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1 **Measuring the digital divide among people with Severe Mental**
2 **Ill Health using the Essential Digital Skills framework.**

3 Keywords: Digital skills, Digital divide, Internet, Severe mental Ill health, Psychosis, Bipolar.

4 Word count

5 Abstract: 286 Text: 3,952

6 **Abstract**

7 **Aims:** Amidst the vast digitalisation of health and other services during the pandemic,
8 people with no digital skills are at risk for digital exclusion. This risk might not abide by the
9 end of the pandemic. This paper seeks to understand whether people with severe mental
10 ill health (SMI) have the necessary digital skills to adapt to these changes and avoid digital
11 exclusion.

12 **Methods:** 249 adults with SMI across England completed a survey online or offline. They
13 provided information on their digital skills based on the Essential Digital Skills (EDS)
14 framework, sociodemographic information, and digital access. This is the first time the
15 EDS is benchmarked in people with SMI.

16 **Results:** 42.2% had no Foundation Skills and 46.2% lacked skills for daily life (lacking
17 Foundation or Life Skills). 23.0% of those working lacked skills for professional life (lacking
18 Foundation or Work Skills). The most commonly missing skills were handling passwords
19 and using the device settings (Foundation Skills) and online problem solving (Skills for
20 Life). People were interested in learning more about approximately half of the skills they
21 did not have. People were more likely to lack Foundation Skills if they were older, not in
22 employment, had a psychosis-spectrum disorder, or had no Internet access at home.

23 **Conclusion:** A significant portion of people with SMI lacked Foundation Skills in this
24 objective and benchmarked survey. This points to a high risk for digital exclusion and the
25 need for focused policy and tailored health sector support, to ensure people retain access
26 to key services and develop digital skills and confidence. To our knowledge this is the first
27 time this has been described using the Essential Digital Skills (EDS) framework. Services,
28 including the NHS, need to be aware and mitigate the risks.

29 **Introduction**

30 During the COVID-19 pandemic, restrictions have been applied to movement and social
31 contact, to contain the spread of the virus ^{1,2}. Many daily activities (e.g. shopping,
32 entertainment, and contacting friends and family) shifted from face-to-face to remote
33 delivery, often via the Internet. The UK National Health Service (NHS) experienced a
34 similar shift, both in mental ³⁻⁵ and general health care ⁶⁻⁸.

35 These changes increased the demand for digital skills and led to more people using the
36 Internet for longer, leading to estimations that in one year the UK made five years' worth
37 of progress in digital engagement ⁹. However, this situation also highlighted the pre-
38 existing digital divide (i.e. inequalities in digital access and engagement in the population)
39 and the health inequalities that may derive from it ¹⁰. People lacking digital skills might
40 experience negative outcomes in relation to health, wellbeing, and social support, as they
41 might struggle to access health services, Government and local authority services, and
42 support network activities that are online ¹¹.

43 It remains unknown whether people with severe mental ill health (SMI; e.g., a diagnosis of
44 Bipolar or Psychosis-spectrum disorder) have the digital skills to adapt to this new
45 digitalisation of services ¹². Finding the Internet too difficult or too complex to understand
46 have been commonly reported among people with SMI as a barrier to use the Internet,

47 both before ¹³⁻¹⁵ and during the pandemic ¹⁶. It is important to gain a deeper
48 understanding of this issue, as digital exclusion in people with SMI might widen existing
49 health and social inequalities. For example, people with SMI are at greater risk for long-
50 term physical health conditions ¹⁷ and at greater need for regular health care appointment
51 to monitor their conditions (e.g. the annual physical health check, ¹⁸). They might also be
52 more likely to experience feelings of loneliness ¹⁹. Lack of skills to use the Internet might
53 obstruct access to important sources of support (e.g., video-calls with health professionals
54 or friends and family, accessing health and community related information online, and
55 participating in online community activities). It is important to note that the risk of
56 exclusion due to lack of skill will probably not abate at the end of the pandemic,
57 considering that the pandemic accelerated plans for digital healthcare to become a
58 mainstream option in the NHS ²⁰

