



Do people with limited health literacy access and take up treatment in a national digital mental health service? A prospective cohort study of 4578 service users

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ABSTRACT

Background: Health literacy plays a crucial role in traditional healthcare access, engagement, and outcomes, yet its impact within newer digital mental health (dMH) services remains unknown. This is a significant knowledge gap given that the digitalisation of mental health care is predicated on the idea of improving access and outcomes for traditionally underserved groups. This study aimed to investigate the prevalence and correlates of limited health literacy among routine care dMH service users.

Methods: A prospective cohort study was conducted using data from 4578 adults who completed an initial assessment for a large national dMH service between January and June 2024. Limited health literacy was assessed using the Single Item Literacy Screener (SILS) (i.e., scored ≥ 3 out of 5). Analyses examined associations between limited health literacy and user characteristics, treatment enrolment and initiation.

Results: At initial assessment, 11.4 % of participants reported limited health literacy, with these individuals more likely to be younger, have lower educational attainment, less proficiency in English, not be in employment nor married, and identify as Aboriginal and/or Torres Strait Islander (all $ps < .001$). They also reported more severe symptoms of depression and anxiety, and higher suicide risk (all $ps < .001$). Limited health literacy was not significantly associated with treatment enrolment nor initiation ($ps = 0.322 - 0.985$).

Discussion: Findings indicate that a meaningful proportion of routine care dMH service users have limited health literacy, and this does not appear to impede access to the treatments provided by these services. Thus, dMH services may go some of the way to providing mental health treatment for groups who face heightened barriers to accessing healthcare. Further research is needed to ascertain whether limited health literacy impacts on users' ongoing treatment engagement and outcomes, as well as which aspects of dMH service design and delivery may benefit users with diverse health literacy levels.

1. Introduction

While different definitions are used, health literacy encompasses the personal knowledge and competencies vital for promoting and maintaining good health [1]. At the individual level, it refers to a person's capacity to obtain, understand, and use health information and services to make decisions about their own healthcare [2]. Across both physical and mental health conditions, health literacy is a key determinant of health behaviours and outcomes. Lower health literacy is associated

with poorer healthcare access and quality, poorer self-management, more negative patient attitudes towards healthcare (i.e., lower satisfaction and trust), less adherence to treatment recommendations, poorer aftercare engagement, and greater use of emergency care [3–5]. Around the world, including in high income countries such as Australia, the US and in the European Union, at least one-third to one-half of adults are estimated to have limited health literacy depending on the measure used [6–9]. The impacts of limited health literacy may be even more profound among individuals with mental health conditions, a group already

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facing treatment disparities [4,10].

Delivering mental health treatment via the internet within digital mental health (dMH) services is intended to improve access to care for people who otherwise might not access it due to prevailing systemic and attitudinal barriers [11]. DMH services are modelled on traditional face-to-face mental health services and provide the same information, treatments, and referrals via the internet [12]. Some dMH services can be offered in an unguided or self-guided format (e.g., automated self-help program), while others are offered in a guided format with support from mental health professionals (e.g., in the form of emails, private messaging, phone or video calls).

Evidence-based dMH interventions, such as internet-delivered cognitive behaviour therapy (iCBT), have been shown to be effective, cost-effective and highly scalable as demonstrated by their response to increased demand during the COVID19 pandemic [13,14]. Nevertheless, people's uptake and engagement with dMH interventions within routine care is highly variable, with the latter being lower than that observed in controlled clinical research settings [15]. Disparities in dMH service access in Australia appear to persist, with some traditionally underrepresented groups in healthcare also underrepresented in dMH services. For example, typical users of dMH services share similar characteristics with people who typically access traditional face-to-face services (e.g., English-speaking women, between 33 and 43 years, residing in urban locations) [16]. The degree to which these disparities may be attributed to limited health literacy remains unknown, however.

Considering that dMH services are a proposed solution for addressing inequities in mental healthcare, there is a need to better understand whether people with limited health literacy access and engage with these services in routine care [11], [17], [18]. A deeper understanding of the role health literacy plays in this setting will build on the evidence showing limited associations between dMH service use and socio-demographic (e.g., age, education, relationship status) or psychosocial factors (e.g., initial symptom severity, number of psychosocial difficulties) [19]. Such understanding can also inform health literacy responsive dMH interventions which accommodate the diverse needs of, and are accessible, engaging, and beneficial for a larger section of the population.

To this end, this study aimed to determine: 1) the proportion of people accessing a national routine care dMH service with limited health literacy; 2) associations between limited health literacy and other baseline sociodemographic, clinical, and help-seeking characteristics; and 3) associations between limited health literacy, treatment enrolment and uptake.

