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Predictors of overall and mental health-related internet use in adults with psychosis

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ABSTRACT

As digital interventions are beginning to be developed to support self-management of psychosis, it is important to understand how illness-related and individual factors may affect internet use and engagement with digital mental health resources among people with psychotic disorders. This study aimed to identify demographic, clinical, and personal variables associated with overall and mental health-related internet use in a sample of 189 adult community mental health service users with nonaffective and affective psychotic disorders. Among participants who regularly used the internet (87.3%), most (67.9%) reported using the internet for mental health information. Higher frequency of overall internet use was predicted by younger age, completion of post-secondary education, and less severe negative symptoms. Internet use for mental health information was predicted by younger age, higher levels of overall internet use, current productive employment, and higher loneliness. This study is the first to quantitatively examine how clinical and personal measures relate to overall and mental health-related internet use in people with psychosis. Although cognitive difficulties and negative symptoms impacted overall internet use, these disorder-related difficulties did not further impact internet use for mental health information. Digital mental health resources should be designed to optimise engagement for this population.

1. Introduction

Internet use and access is increasing among people with severe mental illness (SMI), including those experiencing psychosis (e.g. Record et al., 2016; Robotham et al., 2016). Recent studies suggest that this group endorses the notion of using the internet and digital technology, including mobile devices and social media, for mental health information and/or treatment (Aref-Adib et al., 2016; Berry et al., 2016; Firth et al., 2016; Lal et al., 2015). A growing range of digital mental health tools is available, allowing unprecedented accessibility, personalisation, and interactivity of interventions for people with psychosis (Alvarez-Jimenez et al., 2014; Naslund et al., 2015; van der Krieke et al., 2014). This may be valuable in providing access to specialist self-management resources and interventions to complement face-to-face delivery.

Meanwhile, online forums, social networks, and video streaming websites enable people with SMI to connect with peers and mental health experts worldwide (Highton-Williamson et al., 2015; Naslund et al., 2016; Villani and Kovess-Masfety, 2017). Individuals can share their experiences and interact with peers that they may otherwise not have had access to, including those who have progressed further in their own recovery (Naslund et al., 2014). Whilst the evidence base remains in development, accessing online communities offers opportunities for enhancing self-management and empowerment, and accessing positive role models that may challenge pessimistic stereotypes of recovery and inspire hope (Daker-White and Rogers, 2013; Naslund et al., 2015; Thomas et al., 2015; Villani and Kovess-Masfety, 2017).

Given these potential benefits of internet use for mental health in people with psychosis, it is important to understand factors that may influence their internet use and, in turn, their engagement with digital

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mental health resources, to inform the goals, content, and design elements of such resources. In particular, for this group, there are likely to be important clinical and personal variables influencing spontaneous engagement with digital technology and online information.

1.1. Predictors of internet use in people with psychosis

Previous research has explored demographic correlates of internet use in people with SMI, including those with experiences of psychosis, with consistent findings that younger age, higher education level, and higher socioeconomic status are associated with higher levels of internet use, both overall and for mental health information (Gay et al., 2016; Thomas et al., 2017; Trefflich et al., 2015; Välimäki et al., 2017), as well as higher levels of mobile phone ownership (Ben-Zeev et al., 2013; Torous et al., 2014) and social media use (Brusilovskiy et al., 2016). These findings reflect internet use trends in the general population (Trefflich et al., 2015).

Beyond demographics, relatively few studies have investigated how illness-related and individual factors affect internet use for mental health information. For example, difficulties with cognition are relatively common in people with psychosis (Vohringer et al., 2013) and can negatively impact overall functioning and technology use (Bowie et al., 2010; Depp et al., 2016). Rotondi et al. (2007) highlighted that deficits in executive functioning and working memory may impair individuals' ability to develop a 'mental model' to search and navigate websites effectively, while we hypothesised that deficits in processing speed may affect how individuals absorb and use online information. Therefore, the presence of cognitive impairment in SMI has implications for how online mental health information should be optimally presented (Bernard et al., 2016; Rotondi et al., 2007), yet the extent to which people with SMI who experience cognitive difficulties spontaneously access such information has not been explored.