59 The Essential Digital Skills (EDS) framework which has been adopted by the UK
60 Department of Education defines the skills that people would need to have to fully benefit
61 from using the Internet and digital devices⁹, and sets the standards for all formal digital
62 skills training programs in the country. The framework includes three domains:
63 Foundation Skills, Skills for Life and Skills for Work. The Foundation Skills domain concerns
64 basic pre-requisite knowledge (e.g., knowing how to use the settings in a device, or how to
65 connect to a secure Wi-Fi network), while the other two domains concern five skill types in
66 everyday life and in work environments, respectively: a) Being safe, legal and confident
67 online, b) Communicating, c) Problem solving, d) Transacting and e) Handling information
68 and content. Although EDS is mapped with the general UK population annually through
69 the Lloyds Bank UK Consumer Digital Index, it has never been benchmarked in people with
70 SMI specifically.

71 This paper reports on the Skills and Proficiency in Digital Essential Requirements study
72 (SPIDER) which assesses the digital skills of a sample of people with SMI amidst the COVID-
73 19 pandemic, based on the EDS framework. The primary objectives were to understand
74 the extent to which people with SMI have essential digital skills and how they compare to
75 the general population, as well as to identify the areas of greatest deficit in skills and their
76 association with key sociodemographic and health factors.

77

78 **Methods**

79 **Design and Procedures**

80 The SPIDER study recruited participants from a clinical cohort that participated in the
81 Optimising Wellbeing in Self Isolation (OWLS) study. The cohort included people that were
82 18 years old or over and had a documented diagnosis of schizophrenia or
83 delusional/psychotic illness (ICD 10 F20.X & F22.X or DSM equivalent) or bipolar disorder
84 (ICD F31.X or DSM equivalent). The methods of recruitment to the OWLS study are
85 outlined in the supplementary material (S1). To be eligible for SPIDER, participants had to
86 have consented during OWLS to be contacted about future surveys. Participants were
87 recruited to SPIDER from January 2021 to March 2021.

88 Interested participants were provided with an information sheet (read over the phone, or
89 send by email, text message, or post) and those consenting to participate were given the
90 option to complete the survey online via a link, or offline (over the phone with a
91 researcher or in a hard copy survey sent by post.) Offline options were provided to ensure
92 inclusion of people that were not digitally engaged.

93

94 **Measures**

95 All variables and analysis reported here have been pre-registered ²¹ in Open Science
96 Framework (OSF).

97 ***Essential Digital Skills***

98 Participants were asked whether they could complete a series of tasks related with using
99 the Internet and digital devices, on their own if they ever need to (responses were yes or
100 no). For those answering “no”, they were asked if they would be interested in learning
101 more about them (yes/no). The tasks were derived from the Lloyds UK Consumer Digital
102 Index 2020 ²² and the Scottish Council for Voluntary Organisations (SCVO) Essential Digital
103 Skills Toolkit ²³. The complete list of tasks used in SPIDER is available at
104 [https://mfr.osf.io/render?url=https://osf.io/keumd/?direct%26mode=render%26action=d](https://mfr.osf.io/render?url=https://osf.io/keumd/?direct%26mode=render%26action=download%26mode=render)
105 [ownload%26mode=render](https://mfr.osf.io/render?url=https://osf.io/keumd/?direct%26mode=render%26action=download%26mode=render).

106

107 Participants were considered as having or not having a given skills domain according to
108 the EDS framework ²². For Foundation Skills, participants would need to report they could
109 complete all task from a list of eights basic tasks (e.g., using a device setting to make its
110 use easier, or connecting to a secure and safe Wi-Fi network).

111

112 For Skills for Life, we used a list of 30 tasks, grouped in five skill-types: Communicating
113 (e.g., I can set up an email account), Handling information (e.g., I can use search engines to
114 find information and make use of search terms to generate better results), Transacting
115 (e.g., I can safely buy things online), Problem solving (e.g., I can use the Internet to find
116 how to do something online), and Being safe and legal online (I am careful with what I
117 share online as I realise that the information I put online stays there and could be

118 accessed in the future by other people). To be considered as having Skills for Life,
119 participants should be able to complete at least one task from each skill-type. Only
120 participants who had Foundation Skills were assessed for Skills for Life.