2. Methods

2.1. Setting

MindSpot (www.mindspot.org.au) is a national, free, digital psychology service funded by the Australian Government Department of Health and Aged Care for adults in Australia experiencing difficulties with a range of mental health or other chronic health conditions. MindSpot provides digital and telephone information, assessment and evidence-based psychological treatments delivered via online courses and over the phone (i.e., teletherapy).

The online treatment courses can be completed in an unguided (self-guided) or guided format (with guidance and support from a therapist) and comprise of five modules (called "lessons") delivered over an eight-week period. Patients can self-refer or be referred by their general practitioner (GP) or other health professional (in Western Australia, this occurs via the MindSpot GP arm of the service).

The online treatment courses of focus in this study are the *Wellbeing Course* (WB), *Wellbeing Plus Course* (WBP), *Indigenous Wellbeing Course* (IWB), and *Mood Mechanic* (MM). These transdiagnostic iCBT-based courses are designed to help people aged 16–25 (MM), 26–64 (WB), 65 years and older (WBP), or identifying as Australian Aboriginal and/or

Torres Strait Islander (IWB) to better understand and develop skills to manage symptoms of anxiety and/or depression.

2.2. Participants

A consecutive convenience sample of young people and adults aged 16 years and over who accessed MindSpot and MindSpot GP between January and June 2024 (see *Setting*).

To be eligible to be included people needed to have: i) completed the optional healthy literacy measure (see *Materials and Measures*); ii) indicated that their reason for using the service was for an assessment and/or treatment; iii) indicated that their main concern was depression or anxiety-related; iv) not subsequently enrolled in a specialist/disorder-specific treatment course (e.g., for chronic pain or PTSD).

A sub-sample of participants were included in a treatment-enrolled cohort. In this group, participants also needed to have enrolled in one of the online treatment courses for depression and/or anxiety (i.e., WB, WBP, MM, IWB; see *Setting*). People were eligible to be included irrespective of their referral status (self-referred vs referred by a health professional), enrolment type (self-enrolled vs enrolled by a therapist), or course format (guided/therapist-guided vs unguided/self-guided).

2.3. Procedure

The prospective use of service user data as part of this study was approved by Macquarie University Human Research Ethics Committee (ref: 11018). This approval was in place of service users giving specific consent for their data to be used for this study. Additionally, the MindSpot Senior Management Team reviewed and approved the inclusion of a single item measure of health literacy (see *Materials and Measures*).

After self-referring to the website either independently (e.g., through Google searches or social media posts) or following referral (e.g., from their GP/other health professional), and registering, participants completed an initial online assessment taking 15–20 min, which included both purpose-designed and standardised measures (see *Materials and Measures*).

Following the completion of the initial assessment, participants were provided with a summary of their results, and the option to self-enrol into a treatment course or schedule a call with a therapist to discuss their treatment and other service options. Following the call with therapist, participants could then be enrolled by the therapist into a treatment course.

2.4. Materials and measures

All measures were completed once as part of the initial online assessment.

Sociodemographic information used for this study included age, gender, country of birth, Aboriginal and/or Torres Strait Islander identity, language/s spoken, proficiency in English (if a Language other than English [LoTE] was spoken), rurality, highest level of education completed, relationship status, and type/s of income.

Depression and anxiety symptoms were assessed using the Patient Health Questionnaire 9-Item (PHQ-9) ([20]) and the Generalized Anxiety Disorder 7-Item (GAD-7) [21]

Suicidal thinking and risk were assessed by asking participants if they had had any suicidal thoughts (yes/no) over the past 7 days, and if they had a current plan or intention of harming themselves (yes/no). Answering yes to these items was indicative of elevated (yes/no), and high (yes/yes) risk, respectively. As part of standard practice at MindSpot, participants answering 'yes' to both items were actively followed up by phone and email by the clinic, and police welfare checks arranged as necessary.

Past or current help-seeking was assessed by asking participants if they had ever spoken to their GP about their mental health (yes/no), and if

they had ever or were currently receiving treatment from a psychologist (yes, in the past/yes, currently/no, never).

Main health/mental health concern was determined by asking participants to select which item best reflected the symptom domains of primary concern to them. Eligible participants selected items related to depression or low mood, generalised anxiety or worry, fears or anxiety about having a panic attack or social situations. Other concerns related to having a chronic health condition (incl. chronic pain), PTSD, OCD, or “other” (no specified reason).

Health literacy was measured using the Single Item Literacy Screener (SILS) (Morris et al., 2006). The SILS asks: “How often do you need to have someone help you when you read instructions, pamphlets or other written material from your doctor or pharmacist?”. Participant responses are scored “1” (Never), “2” (Rarely), “3” (Sometimes), “4” (Often), or “5” (Always). Scores ≥ 3 out of 5 have been shown to reliably identify patients with limited basic or functional health literacy [22], [23]. The SILS is less burdensome and time-consuming than alternative multi-item measures and so could be readily implemented into routine care. It was also feasible to self-administer in a remote (digital) setting, in contrast to behavioural health literacy measures which require administration by a clinician or researcher [24].