Psychotic symptoms may fluctuate in severity and affect an individual's ability to use the internet and engage in online social interaction and information seeking. Qualitative research has suggested that negative symptoms, such as lack of energy and motivation, may inhibit internet use for mental health information, while the presence of positive symptoms may impair concentration, or lead to paranoia about security or the trustworthiness of online sources (Aref-Adib et al., 2016; Schrank et al., 2010). Indeed, trust in online sources of mental health information tends to be lower in people with schizophrenia than people with non-psychotic diagnoses, although having a higher education level reduces this difference (Maguire et al., 2011). However, no studies to date have quantitatively explored the association of spontaneous internet use for mental health information with severity of symptoms in people with psychosis.

Personal factors are also likely to influence use of the internet for mental health information. For example, recovery style refers to individual approaches to recovery from SMI, ranging from an *integrative* style, where an individual views their experiences with curiosity and interest, to a *sealing-over* style, where experiences are not accepted as symptoms and the individual prefers not to explore them (Drayton et al., 1998). Having an integrative recovery style could be expected to lead to more active information-seeking and interest in novel mental health resources (Lederman et al., 2011), while having a sealing-over recovery style may be associated with reluctance to engage with information and treatment (Tait et al., 2003). Similarly, having a lower sense of self-efficacy, or confidence in one's ability to achieve specific goals, may be associated with lower motivation to engage in active mental health information-seeking (Henshaw and Freedman-Doan, 2009). As well, stigma associated with traditional help seeking for psychiatric difficulties may lead people to prefer using the internet for mental health information due to its anonymity (Thomas et al., 2015). Finally, loneliness and social isolation are reported to be among the greatest concerns for people with psychosis (Morgan et al., 2012). Online peer contact provides a means of creating new social connections and validating one's own experiences to feel less alone (Naslund et al., 2016). However, in a recent survey of people with SMI, there was no difference in self-reported loneliness between social media users and non-users, yet two thirds of social media users reported that they used such sites to feel less lonely (Brusilovskiy et al., 2016). No studies to date have explored the relationship between these personal variables and internet use for mental health information.

1.2. Aims and hypotheses

The current study aimed to identify correlates of internet use, overall and for mental health information, in adults with psychotic disorders. It was hypothesised that participants with differing patterns of internet use could be distinguished based on a range of clinical and personal variables, beyond well-established demographic predictors.

Specifically, it was expected that better cognitive functioning and less severe psychotic symptoms would be associated with higher levels of overall and mental health-related internet use, and that having a more integrative recovery style, and higher self-efficacy, internalised stigma, and loneliness would be associated with higher levels of internet use for mental health information.

2. Methods

2.1. Context

Data for this study were collected as part of the Self-Management and Recovery Technology (SMART) research program in Victoria, Australia. The SMART research program focused on the development and use of digital resources for psychosis (Thomas et al., 2016a), either integrated within routine care (SMART-Service) or delivered as a standalone intervention (SMART-Therapy; protocol in Thomas et al. (2016b)). Trials evaluating the use of the resources were conducted, and full results will be reported elsewhere. The current study uses pooled baseline data from the SMART-Therapy and SMART-Service studies.

The SMART-Therapy and SMART-Service projects were conducted in accordance with the Declaration of Helsinki, and were approved by relevant human research ethics committees.

2.2. Participants

Participants were recruited to SMART-Therapy or SMART-Service via systematic caselist screening at clinical and community-based adult mental health services in Victoria, supplemented by practitioner referral and publicity within services and on social media. Interested individuals either provided verbal consent to their mental health service for the research team to contact them for a screening interview, or contacted the research team directly.