121

122 For Skills for Work, we used a list of 14 tasks, grouped in the same skill-types as in Skills for
123 Life. The difference was that the tasks in each skill-type were more relevant to a working
124 environment (e.g., I can set up and manage an account on a professional online
125 network/community, or I can organise, store and share work-related information on
126 different computers, tablets or phones). To be considered as having Skills for Work
127 participants should be able to complete at least one task in each skill-type. Only
128 participants who had Skills for Life and were in employment were assessed for Skills for
129 Work.

130 ***Digital access***

131 In the initial OWLS survey, participants were asked if they owned a digital device
132 (smartphones, computers, laptops or tablets - yes/no), and whether they could access the
133 Internet from home (yes/no). In the SPIDER study we also asked whether people have
134 used the Internet in the last 12 months (yes a lot, yes a little, or not at all) and if in the last
135 12 months they ever experienced not having enough data available to access the Internet
136 as much as they would need (data poverty - yes/no).

137 ***Sociodemographic and health variables***

138 Using data that were available in the initial OWLS dataset, we derived participants' age
139 (grouped as 18-30, 31-45, 46-65, and 66+), gender (female, male, or transgender),
140 ethnicity (grouped as White background or Other than White), employment (grouped as
141 being in paid employment or not) and care setting (grouped as primary or secondary

142 mental health care). We also derived participants' socioeconomic deprivation index²⁴
143 according to their area of residency using their post-codes. Index scores range from 1 to
144 10 with higher scores indicating less deprivation and were grouped in very high
145 deprivation (1-2), high deprivation (3-4), medium deprivation (5-6), low deprivation (7-8)
146 and very low deprivation (9-10).

147 Participants' health records were inspected for consenting participants to obtain their SMI
148 diagnosis, which was then categorised into psychosis spectrum disorders (including
149 schizophrenia, schizoaffective or any other psychotic disorder), bipolar disorder, or other
150 SMI (including participants who were eligible for OWLS on the basis of a psychosis or
151 bipolar disorder diagnosis which was later changed in their health records to something
152 different, as for example severe depressive disorder with psychotic features). For those
153 not providing consent to access their records or insufficient identifiable information (e.g.,
154 name and date of birth), diagnosis was coded as "not recorded". The "not recorded"
155 category is not reported in our pre-registered plan but was added to retain in the analysis
156 the 48 participants falling in this group.

157 **Analysis**

158 Descriptive statistics are provided for each skills domain (Foundation, Skills for Life, or
159 Skills for Work). For participants lacking a skills domain, we present descriptive statistics
160 for the most commonly missing skill types, and for interest in learning more about these
161 skill types.

162 Association of sociodemographic and health, and digital access variables (independent
163 variables) with having Foundation Skills were examined with a univariable binary logistic
164 regression model before added into a hierarchical multivariable binary logistic regression.
165 In the multivariable model all independent variables were inserted at once, with

166 sociodemographic and health variables inserted in the first block and digital access
167 variables in the second block. Statistical significance was set a $p < .05$ and analysis was
168 conducted with IBM SPSS 26.

169 Some of the pre-registered analysis was not possible due to very low counts in the sample.
170 Among people with Foundation Skills, only nine people reported having no Skills for Life
171 (93.0%) and four working people reported having no Skills for Work (92.0%). As a result,
172 we do not present any descriptive statistics for missing skill domains and interest in
173 learning more among those who reported having no Skills for Work. We also did not
174 explore which factors are associated with having Skills for Life or Work.

175 To test for response bias, we examined whether participants who accepted or declined
176 our invitation to the SPIDER study differed in age, gender, ethnicity, socioeconomic
177 deprivation, care setting and diagnosis. Differences were examined with a χ^2 test (or the
178 likelihood ratio if test assumptions were violated), apart for age where we used an
179 independent samples t-test instead.