2.5. Patient and public involvement

One of the authors (AR) is a consumer researcher who drew on her lived experience of having and/or supporting a loved one’s health literacy-related difficulties, mental health distress, and use of digital tools and services. As a core member of the research team, AR advised on the study design, materials, data analyses and interpretation, and co-authored this manuscript (reviewing and editing).

2.6. Statistical analysis plan

All analyses were conducted using SPSS version 29. For ease of interpretation, several multi-level categorical variables (e.g., highest level of education completed) were re-coded (e.g., no University education = 0; University education completed = 1). The analyses were conducted in stages.

First, the proportions of patients with limited health literacy at each point in the service journey were identified. Limited health literacy was defined as those scoring ≥ 3 out of 5 on the SILS (Aim 1).

Next, logistic regressions were run to identify sociodemographic (e.g., age, education), clinical (e.g., baseline anxiety, depression) and help-seeking factors (e.g., spoken to a GP about mental health, seen another health professional) potentially associated with limited health literacy (Aim 2).

Finally, logistic regressions were conducted exploring the relationship between limited health literacy and several different service use outcomes (Aim 3). To account for the reduced sample size in treatment and improve statistical power, health literacy was treated as a continuous variable in these subsequent analyses (i.e., range 1–5). Here, outcomes were treatment enrolment (yes/no) and uptake (yes/no). For these final analyses, treatment enrolment was operationalised as the percentage of people who enrolled into an online treatment course (see Setting and Participants). Treatment uptake was operationalised as the percentage of people who started lesson 1.

Sensitivity analyses were planned if any of the logistic regressions exploring Aim 3 were significant. Specifically, any statistically significant logistic regression analyses would be repeated including other demographic, clinical, or help-seeking factors. The purpose of these analyses was to examine if health literacy status was uniquely associated with outcomes. A *p*-value of < 0.025 was treated as statistically significant for all analyses.

3. Results

Between 1st January and 30th June 2024, 4578 participants completed the initial assessment and were eligible to be included in the baseline analyses. Of these 4578 participants, 333 (8.2 %) subsequently enrolled in one of the treatment courses for depression and/or anxiety. Of these 333 participants, 254 (76.3 %) started lesson 1.

3.1. Sample characteristics

As seen in Table 1, the overall sample (n = 4578) was aged 34.5 years

Table 1 Demographic characteristics of the sample overall, as well as those with limited health literacy or not.

Variable	Overall sample n = 4578	Limited health literacy = no n = 4057	Limited health literacy = yes n = 521
Age M (SD)	34.5 (13.4)	34.8 (13.1)	31.9 (14.7)
Gender n (%)			
Female	3401 (74.3)	3039 (74.9)	362 (69.5)
Male	1126 (24.6)	980 (24.2)	146 (28)
Other	51 (1.1)	38 (0.9)	13 (2.5)
Birth country n (%)			
Australia	3337 (72.9)	2940 (72.5)	397 (76.2)
England	191 (4.2)	178 (4.4)	13 (2.5)
New Zealand	137 (3.0)	121 (3)	16 (3.1)
India	115 (2.5)	105 (2.6)	10 (1.9)
China	81 (1.8)	68 (1.7)	13 (2.5)
Philippines	67 (1.5)	63 (1.6)	4 (0.8)
Other	650 (14.2)	582 (14.3)	68 (13)
Aboriginal and/or Torres Strait Islander Australian n (%) yes	240 (5.3)	190 (4.7)	50 (9.6)
English as main language n (%) yes	3754 (82)	3331 (82.1)	423 (81.2)
Proficient in English ^a n (%) yes	797 (96.7 %)	709 (97.7 %)	88(89.8 %)
Location n (%)			
Urban	3815 (83.3)	3380 (83.3)	453 (83.5)
Rural/remote	763 (16.7)	677 (16.7)	86 (16.5)
Educational attainment n (%)			
High school or below	1522 (33.2)	1206 (29.7)	316 (60.7)
Trade certificate or diploma	1224 (26.7)	1119 (27.6)	105 (20.2)
University degree	1832 (40.1)	1732 (42.7)	100 (19.2)
Relationship status n (%)			
Never married	2516 (55.0)	2170 (53.5)	346 (66.4)
Married/defacto	1457 (31.8)	1366 (33.7)	91 (17.5)
Separated/divorced	554 (12.1)	481 (11.9)	73 (14.0)
Widowed	51 (1.1)	40 (1)	11 (2.1)
Income n (%)			
Full-time employment	1744 (38.1 %)	1645 (40.5 %)	99 (19 %)
Part-time employment	1329 (29 %)	1196 (29.5 %)	133 (25.5 %)
Unemployed, no income	659 (14.4 %)	532 (13.1 %)	127 (24.4 %)
Disability support pension	139 (3 %)	96 (2.4 %)	43 (8.3 %)
Superannuation/pension	139 (3 %)	117 (2.9 %)	22 (4.2 %)
Other pension or benefit	568 (12.4 %)	471 (11.6 %)	97 (18.6 %)