Inclusion criteria for both studies were: (a) age between 18 and 65 years inclusive; (b) diagnosis of a nonorganic psychotic disorder (schizophrenia-related disorder or bipolar disorder or major depressive disorder with psychotic features present within the past 2 years), confirmed using the Structured Clinical Interview for DSM-IV-TR Axis I Disorders (SCID; First et al., 2002); (c) sufficient conversational English for meaningful participation; (d) overall intellectual functioning within normal limits (having an IQ greater than 70, as estimated by the Wechsler Test of Adult Reading) (WTAR; Holdnack, 2001). Exclusion criteria for both studies were: (a) initiation of a new antipsychotic medication, or commencement or completion of a formal psychological treatment, within the previous 8 weeks; (b) inpatient admission within the previous 8 weeks to exclude potential participants experiencing an acute episode. All participants gave written informed consent prior to commencing the baseline interview. A total of 366 participants were referred across the studies. From these potential participants, 52 did not meet criteria and were excluded, 81 declined participation, 42 were not

contactable, one participant withdrew their data, and data was missing for one participant.

2.3. Measures

Upon enrolment into the SMART program, all participants attended a baseline interview with a research assistant, completing the SCID, cognitive tests, and a range of recovery, symptomatology and functioning measures.

Internet use and access were evaluated using a 27-item questionnaire adapted from Thomas et al. (2017), including questions on participants' access to and use of digital devices and the internet; use of the internet for mental health information; and attitudes to use of technology within mental health services. The questionnaire is included in the supplementary material.

Overall internet use was defined by the frequency of using the internet for any purpose. Four items tapping frequency of use of different types of websites (social networking sites, video streaming sites, forums, and other websites) for mental health information were collapsed into a single dichotomous variable of whether the participant reported any use of any type of website for mental health information, or reported that they rarely or never used the internet for this purpose.

The following measures were included as potential predictors of internet use:

Demographic variables were age, gender, completion of post-secondary education, current engagement in vocational activities (i.e. work, study, or volunteering), and highest occupation achieved, which was coded based on the Australian and New Zealand Standard Classification of Occupations (Australian Bureau of Statistics, 2013).

Clinical variables were cognitive functioning and psychotic symptom severity. Cognitive functioning was measured using standardised scores on a small battery of tests, including the WTAR as an estimate of pre-morbid IQ; and the following domains of current cognitive functioning (Reitan and Wolfson, 1985): (a) processing speed: Symbol Coding, Animal Fluency, and Trails A; (b) working memory: Digits Forward and Digits Backward; and (c) executive functioning: Trails B and Animal Fluency. Age-standardised scores for each sub-test were transformed into z-scores and summed to produce each domain score.

The symptoms of psychotic disorders reliably reduce to five symptom dimensions both in schizophrenia (e.g., Lindenmayer et al., 1994; van der Gaag et al., 2006; Wallwork et al., 2012), and across the psychosis spectrum (e.g., Dikeos et al., 2006; Quatrrone et al., 2019). To assess these symptom dimensions, we used scoring developed by the van der Gaag et al. (2006) of the interviewer-rated Positive and Negative Syndrome Scale (PANSS; Kay, 1991), producing scores for positive symptoms, negative symptoms, disorganisation, excitement, and emotional distress. Inter-rater reliability on the PANSS was established at $r_I = 0.89$ between research interviewers. **Personal variables** included as potential predictors of internet use for mental health information were: *loneliness*, assessed using total scores on the UCLA Loneliness Scale (Russell, 1996), a 20-item self-report measure where higher scores indicate greater social isolation and loneliness; *self-stigma*, measured using total scores on the 29-item Internalized Stigma of Mental Illness Scale, which includes items on alienation, stereotype endorsement, discrimination experience, social withdrawal, and stigma resistance (Ritsher et al., 2003); *self-efficacy*, measured using total scores on the 10-item Generalised Self-Efficacy Scale (Schwarzer and Jerusalem, 1995); and *recovery style*, measured using total scores on the 39-item Recovery Style Questionnaire, where higher scores indicate a more integrated recovery style and lower scores represent a more sealing-over style (Drayton et al., 1998).