180 **Results**

181 **Sample**

182 We invited 315 adults with SMI to the SPIDER study and 249 (67.8%) participated. Those
183 who accepted or declined the invitation did not differ in terms of any of the examined
184 sociodemographic characteristics (Age: $t(365) = -0.45$, $p = .650$; Gender: Likelihood Ratio
185 (2) = 4.77, $p = .092$; Ethnicity: $\chi^2(1) = 1.44$, $p = .230$; Deprivation: $\chi^2(4) = 6.47$, $p = .167$;
186 Care setting: $\chi^2(1) = 0.63$, $p = .429$; Diagnosis: $\chi^2(3) = 6.07$, $p = .108$).

187 Table 1 provides the sample characteristics. Participants had a mean age of 51.7 years old
188 (range: 21-84) and the sample included 51.4% men, 46.6% women, 2% transgender, 15.6%

189 people from other than White ethnic backgrounds, and 44.6% resided in high/very high
 190 deprivation areas. The primary diagnosis was psychosis-spectrum disorder (48.2%). The
 191 survey was completed online by 93 (37.3%) participants and over the phone or via the
 192 post by 156 (62.7%). Regarding digital access, 21.3% of the sample were non-users of the
 193 Internet, 12.4% did not own a digital device, 15.3% had no access to the Internet at home,
 194 and 11.2% had experienced data poverty.

195 **Table 1. Sample characteristics (N = 249)**

Variable (valid N)	N (%)
Age (249)	
18-30	28 (11.2)
31-45	64 (25.7)
46-65	100 (40.2)
66+	57 (22.9)
Gender (249)	
Female	116 (46.6)
Male	128 (51.4)
Transgender	5 (2.0)
Ethnicity (249)	
Asian	14 (5.6)
Black	4 (1.6)
Mixed	11 (4.4)
White British	200 (80.3)
White (other)	10 (4.0)
Other	10 (4.0)
Socioeconomic Deprivation (241)	
Very high	60 (24.1)
High	51 (20.5)
Medium	49 (19.7)
Low	43 (17.3)
Very low	38 (15.3)
In paid employed (248)	
Yes	61 (24.5)
No	187 (75.1)
Diagnosis (249)	
Bipolar disorder	83 (33.3)
Psychosis spectrum disorder	120 (48.2)

Other SMI	16 (6.4)
Not recorded	30 (12.0)
Care setting (247)	
Primary care	95 (38.2)
Secondary care	152 (61.0)
Using the Internet	
A lot	137 (55.0)
Just a little	58 (23.3)
Not at all	53 (21.3)
Owning any digital device (245)	
Yes	214 (85.9)
No	31 (12.4)
Access to the Internet at home (246)	
Yes	208 (83.5)
No	38 (15.3)
Ever felt not having enough data? (248)	
Yes	28 (11.2)
No	177 (71.1)
N/A (Not using the Internet)	43 (17.3)

196

197 **Essential Digital Skills**

198 Table 2 presents the EDS framework descriptive results. Out of the total sample (N = 249),
 199 105 participants (42.2%) reported no Foundation Skills. They were unable to complete on
 200 average 3.64 (± 2.50) tasks out of eight in total but were interested in learning more about
 201 on average 2.22 (± 2.80) of them. The tasks that people who reported no Foundation Skills
 202 were most often unable to perform were updating and changing passwords (68.6%) and
 203 using the device settings to improve its usability (e.g. change font sizes, screen brightness,
 204 screen contrasts, etc.) (61.9%). The least frequent skill deficit was not knowing how to
 205 turn on a device (17.1%) (Figure 1).

