIRO Health and Medical Human Research Ethics

168   Committee (approval number H-2019-109). All participants provided informed consent.

169   Reporting adhered to the STROBE cross-sectional guidelines. Table 1 presents a summary of

170   the characteristics of the study participants at Time 1 and Time 2.

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*

6

190   *of the time*), and 4 (*all of the time*). Cronbach's alphas for the MDRS are reported in Table 2

191   for both age groups and for the overall sample and are considered adequate.

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 (α = .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 (α = .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

7

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

8

250   on prototypic depression (PHQ-9) and psychological distress (K10). We classified individuals

251   into depression groups using the MDRS-7 in combination with the PHQ-9 based on previous

252   research [24] with groups referred to as: not depressed (PHQ-9 < 10 and MDRS-7 ≤ 5),

253   prototypic depression features (PHQ-9 ≥ 10 and MDRS-7 ≤ 5), mixed features (PHQ-9 ≥ 10

254   and MDRS-7 > 5), and externalising and male-type features (PHQ-9 < 10 and MDRS-7 > 5). In

255   addition, we used the K10 to determine those individuals suffering a moderate mental

256   illness (K10 ≥ 25) from those without a mental illness (K10 < 25), and current suicidality was

257   ascribed based on scores ≥ 1 on PHQ-9 item 9: "Over the past two weeks, how often have

258   you been bothered by thoughts that you would be better off dead, or of hurting yourself in

259   some way?". Based on these classifications, generalised linear models (GLMs) were used to

260   determine risk of mental illness and suicidality based on depressive symptom groupings

261   whilst controlling for previous diagnosis of depression. An additional GLM examined risk of

262   depression at Time 2 (PHQ-9 ≥ 10) as a function of MDRS-7 categories at Time 1.

263   Assumptions of GLMs were considered through inspection of scatter plots and histograms of

264   residuals and predicted values, with model results reported as standardised betas.

265

266   **Results**

267   *Sample characteristics*

268   Table 1 presents the characteristics of the participants at Time 1 and Time 2. As

269   expected, there was a higher proportion of older participants who reported themselves as

270   married/de-facto or widowed/divorced/separated, in comparison to younger men.

271   Regarding education, the majority of older participants completed year 11 or below, whilst

272   the proportion of participants completing a Bachelor's degree was higher in the younger

273   sample. In addition, household income appeared to be higher in younger compared to older

274   men, consistent with the majority of the older sample reporting themselves as being retired.

275   Comparisons with 2016 Australian Census data indicate that participants in the current

276   study were more likely to be married or in a de-facto relationship (63.1% vs 58.1%), more

277   likely to have completed a Bachelor Degree level or above (49.8% vs 22.0%), and less likely

278   to be employed full-time (44.5% vs 57.7%) compared to the Australian population [43]. This

279   likely reflects the trend towards older males in the current study. Sample characteristics at

9

280 Time 1 and Time 2 were mostly comparable, with a higher proportion of participants at

281 Time 2 retired.

282

283 ---

284   Insert Table 1 about here

285 ---

286

Item reduction

288   Descriptive and relational statistics for each of the MDRS-22 items across younger

289 and older age groups are displayed in Supplementary Table 1. For the emotion suppression,

290 alcohol use, somatic symptoms, and drug use domains, a single highest scoring item

291 emerged congruent across age groups. For the anger and aggression domain, two different

292 items were retained because of their performance across the age groups. Finally, although

293 two risk-taking items scored equally well in the younger group, only one of these loaded

294 within the older age group, and only this item was retained. This resulted in a total selection

295 of seven items for the short form scale covering all of the original MDRS-22 domains.

296   Factor analysis of these seven items revealed the presence of a single underlying

297 domain that satisfied criteria determined by the parallel analysis; eigenvalues were required

298 to exceed 1.16. As shown in Table 2, all items demonstrated a moderate-to-strong loading

299 on a single underlying factor except for those measuring alcohol and drug use, which loaded

300 moderately. When modelling these 7-items using CFA at Time 2, the initial solution

301 specifying all items loading on a single latent MDRS-7 factor was not quite adequate [χ^2(14)

302 = 65.85 p < .001, CFI = 0.96, TLI = 0.94, RMSEA = 0.11 (0.08, 0.13), SRMR = 0.10]. However,

303 allowing the errors of the two items assessing anger and physical aggression to covary

304 resulted in acceptable model fit [χ^2(13) = 29.04 p ≤ .01, CFI = 0.99, TLI = .98, RMSEA = 0.06

305 (0.03, 0.09), SRMR = 0.09].