2.4. Statistical analyses

To form categories based on the observed distribution of scores that would be meaningful in informing online intervention development, responses to the question on overall internet use were categorised as either daily or more (high), less than daily but at least weekly (medium), or less than weekly (low). Participants within the low internet use group who reported that they rarely or never used the internet ($n = 23$) were excluded from the analysis of predictors of internet use for mental health information. Chi-square analyses, independent sample t-tests, and one-way ANOVAs were used to investigate bivariate associations between internet use and the potential predictors described above, with Tukey post-hoc tests conducted to identify significant between-group contrasts where applicable. Logistic regressions were conducted to identify unique predictors among variables with significant bivariate associations with internet use, both overall and for mental health information.

3. Results

3.1. Sample characteristics

All participants who completed the SMART-Therapy or SMART-Service baseline assessment ($N = 189$) were included in the analysis. Most participants reported using the internet at least daily ($n = 121$; 64.0%), with 35 (18.5%) using the internet at least weekly but less than daily, and 33 (17.5%) using the internet less than weekly, including 23 participants (12.2% of total sample) who reported rarely/never using the internet. Table 1 displays demographic characteristics for each group and the overall sample.

Excluding the 23 participants who rarely/never used the internet at all, and one participant with missing data, 112 (67.9%) of the remaining 165 participants regularly used the internet for mental health information, with 35 (21.2%) reporting using any type of website daily for this purpose; 29 (17.6%) weekly; 48 (29.1%) monthly or less. Fifty-three participants (32.1%) stated that they rarely/never used any type of website for mental health information.

Of the total sample, the majority felt positively about the idea of using digital technology as part of their mental health care ($n = 153$; 81.0%), which was unrelated to their existing levels of overall internet use ($\chi^2(2) = 0.719$, $p = .698$) and internet use for mental health information ($\chi^2(1) = 0.099$, $p = .753$).

3.2. Predictors of overall internet use

Age was strongly associated with overall internet use ($F(2185) = 17.956$, $p < .001$, $\eta^2 = 0.16$), with post-hoc tests showing that high internet users were significantly younger than medium ($p = .024$) and low internet users ($p < .001$). More frequent internet use was also associated with completion of post-secondary education ($\chi^2(2) = 9.892$, $p = .007$, Cramer's $V = 0.23$). Gender, current employment status, and occupational achievement were not significantly associated with overall internet use.

Table 2 displays descriptive statistics and ANOVA results comparing cognitive and symptom variables for high, medium, and low internet use groups. Higher levels of internet use were associated with higher executive functioning and processing speed scores. Working memory was also associated with higher internet use, though this relationship did not reach statistical significance, while pre-morbid IQ was not associated with internet use.

Overall internet use was significantly associated with severity of positive and negative symptoms. Post-hoc tests showed that medium internet users had the highest levels of positive symptoms ($p = .021$ compared to high internet users; not significant compared to low internet users), while low internet users had the highest levels of negative symptoms ($p = .011$ compared to high internet users; not significant compared to medium internet users). However, the other symptom domains – disorganisation, excitement, and emotional distress – were not associated with overall internet use.

An ordinal logistic regression was conducted to identify unique

Table 1
Demographic characteristics of sample, overall and by internet use level.