206

207

208 **Table 2. Essential Digital Skills Framework**

	N (%)
Skills Domains	
Foundation Skills ^a	
Yes	142 (57.0)
No	105 (42.2)
Skills for Life ^b	
Yes	132 (93.0)
No	9 (6.3)
Skills for Work ^c	
Yes	46 (92.0)
No	4 (8.0)
Overall	
Essential skills for daily life ^a	
Yes (having Foundation AND Life Skills)	132 (53.4)
No (Lacking Foundation OR Life Skills)	114 (46.2)
Essential skills for professional life ^d	
Yes (Having Foundation AND Work Skills)	46 (75.4)
No (Lacking Foundation OR Work Skills)	14 (23.0)

209 a. Out of total sample N = 249. b. Out of those having Foundation Skills, n = 142. c. Out of those
 210 being in paid employment and having Skills for Life, n = 50. d. Out of those being in paid
 211 employment, n = 61.

212

213

214

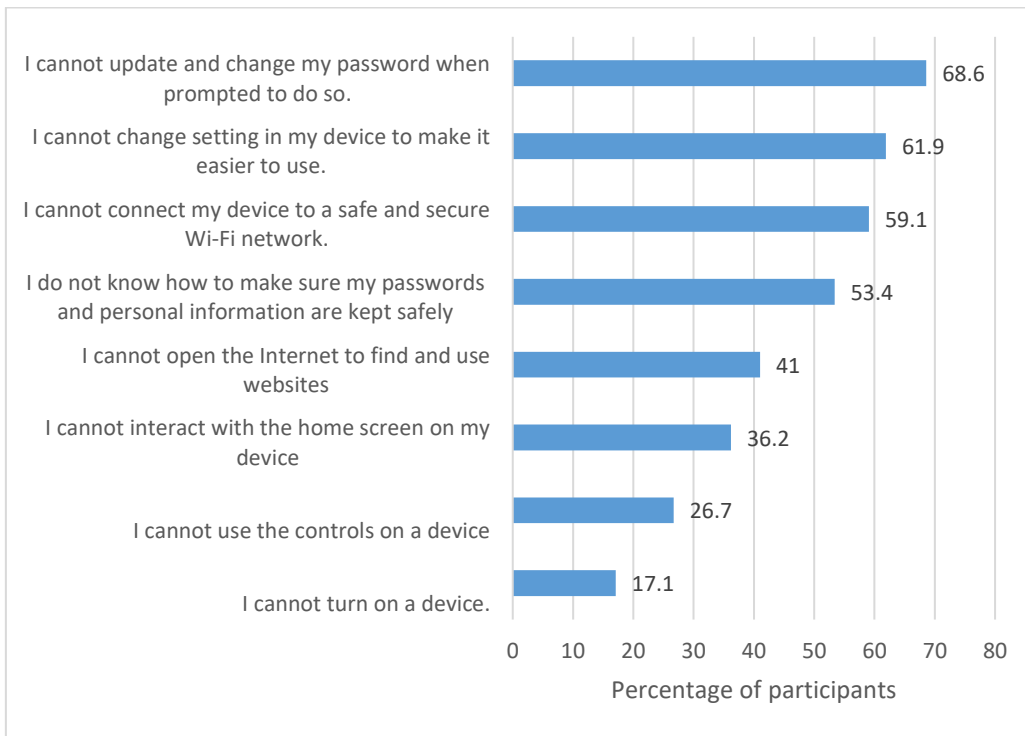
215

216

217

218

219 **Figure 1. Prevalence of skills deficiency among participants with no Foundation Skills (N**
 220 **= 105)**



221

222 Among those who reported having Foundation Skills (N = 142, 57.0%), almost everyone (n
 223 = 132, 93.0%) reported having Skills for Life. Among the few people that reported not
 224 having Skills for Life (n = 9), five (55.6%) reported having no Problem Solving skills and four
 225 (44.4%) no Transacting Skills. No deficiency was reported in Communication, Handling
 226 Information, and Being safe and legal online (0% were missing these skill-types).
 227 Participants that reported not having Skills for Life were unable to complete on average
 228 14.6 (±6.5) tasks out of 30 overall but were interested in learning more about 7.7 (±7.4) on
 229 average. Among those who reported having Skills for Life and were in paid employment (N
 230 = 50), almost everyone (n = 46, 92.0%) reported having Skills for Work.