306 ---

307   Insert Table 2 about here

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310   *Cut-off scores for the short scale*

311   The proportion of men in each of the different MDRS-7 symptom severity categories

312   are shown in Supplementary Figure 1 for the total sample, and by age group. As can be

313   seen, older men appear more likely to be in the 'low' category of symptoms, and less likely

314   to be in the 'severe' or 'extremely severe' categories compared to younger males. Figure 1

315   shows the effect of age and MDRS-7 categories on prototypic depression (PHQ-9) and

316   psychological distress (K10). For PHQ-9, there were significant differences between all

317   MDRS-7 groups [$F(3, 912) = 208.05$, $p < .001$] and between age groups [$F(1, 912) = 26.76$, $p <$

318   $.001$], with no significant interaction between MDRS-7 and age [$F(3, 912) = 0.59$, $p = .625$].

319   For the K10, results were similar: significant differences between all MDRS-7 groups [$F(3,$

320   $912) = 188.95$, $p < .001$] and between younger and older men [$F(3, 912) = 33.05$, $p < .001$],

321   but no interaction between MDRS-7 and age *[F(3*, 912) = 0.44, *p* = .719].

322

323   --

324   Insert Figure 1 about here

325   --

326

327   *Clinical utility of the MDRS-7*

328   The proportion of males according to depressive classification type is shown in

329   Supplementary Figure 2. Externalised and male-type depression affected approximately 10%

330   of younger and older males, whilst prototypic and mixed depressive symptoms were more

331   common in younger males. Table 3 shows the risk of mental illness and suicidality compared

332   to non-depressed participants within each age group after controlling for a previous

333   diagnosis of depression. All classifications were associated with both outcome measures.

334   Individuals with mixed symptoms have the highest risk of suicidality and mental illness.

335

336   --

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
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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
12
13   345   associated. Those classified as having moderate MDRS-7 symptoms at Time 1 were
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15   346   significantly more likely than those in the low symptom category to be classified as
16
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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21   349
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23   350   --
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25   351   Insert Table 4 about here
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27   352
28
29   353   **Discussion**
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31   354   Clinical reports and emergent empirical work suggest that men's depression may be
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33   355   under-detected as a result of prototypic screening tools that may be insensitive to men's
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35   356   gender role socialisation [11, 13, 44]. The Male Depression Risk Scale (MDRS-22) assesses
36
37   357   externalised and male-type symptoms of depression, such as substance misuse, risk-taking,
38
39   358   and anger. However, in its current 22-item form, it is impractical for rapid use in primary
40
41   359   care, particularly when used alongside traditional depression screening tools [12]. The
42
43   360   present research aimed to derive a short form of the MDRS-22, examine its psychometric
44
45   361   properties and relationships with psychological distress, depression, and suicidal ideation in
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47   362   order to demonstrate its utility as a potential screening tool in primary and other health
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49   363   care settings.
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51   364   The short form derived herein comprises seven items, representing 1 item for each
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53   365   of the original MDRS domains including emotion suppression, risk-taking, substance use,
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55   366   drug use, somatic symptoms, and two items for the anger and aggression domain, based on
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57   367   criteria including variability within items, the item's relationship to its original MDRS domain
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59   368   but also with the overall MDRS score. Of particular importance is our finding that the
60   369   correlation between the MDRS-7 and the original MDRS-22 was near perfect (r = .94). Five

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370 of the seven items demonstrated moderate-to-strong loadings on a single underlying

371 construct presumed to reflect the male depression phenotype, whilst two items assessing

372 alcohol and drug use loaded moderately. This likely reflects the reduced variability of

373 participant responses on these items, with most participants reporting that these items

374 applied to them none, or a little of the time. However, these loadings still exceeded the

375 minimum recommended factor loading of .32 [45]. In addition, items that tap these

376 behaviours are important to retain given that substance use is an important marker of

377 depression and suicidality in men and particularly those who adhere to masculine norms

378 [44, 46]. It is nonetheless important to note that substance use may reflect a comorbidity

379 [47] or maladaptive coping [48]. These are important questions for future research to

380 explore.