Variable	High (n = 121)	Medium (n = 35)	Low (n = 33)	Total (n = 189)
Age: mean (SD)	37.00 (10.5)	42.18 (10.6)	48.78 (8.2)	39.97 (11.1)
Age range	18–65	19–63	35–63	18–65
Gender:				
Male	65 (53.7)	15 (42.9)	16 (48.5)	96 (50.8)
Female	56 (46.3)	20 (57.1)	17 (51.5)	93 (49.2)
Highest educational qualification:				
Year 10 or lower	19 (15.7)	9 (25.7)	12 (36.4)	40 (21.2)
Year 11/12	35 (28.9)	10 (28.6)	13 (39.4)	58 (30.7)
Certificate	19 (15.7)	4 (11.4)	2 (6.1)	25 (13.2)
Diploma	17 (14.0)	5 (14.3)	2 (6.1)	24 (12.7)
Bachelor degree (including Honours)	25 (20.7)	5 (14.3)	4 (12.1)	34 (18.0)
Postgraduate diploma/ certificate	3 (2.5)	2 (5.7)	0	5 (2.6)
Masters	2 (1.7)	0	0	2 (1.1)
Missing	1 (0.8)	0	0	1 (0.5)
Current employment status:				
Student	13 (10.7)	3 (8.6)	2 (6.1)	18 (9.5)
Paid/self-employment	27 (22.3)	6 (17.1)	1 (3.0)	34 (18.0)
Voluntary employment	7 (5.8)	6 (17.1)	3 (9.1)	16 (8.5)
Unemployed	68 (56.2)	17 (48.6)	27 (81.8)	112 (59.3)
Housewife/husband	6 (5.0)	2 (5.7)	0	8 (4.2)
Missing	0	1 (2.9)	0	1 (0.5)
Highest occupation achieved:				
Never worked	6 (5.0)	1 (2.9)	1 (3.0)	8 (4.2)
Labourer, driver, or machinery operator	22 (18.2)	10 (28.6)	12 (36.4)	44 (23.3)
Community/service, clerical/ administration, or sales	54 (44.6)	18 (51.4)	14 (42.4)	86 (45.5)
Managerial, technical, or professional	38 (31.4)	6 (17.1)	5 (15.2)	49 (25.9)
Missing	1 (0.8)	0	1 (3.0)	2 (1.1)
Diagnosis:				
Schizophrenia	52 (43.0)	21 (60.0)	18 (54.5)	91 (48.1)
Schizoaffective disorder	29 (24.0)	9 (25.7)	10 (30.3)	48 (25.4)
Delusional disorder	4 (3.3)	0	0	4 (2.1)
Depression with psychotic symptoms	16 (13.2)	0	1 (3.0)	17 (9.0)
Bipolar disorder with psychotic symptoms	15 (12.4)	5 (14.3)	3 (9.1)	23 (12.2)
Psychotic disorder not otherwise specified	2 (1.7)	0	0	2 (1.1)
Missing	3 (2.5)	0	1 (3.0)	4 (2.1)

predictors of overall internet use among these significant variables. Results showed that younger age, completion of post-secondary education, and lower negative symptom severity were unique predictors of overall internet use, as displayed in Table 3.

3.3. Internet use for mental health information

Table 4 displays the type of websites used for mental health information among regular internet users (n = 165). Participants who reported use of any type of website for mental health information were likely to have higher overall internet use ($\chi^2(2) = 19.974$, $p < .001$, Cramer's $V = 0.35$), be younger ($t(162) = -3.193$, $p = .002$, $d = 0.53$), be currently engaged in productive employment ($\chi^2(1) = 6.294$, Fisher's $p = .016$, $\varphi = 0.20$), and have achieved a higher occupational level ($\chi^2(2) = 9.582$, $p = .008$, Cramer's $V = 0.25$). Internet use for mental health information was significantly predicted by higher levels of loneliness ($t(155) = 3.143$, $p = 0.002$, $d = 0.53$), but contrary to hypotheses, was unrelated to all cognitive variables, self-efficacy, recovery style, internalised stigma, or psychotic symptom severity.

A binary logistic regression was conducted with significant correlates to identify unique predictors of any internet use for mental health information, compared to no internet use for mental health information, with results presented in Table 3. This type of internet use was uniquely predicted by higher levels of overall internet use, younger age, and higher loneliness.