231 Overall, 114 participants from the total sample (45.7%) did not have the essential digital
 232 skills for daily life, lacking either Foundation Skills or Skills for Life. Among the working
 233 population in our sample (N = 61), 14 participants (23.0%) did not have the essential
 234 digital skills for professional life, lacking either Foundation Skills, Skills for Life, or Skills for
 235 Work.

236 **Sociodemographic associations with Foundation Skills.**

237 A multivariable binary logistic regression model (Table 3) demonstrated that reporting
 238 having Foundation Skills was eight and four times more likely among the 18-30 and 31-45
 239 age groups respectively (compared to 66+), three times more likely among those in paid
 240 employment, and four times more likely in those with a bipolar disorder diagnosis
 241 (compared to psychosis-spectrum). It was also found that participants with no Internet
 242 access at home were seven times less likely to report they had Foundation Skills.

243 **Table 3. Association of having Foundation Skills with sociodemographic and digital**
 244 **access variables.**

Variables (Valid N)	Have Foundation Skills N (%)	Univariable Model		Multivariable Model (N = 229)	
		OR	95% CI	AdjOR	95% CI
Age (247)					
18-30	24 (85.7%)	10.29**	3.14 – 33.72	7.56*	1.75 – 32.66
31-45	45 (70.3%)	4.06**	1.90 – 8.68	3.60*	1.22 – 10.57
46-65	52 (53.1%)	1.94	0.99 – 3.78	1.93	0.75 – 4.97
66+	21 (36.8%)	1		1	
Gender (242)					
Male	74 (58.3%)	1.07	0.65 – 1.79	1.78	0.89 – 3.53
Female	65 (56.5%)	1		1	
Ethnicity (247)					
Other than White	22 (56.4%)	1.05	0.53 – 2.10	1.05	0.43 – 2.60
White	120 (57.7%)	1		1	

Socioeconomic deprivation (239)					
Very high	29 (49.2%)	0.63	0.28 – 1.44	0.65	0.22 – 1.97
High	26 (52.0%)	0.71	0.30 – 1.66	0.44	0.14 – 1.36
Medium	34 (69.4%)	1.48	0.61 – 3.60	1.37	0.44 – 4.23
Low	24 (55.8%)	0.82	0.34 – 2.00	0.56	0.18 – 1.73
Very Low	23 (60.5%)	1		1	
In paid employment (247)					
Yes	50 (83.3%)	5.16**	2.47 – 10.79	2.67*	1.07 – 6.66
No	92 (49.2%)	1		1	
Diagnosis (247)					
Not recorded	19 (63.3%)	1.94	0.85 – 4.44	1.40	0.48 – 4.07
Other SMI	9 (60.0%)	1.69	0.57 – 5.04	1.43	0.40 – 5.17
Bipolar	58 (69.9%)	2.61*	1.45 – 4.71	3.67*	1.56 – 8.64
Psychosis spectrum	56 (47.1%)	1		1	
Care setting (245)					
Secondary care	86 (57%)	0.94	0.56 – 1.58	1.15	0.55 – 2.38
Primary care	55 (58.5%)	1		1	
Device ownership (243)					
No	2 (6.5%)	0.04**	0.01 – 0.16	0.26	0.04 – 1.70
Yes	138 (65.1)	1		1	
Internet access at home (244)					
No	3 (7.9%)	0.04**	0.01 – 0.15	0.14*	0.03 – 0.70
Yes	137 (66.5%)	1		1	

245 * p < .05, ** p < .001

246 **Discussion**

247 We assessed digital skills in a sample of people with SMI using the Essential Digital Skills
248 framework. To our knowledge this is the first time this benchmark measure of knowledge
249 and skills has been applied in a sample of people who use mental health services. It is
250 concerning that 42% (n = 105) had no Foundation Skills, lacking pre-requisite knowledge to

251 interact with digital technologies and benefit from its use. The most problematic areas
252 were handling passwords and using device setting to improve usability. Older people,
253 those not currently in work, those with a psychosis-spectrum disorder, and those with no
254 Internet access at home were at greater risk for lacking Foundation Skills. More positively,
255 among people who had Foundation skills, almost everyone had Skills for Life and Skills for
256 Work.