381   In the present study, externalising and male-type symptoms, either alone or in

382 combination with prototypic symptoms, were found to be more common than exclusively

383 prototypic symptoms. Approximately 10% of younger and older males were found to

384 present with uniquely externalising and male-type symptoms, whilst 38% of younger males

385 and 13% of older males presented with mixed symptoms. These findings are consistent with

386 previous research using the MDRS-22 [24] and highlight the potential utility of the MDRS-7

387 for detecting additional cases of men at risk. Men with exclusively externalised and male-

388 type depression are a subset who score below threshold on traditional prototypic measures

389 but whom report a degree of externalised behaviours that might be problematic.

390 Furthermore, both younger and older males in the mixed symptom group had increased risk

391 of a mental illness—after controlling for a previous diagnosis of depression—demonstrating

392 unequivocally that this represents a unique group of psychologically distressed, at-risk men.

393 Similarly, both younger and older males in the mixed symptom group had a significantly

394 elevated risk of suicidality. These findings are consistent with research by Zajac and

395 colleagues [24] and highlight the clinical importance of considering a broad range of

396 potential presentations of depression in men, all of which are associated with increased risk

397 of poor outcomes.

398   The MDRS-7 was also shown to be effective at predicting depression at a later time

399 point, suggesting a possible prodromal effect. These findings are consistent with those by

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400 Kendler and colleagues [49] who demonstrated that externalising and male-type symptoms

401 predicted a future depressive episode in men. Hence, our findings may reflect early

402 symptom expression, or even attempts of men to cope with what has the potential to

403 develop into a threshold depressive disorder. This further highlights the potential value of

404 screening for externalising and male-type symptoms to facilitate early intervention and

405 prevention of further mental health issues [50]. In addition, given the externalised nature of

406 male-typical symptoms of depression, it is important to note that these symptoms not only

407 affect men's health and wellbeing but also the health wellbeing of their families, friends,

408 and communities [13, 51, 52]. Hence the better identification and management of male

409 depression is likely to have substantial public health implications.

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.

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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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430 appropriate across the lifespan. Future research should examine the psychometric

431 properties of the MDRS-7 with additional populations, including clinical samples of men

432 across the lifespan presenting to primary care. In addition, as data was self-report, diagnosis

433 of depression could not be verified at clinical interview. The results of this study would be

434 strengthened by a more rigorous assessment of psychopathology and comorbidity. It is also

435 important to acknowledge that this study used a single item from the PHQ-9 to examine

436 current suicidal ideation. Therefore, there is a need for additional research to examine the

437 relationship between the MDRS-7 and other measures of suicidality, including recent suicide

438 attempt.

439

440 **Conclusion**

441 The present study provides important preliminary information on the development

442 and validation of the MDRS-7. Specifically, this study provides emerging support for the

443 validity and reliability of the MDRS-7 as a measure of externalising and male-type

444 depression symptoms in both younger and older men in terms of its psychometric

445 properties as well as its relationship to prototypic depression symptoms, psychological

446 distress, and suicidality. Use of male-specific measures of depression such as the MDRS-7

447 may improve the detection of depression and suicide risk in men, and adjunctive use

448 (alongside established prototypic scales such as the PHQ-9) may contribute to improved

449 public health outcomes.

450

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454 **Author contributions**

455 D.H., S.R., and I.Z. developed the study concept. D.H. and I.Z. performed the data analyses.

456 D.H. drafted the paper and S.R. and I.Z. provided critical revisions. All authors approved the

457 final version of the paper for submission.