4. Discussion

This study provides a detailed cross-sectional analysis of demographic, clinical, and personal variables associated with overall and mental health-related internet use in a sample of 189 adults with persisting psychosis. While the majority of participants were technologically literate and amenable to the use of digital resources for mental health, high, medium, and low internet use groups were identified by the internet use questionnaire used in this study, and showed distinct demographic and clinical profiles. This study also was the first to explore predictors of internet use for mental health information.

4.1. Predictors of overall internet use

Distinct demographic and clinical profiles of high, medium, and low internet user groups were apparent. Firstly, participants in the high internet use group were younger and relatively well-educated, with better cognitive functioning and low symptom severity. In contrast, members of the low internet use group were likely to be older, and without post-secondary education, facing more cognitive difficulties and severe negative symptoms. Participants with medium internet use were cognitively similar to the low internet use group, but had different patterns of symptoms and fell between the high and low groups on many demographic characteristics.

The demographic predictors of overall internet use were consistent with previous research. A new finding was that low internet users experienced significantly more severe negative symptoms, even when controlling for demographic variables, while high and medium internet

Table 2
Mean (SD) for cognitive functioning and symptom variables by internet use level.

Variable	High (n = 121)	Medium (n = 35)	Low (n = 33)	Test statistic
Cognition				
WTAR standard score	98.86 (14.1)	96.00 (11.5)	93.94 (12.0)	$F(2175) = 1.921$, $p = .15$, $\eta^2 = 0.02$
Processing speed[a]	0.1274 (0.85)	−0.2116 (0.57)	−0.2193 (0.64)	Welch's $F(2,75.9) = 5.011$, $p = .009$, $\eta^2 = 0.05$
Working memory[a]	0.1053 (0.88)	−0.2720 (0.80)	−0.0783 (0.81)	$F(2180) = 2.779$, $p = .065$, $\eta^2 = 0.03$
Executive functioning[a]	0.1118 (0.85)	−0.1558 (0.56)	−0.2182 (0.79)	Welch's $F(2,72.5) = 3.392$, $p = .039$, $\eta^2 = 0.03$
Symptoms				
PANSS Positive	15.20 (5.7)	18.11 (5.7)	15.09 (5.4)	$F(2186) = 3.862$, $p = .023$, $\eta^2 = 0.04$
PANSS Negative	12.27 (4.2)	12.60 (5.3)	15.00 (5.9)	$F(2186) = 4.277$, $p = .015$, $\eta^2 = 0.04$
PANSS Disorganisation	15.98 (4.5)	16.63 (3.8)	17.36 (5.3)	$F(2186) = 1.279$, $p = .281$, $\eta^2 = 0.01$
PANSS Excitement	5.69 (2.3)	5.91 (1.6)	5.30 (1.8)	$F(2186) = 0.757$, $p = .471$, $\eta^2 = 0.01$
PANSS Emotional distress	11.50 (4.1)	12.11 (3.7)	11.33 (4.2)	$F(2186) = 0.398$, $p = .672$, $\eta^2 = 0.004$

[a] Cognitive domain scores were produced by converting standardised test scores into z-scores and summing for each domain.

Table 3
Results of logistic regressions for overall internet use (n = 189) and use of the internet for mental health information (n = 165).

Variable	Odds ratio (95% CI)	p-value
Overall internet use[a]		
Age	0.897 (0.865, 0.929)	<.001
Completed post-secondary education	3.784 (1.835, 7.803)	<.001
Processing speed	2.080 (0.897, 4.823)	.088
Executive functioning	0.683 (0.316, 1.474)	.331
PANSS Positive	1.014 (0.956, 1.075)	.652
PANSS Negative	0.914 (0.848, 0.984)	.017
Internet use for mental health information[b]		
Overall internet use:		
• Low	1	
• Medium	9.598 (1.811, 50.864)	.008
• High	26.300 (5.308, 130.309)	<.001
Age	0.948 (0.908, 0.991)	.018
Currently engaged in productive employment	2.527 (1.062, 6.010)	.036
Occupational level achieved:		
• Labourer, driver, or machinery operator	1	
• Community/service, clerical/ administration, or sales	2.609 (0.921, 7.386)	.071
• Managerial, technical, or professional	1.828 (0.563, 5.937)	.316
UCLA Loneliness total score	1.061 (1.014, 1.109)	.010