257 Our results reveal a digital divide between our SMI sample and the general population.
258 People with SMI in this study were twice as likely to experience a deficit in either
259 Foundation or Life Skills (n = 114, 46.2%) compared to the general population (22% ²²).
260 During the pandemic, this might contribute to inequalities of access to digital services,
261 including but not limited to healthcare services, due to lack of familiarity or confidence
262 with technology ²⁵. More worryingly, these inequalities might remain beyond the
263 pandemic ²⁶, given that transition to digital healthcare might become a more mainstream
264 option ^{20, 27}. Combined with the fact that most people in our study owned a digital device
265 (n = 214, 85.9%), this implies that access to digital devices on its own may not mitigate
266 for digital exclusion and that many people may use their devices only for very basic things.
267 This suggests that digital skills training programs are needed, that will be tailored to the
268 needs of people with SMI, to help close this gap (see for example Recovery Colleges at
269 <https://imroc.org/resources/1-recovery-colleges/>).

270 It was interesting that fewer of the working people in this study experienced a deficit in
271 skills necessary for work, lacking either Foundation or Work Skills (n = 14, 23%), compared
272 to the general population (52% ²²). This could be a sampling issue in our study and might
273 not be representative of the total SMI population. However, it may also be explained by
274 the fact that employment is less common in people with SMI, ²⁸⁻³⁰, as shown by the 75.1%
275 (n = 187) rate of unemployment in this study, and has been associated with younger age

276 and higher educational attainment ^{29, 31, 32}, as well as less severe SMI symptoms ^{29, 32}. All of
277 these might help people to acquire good digital skills and this may be directly linked with
278 this study's finding that employed participants were more likely to have Foundation Skills
279 compared to those not in employment. Future studies should explore Skills for Work
280 among people with SMI who are unemployed, as an indicative factor of their employment
281 prospects and potential learning needs. Researchers should also seek to understand the
282 contribution of digital skills deficits in the high unemployment rates in people with SMI
283 (e.g., most jobs advertised online), especially in relation to other employment barriers
284 related to SMI (e.g. ill health or stigma).

285 Looking further into skills deficits, we found that people with no Foundation Skills
286 struggled the most with handling passwords and using device settings. As such, important
287 as it is to providing people with digital devices to tackle access issues (as happened a lot
288 during the pandemic; ³³), this should be combined with training and support for using
289 these devices. Moreover, creating and maintaining a password is imperative to access
290 several online services (e.g. GP services, streaming platforms, online banking and
291 Government online services, to name a few), so that deficits in that area may adversely
292 affect not only people's confidence in using these services but also to the security of their
293 information. As these skills seem to be often missing in the general population as well ²², it
294 is important for future studies to explore the specific barriers the SMI population might
295 face, and how to address these from a person-centred design perspective. Among the few
296 people who had Foundation Skills but no Skills for Life, the greatest area of deficit was
297 Problem Solving skills. Evidence suggests that lack of problem solving skills in general, not
298 just digital, is a common cognitive deficit found in people with schizophrenia ³⁴.

299 We also found that people with no Foundation Skills were interested in learning more
300 about half of the tasks they could not perform. Given that lack of interest is a commonly

301 reported barrier to digital engagement ⁹, this suggests that people with SMI might have
302 the motivation to learn new skills if appropriate support becomes available. Efforts to
303 reduce the digital divide in the SMI population could include tailored training in digital
304 skills along with confidence-building measures and measures to increase the motivation to
305 address digital exclusion³⁵. Reducing the digital divide has the potential to reduce health
306 inequalities. Future studies should seek to consult with those with lived experience to
307 explore motivation in beginning and sustaining digital skills training, preference for
308 training mode and setting, as well as barriers to engaging with web-based resources
309 specifically related to SMI conditions (e.g. fluctuating levels of wellness, low energy and
310 motivation, paranoid thoughts, suspiciousness and concerns about privacy and difficulty
311 processing information; ³⁶), in order to develop accessible skills training programs tailored
312 to the needs of this population