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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, *M* (*SD*)	45.43 (14.56)		72.79 (5.88)	
Relationship status, *n* (%)				
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, *n* (%)				

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463 writing the manuscript.
464

Ethics approval

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

Competing interests

471 The authors declare that they have no competing interests.
472

Data sharing statement

474 Data is available upon reasonable request.

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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, *n* (%)				
<$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, *n* (%)				
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
	Eigenvalue	2.52	2.74	2.72	
	Variance explained (%)	36.04	39.08	38.82	
	Cronbach's alpha	.68	.71	.72	
	Correlation with MDRS-22	.94	.94	.94	
	Short form re-test reliability	.72	.69	.71	
	M (SD)	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 $p < .001$

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

	Depressed group, n	Moderate mental illness, n (%)	Moderate mental illness, AOR [95% CI]	Suicidality, n (%)	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.

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

Outcome: Depressed (PHQ-9 ≥ 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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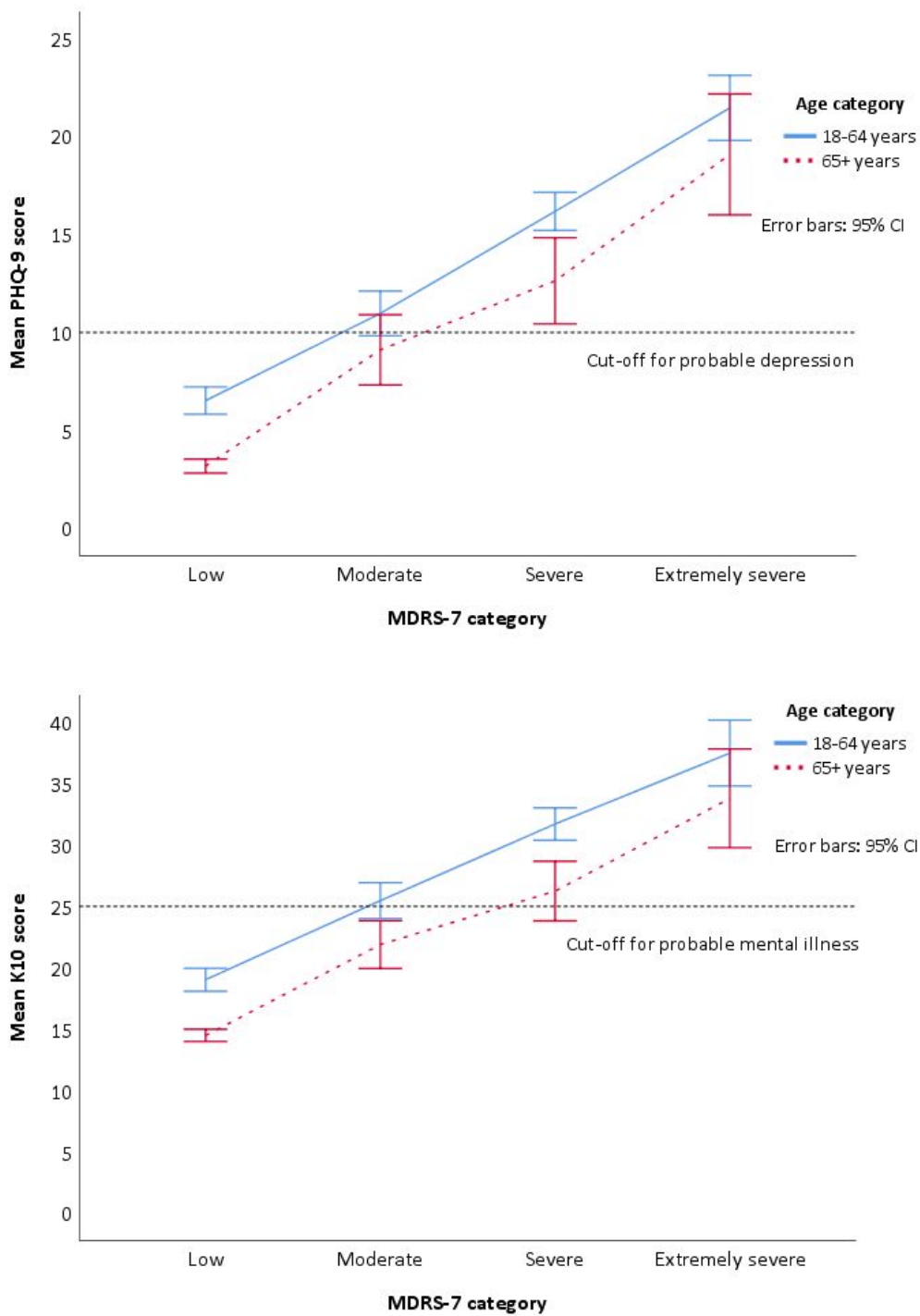492
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504   Figure 1. Effect of age and MDRS-7 category on prototypic depression symptoms (PHQ-9)