[a] Ordinal logistic regression, with low internet use as the reference category. Model $\chi^2(7) = 61.355$, $p < .001$; Nagelkerke $R^2 = 0.342$; goodness-of-fit $\chi^2(354) = 357.2$, $p = .443$.

[b] Binary logistic regression, with no internet use for mental health information as the reference category. Model $\chi^2(7) = 73.094$, $p < .001$; Nagelkerke $R^2 = 0.477$; 79.8% of cases classified correctly.

Table 4
Frequency of use of websites for mental health information among the participants using the internet regularly, i.e. more than rarely/never (n = 165).

Type of website	Daily	Weekly	Monthly	Less than monthly	Rarely or never
Social networking sites (e.g. Facebook, Twitter)	22 (13.3%)	9 (5.5%)	9 (5.5%)	15 (9.1%)	110 (66.7%)
YouTube or other video streaming sites	15 (9.1%)	18 (10.9%)	13 (7.9%)	21 (12.7%)	98 (59.4%)
Forums	6 (3.6%)	11 (6.7%)	8 (4.8%)	11 (6.7%)	129 (78.2%)
General websites	24 (14.5%)	26 (15.8%)	20 (12.1%)	27 (16.4%)	68 (41.2%)

users shared similar levels of negative symptoms. On the other hand, low and medium internet users both had lower levels of cognitive functioning than high internet users. These findings suggest that the amotivation and withdrawal associated with negative symptoms may inhibit internet use to a greater extent than reduced cognitive performance.

The relationship of positive symptoms with internet use was less clear, with medium levels of overall internet use being associated with the highest positive symptom severity scores, while the low and high internet use groups had relatively similar levels of positive symptoms. However, there was no association of positive symptoms with internet use for mental health information. These results somewhat contradict those of Rotondi et al. (2010), which found that more severe positive symptoms were associated with more extensive use of a psychoeducational intervention, and suggested that symptoms may provide motivation to use online resources for mental health. Future studies may benefit from collecting more detailed data about the circumstances under which people with severe psychotic symptoms spontaneously use the internet, to help clarify this relationship.

Regardless of their level of internet use, the majority of participants felt positively about the idea of using digital resources as part of their mental health care, suggesting that the needs of people who are not current internet users should be considered when designing and delivering digital mental health information and interventions in SMI.

4.2. Internet use for mental health information

Of participants who regularly used the internet, nearly 70% used at least one type of website regularly for mental health information, and 20% reported doing so daily, which is higher than rates reported in earlier studies of people with SMI (e.g. Villani and Kovess-Masfety, 2017). Younger participants and those with higher levels of overall internet use were significantly more likely to use any type of website for mental health information. General websites were most commonly used for mental health information; however, social networking and video streaming sites were also used regularly for mental health information by approximately a third of participants. This is indicative of a recent shift, particularly among young people, towards the use of peer-generated web content (Lal et al., 2015), compared with earlier findings that few young people used such sources for mental health information (Burns et al., 2010).

Along with age and overall internet use, higher levels of loneliness were significantly associated with internet use for mental health information. It is plausible that people who feel socially isolated in real life may seek additional support or validation of their experiences online to compensate (Skues et al., 2012). Conversely, increased reliance on the internet for information and support could lead to participants feeling more disconnected from those around them in real-life settings, if online contacts displace in-person sources of support (Nowland et al., 2017). Either way, these results suggest that digital mental health resources should aim to enhance social connectedness for people with psychosis, both on- and offline.