313 Older people in this study were less likely to have Foundation Skills, as also found in the
314 general population ²². This is unsurprising, as age is traditionally associated with less digital
315 engagement in SMI ¹⁴⁻¹⁶ and general population ^{37,38} alike. People with psychosis-spectrum
316 disorders were at greater risk for not having Foundation Skills compared to those with
317 bipolar disorder, after adjusting for people's age or employment status. This supports our
318 previous findings that during the pandemic restrictions people with bipolar disorder were
319 more likely to use the Internet a lot for their daily activities compared to people with
320 psychosis ¹⁶. Cognitive and occupational disfunctions that are common in schizophrenia
321 ³⁹might not facilitate development of digital skills. It might also be that specific SMI-
322 related barriers to digital engagement (e.g. reduced concentration, hallucinations, or
323 paranoid ideas; ^{13,40}) are more common in people with psychosis than bipolar disorder.
324 Digital exclusion is becoming increasingly concentrated in vulnerable populations
325 (including older people with SMI who are likely to be heavier users of healthcare services)

326 leading to worse health outcomes through both direct and indirect routes⁴¹. The
327 increasing use of digital technology in the delivery of health services will directly affect
328 those who are digitally excluded as they will not be able to access services which could
329 benefit them. This could range from accessing appointment booking systems to health
330 promoting services or applications, along with accessing video appointments. Given the
331 current drive towards comprehensive digital healthcare within in the NHS ²⁰, the
332 importance of digital inclusion for health and social care should, and to some extent is,
333 being acknowledged⁴². The particular needs and barriers experienced by people with SMI
334 should inform this wider policy context.

335

336 The SPIDER study is not free of limitations. The sample size may have been underpowered
337 for the estimate of the logistic regression, but this analysis was exploratory. We used a
338 non-random sample that might lead to respondent biases and limited generalisability,
339 although the use of a sampling framework increases our confidence that we were
340 recruiting across a good spread of the SMI population. Skills were self-evaluated by
341 participants rather than completing objective tests. Self-evaluation might be susceptible
342 to other fluctuating factors (e.g. current mood), as well as response and social desirability
343 bias (e.g. n = 134, 53.8% of the sample completed the survey over the phone with a
344 researcher). It should be noted though that organising objective tests, especially in the
345 context of the pandemic restrictions, would present several practical challenges.
346 Participants were also assessed on the basis of pre-determined tasks, rather than
347 personalised tasks related to the specific activities they want/need to complete in their
348 everyday lives. However, that would affect the comparability of results across different
349 populations and existing datasets. Regarding digital access, we did not examine whether
350 the devices that people owned were current enough or had to be shared with other

351 members of the household, as it often happened during the pandemic ⁴³. Despite the high
352 rates of device ownership in our sample, real unobstructed access might be undermined
353 by obsolete technologies or multi-usership. Lastly, in this study we examined generic
354 digital skills rather than skills and factors that may be more pertinent to this population
355 and their use of digital health services (e.g. e- health literacy, online help-seeking and
356 service use), which should be considered in future research.

357 **Conclusion**

358 This study highlighted deficits in digital skills in the SMI population that are worse than in
359 the general population. This might suggest that an already socially disadvantaged
360 population are at risk for further exclusions due to digital skills deficits, as many health
361 services and social connections have moved to digital platforms during 2020 / 2021.
362 Importantly and worryingly this includes vital health services many of which might
363 continue to operate digitally into the future. Services including the NHS need to be aware
364 and have a responsibility to actively and immediately accommodate for those with SMI
365 who would prefer face-to-face rather than online contact, and whose health will likely
366 suffer through the digital divide. Additionally, further funding is needed for research into a
367 widely available, person-centered, accessible training program, co-produced with end
368 users to identify and remove barriers related to lack of digital skills.

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370

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382 **Conflicts of Interest**

383 The authors have no conflicts of Interest to declare.

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