505   and psychological distress (K10)

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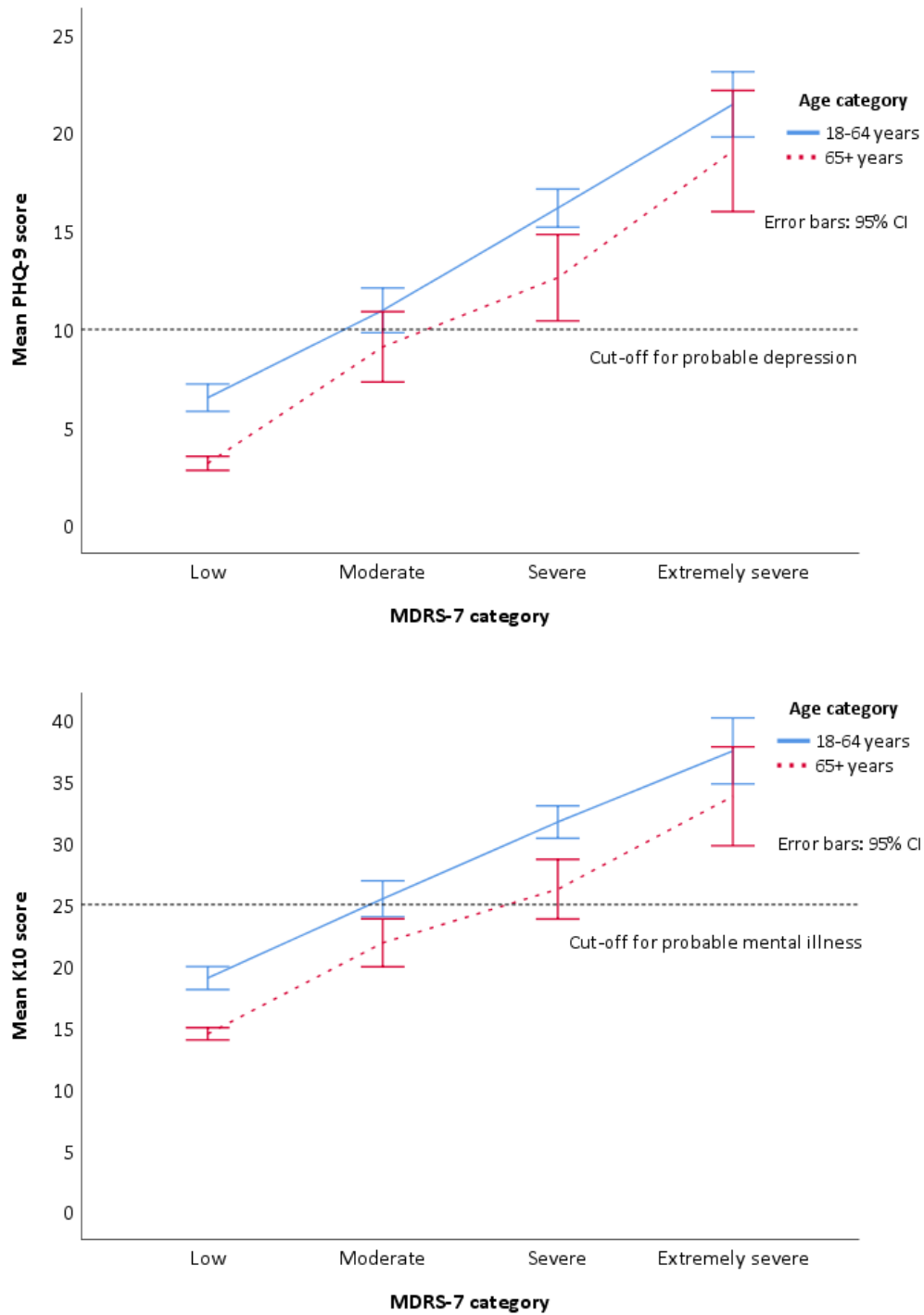47
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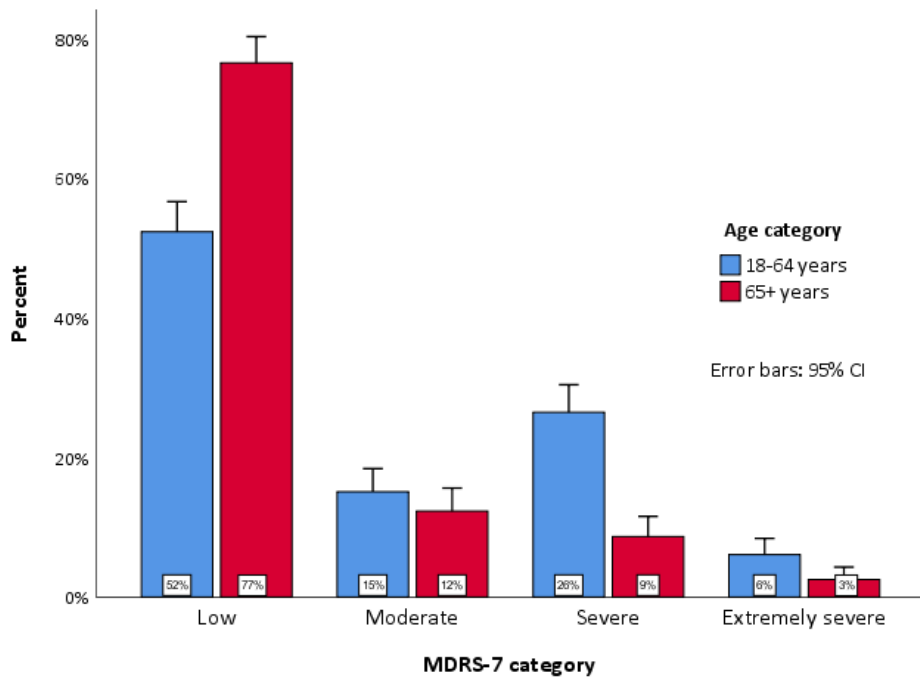51
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Figure 1. Effect of age and MDRS-7 category on prototypic depression symptoms (PHQ-9) and psychological distress (K10)