Internet use for mental health information in the current study was not significantly associated with current cognitive functioning or negative symptoms, contrary to the results for overall internet use in this study. This suggests that when those experiencing cognitive difficulties or negative symptoms are able to use the internet, they are no less interested in accessing mental health resources than those without such difficulties or symptoms. This of course does not detract from the need for mental health websites to attend to design features that minimise the impact of cognitive deficits (Rotondi et al., 2007), and where possible, negative symptoms, on successful use.

4.3. Limitations

Data were collected as part of a broader research program, so the sample may be biased by selection of those willing to take part in a treatment study. Since the broader research was explicitly exploring the use of digital resources for mental health, participants' attitudes to technology were also likely more positive than average. For instance, participants were both younger and more likely to use the internet than a sample of respondents surveyed whilst attending clinical mental health services in another study at one of our recruitment sites (Thomas et al., 2017). Nonetheless, our sample was demographically diverse, with sufficient variability to identify characteristics predicting distinct levels of internet use.

The cognitive battery used in this study was limited to three major cognitive domains – processing speed, working memory, and executive functioning. These domains were selected for this study based on their correlation with general cognitive difficulties among people with psychosis (Vohringer et al., 2013). As the cognitive assessment was part of an extensive study visit within a broader research program, it was unfeasible to include further measures of cognition. Future research could examine the relationship between internet use and other potentially relevant cognitive domains, such as social cognition and visual and verbal learning. Social cognition may be of particular relevance given its relationship with psychosocial functioning (Couture et al., 2006) and the current finding that loneliness is associated with mental health-related internet use.

The self-report questionnaire assessing internet use may be susceptible to recall or response desirability bias. It also did not precisely define 'internet use for mental health information', so participants determined which activities and types of information were included. From the relatively high frequency of internet use for mental health information in this study, it seems that the question was interpreted fairly inclusively. However, nuanced analysis of the types of internet use (e.g. actively posting on social media to seek information vs. viewing a mental health organisation's social media page) or information sought (e.g. about medication or symptoms vs. personal recovery) was not possible. In addition, the survey did not explore existing use of digital mental health interventions, including smartphone applications. As the use of social media and crowd-sourced web content increase, and digital interventions become more interactive and personalisable, it is likely that characterising, predicting, and enhancing different types of online engagement will be of greater interest. It is possible that internalised stigma and recovery style, which did not significantly predict internet use for mental health information as broadly defined in the current study, may emerge as predictors of specific types of online engagement.

4.4. Conclusion

This study affirms the recent rise in the use of digital technology and the internet in people with psychosis, both overall and as a source of mental health information, and is the first study to examine a range of clinical and personal predictors of internet use in this population. While well-established demographic predictors of internet use remain important, the results of this study suggest there may also be distinct symptom and cognitive profiles associated with internet use. These novel findings have several implications for the development of digital mental health resources for people with psychosis.

In particular, this study suggests that the following elements may be relevant: being usable by those with diverse educational backgrounds, deficits in cognition and concentration, and varying experience with the internet, through user-friendly, uncomplicated design and comprehensible content; being appealing to those experiencing positive and negative symptoms, potentially through the use of interactive and multimedia elements to enhance engagement when more formal presentation of materials may be difficult to attend to; and providing means of enriching social connections, both on- and offline. In addition, given that even participants who were not currently using the internet expressed an interest in the use of digital resources as part of their mental health care, there may be a place for providing in-person support for assisting people with less experience using the internet, or integrating such resources into existing mental health services.

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Declarations of interest

None.

Ethical approvals

The SMART-Therapy and SMART-Service studies received ethical approval from Human Research Ethics Committees at The Alfred (study numbers 139-14 and 502-14), St Vincent's Hospital Melbourne (study numbers 041.14 and 137.14), Melbourne Health (study numbers 2014.087 and 2014.222), Austin Health (study numbers ND15/308 and ND15/309), Swinburne University (study numbers 2014/119 and 2015/011), and Deakin University (study numbers 2014-285 and 2015-053).

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