Supplementary Table 1. Descriptive and relational statistics for MDRS-22 items across younger and older age groups
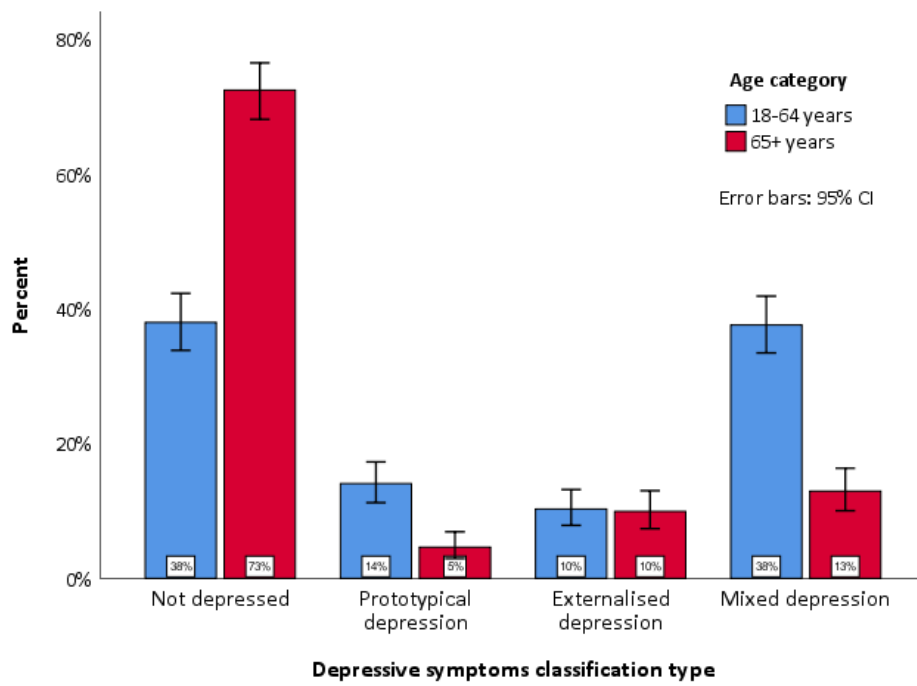
Domain	Item	Younger males							Older males						
		M	SD	Skew	Total(r)	Domain(r)	Other domains(r)	Item score[a]	M	SD	Skew	Total(r)	Domain(r)	Other domains(r)	Item score
Emotion Suppression	I tried to ignore feeling down	1.77	1.12	0.08	.62	.77	.46	1	1.34	1.26	0.51	.57	.77	.35	0
	I bottled up my negative feelings	1.93	1.16	0.01	.64	.86	.45	3	1.28	1.15	0.58	.73	.86	.52	3
	I covered up my difficulties	1.90	1.18	-0.04	.64	.85	.45	2	1.21	1.21	0.63	.72	.84	.51	0
	I had to work things out by myself	2.38	1.18	-0.31	.46	.68	.29	2	1.95	1.36	-0.04	.58	.72	.39	3
Alcohol Use	I drank more alcohol than usual	0.80	1.09	1.24	.60	.89	.34	2	0.47	0.89	2.11	.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	2.51	.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	2.02	.61	.94	.34	6
	I needed to have easy access to alcohol	0.53	0.98	1.93	.58	.87	.34	1	0.44	0.91	2.17	.59	.91	.33	0
Somatic Symptoms	I had more heartburn than usual	0.60	0.91	1.48	.39	.65	.26	0	0.38	0.71	1.87	.50	.70	.38	0
	I had regular headaches	0.89	1.04	1.07	.49	.74	.35	0	0.41	0.79	2.23	.54	.77	.42	0
	I had stomach pains	0.72	0.90	1.06	.53	.74	.40	2	0.38	0.76	2.33	.57	.77	.45	2
	I had unexplained aches and pains	1.05	1.13	0.80	.52	.78	.37	4	0.74	0.93	1.19	.57	.78	.44	5
Anger & Aggression	I overreacted to situations with aggressive behaviour	0.59	0.83	1.41	.52	.83	.38	2	0.41	0.70	1.80	.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	3.44	.45	.75	.34	0
	I was verbally aggressive to others	0.34	0.65	2.13	.46	.83	.31	0	0.20	0.49	2.85	.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	2.35	.58	.81	.47	2
Drug Use	I sought out drugs	0.32	0.79	2.64	.47	.94	.30	3	0.11	0.43	4.82	.33	.90	.23	4
	I used drugs to cope	0.32	0.81	2.79	.47	.94	.30	2	0.07	0.36	5.55	.31	.83	.23	0
	Using drugs provided temporary relief	0.33	0.84	2.73	.47	.95	.29	4	0.10	0.43	4.89	.40	.90	.31	4
Risk-Taking	I drove dangerously or aggressively	0.33	0.66	2.04	.33	.67	.24	0	0.12	0.37	3.14	.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	3.26	.54	.83	.47	5
	I took unnecessary risks	0.39	0.70	1.93	.56	.84	.46	3	0.15	0.46	3.21	.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+).

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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 sectionalreporting guidelines, and cite them as:

von Elm E, Altman DG, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.

		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			

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

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 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

Key results	[#18](#)	Summarise key results with reference to study objectives	12-15
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
Interpretation	[#20](#)	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	12-15
Generalisability	[#21](#)	Discuss the generalisability (external validity) of the study results	14

Other Information

| 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 |