on average, predominantly female (74.3 %), born in Australia (72.9 %), mainly spoke English (82.0 %), living in an urban area (83.3 %), had less than university level education (59.9 %), were in full- or part-time employment (67.1 %), and had never married (55.0 %). A minority of participants identified as being Aboriginal and/or Torre Strait Islander Australian (5.3 %).

As seen in Table 2, most participants indicated that their main concern was anxiety (54.9 %), followed by depression (45.1 %), and most had seen a health professional about their mental health (56.7 %). At baseline, participant scores for depression and anxiety were both in the moderate range (PHQ9, *M*=14.9; GAD7, *M*=12.6). In addition, most participants met the clinical cut-off for depression (*n* = 3640; 79.5 %) and for anxiety (*n* = 3256; 71.1 %), and around a third (32.8 %) indicated elevated or high suicide risk.

3.2. Limited health literacy in the sample

At all stages of the service journey, a minority of participants met the cut-off for limited health literacy (see Table 2). Specifically, the proportions of participants reporting limited health literacy were: 11.4 % (521/4578) at initial assessment; 10.2 % (34/333) at treatment enrolment; and 9.4 % (25/254) at treatment uptake.

3.3. Associations between limited health literacy and baseline variables

Table 3 displays associations were found between limited health literacy and baseline sociodemographic, clinical, and help-seeking variables.

Limited health literacy was significantly associated with several

Table 2

Clinical, help-seeking and service use characteristics of the sample overall, those with limited health literacy or not.

Variable	Overall sample <i>n</i> = 4578	Limited health literacy = no <i>n</i> = 4057	Limited health literacy = yes <i>n</i> = 521
Main reason for seeking help <i>n</i> (%)			
Depression concerns	2064 (45.1)	1834 (45.2)	230 (44.1)
Anxiety concerns	2514 (54.9)	2223 (54.8)	291 (55.9)
Ever seen a GP about mental health <i>n</i> (%)			
yes	2118 (46.3)	1892 (46.6)	226 (43.3)
Ever seen another health professional for mental health <i>n</i> (%)			
yes	2598 (56.7)	2322 (57.2)	276 (53)
Suicide risk <i>n</i> (%)			
Low	3067 (66.9)	2767 (68.2)	300 (57.6)
Elevated/High	1502 (32.8)	1281 (31.6)	221 (42.4)
Depressive symptoms (PHQ9) <i>M</i> (SD)			
	14.9 (6.0)	14.7 (6.0)	17.3 (5.7)
Anxiety symptoms (GAD7) <i>M</i> (SD)			
	12.6 (5.1)	12.4 (5.1)	14.4 (4.9)
Enrolled in treatment <i>n</i> (%)			
yes	333 (7.3)	299 (7.4)	32 (6.1)
Treatment enrolment type^a <i>n</i> (%)			
Self-enrolled	135 (40.5)	119 (39.8)	16 (47.1)
Therapist-enrolled	198 (59.5)	180 (60.2)	18 (52.9)
Treatment format type <i>n</i> (%)			
Guided/therapist-guided	272 (81.7)	248 (82.9)	24 (70.6)
Unguided/ self-guided	61 (18.3)	51 (17.1)	10 (29.4)
Started lesson 1^a <i>n</i> (%)			
yes	254 (76.3)	229 (76.6)	25 (73.5)

Notes.

PHQ9; Patient Health Questionnaire 9-item,

GAD7; Generalised Anxiety Disorder 7-item.

^a As a proportion of people who enrolled in treatment (*n* = 333).

Table 3

Associations between limited health literacy and baseline variables (socio-demographic, help-seeking, and clinical).

Variable	<i>p</i>	Odds ratio	95 % CI
Age	< .001	0.98	0.97–0.98
Gender – Male (0 = no, 1 = yes)	0.054	1.22	0.99–1.49
Born in Australia (0 = no, 1 = yes)	0.072	1.22	0.98–1.50
Aboriginal and/or Torres Strait Islander Australian (0 = no, 1 = yes)	< .001	2.16	1.55–2.99
Language (0 = English only, 1 = LoTE)	0.609	1.06	0.84–1.34
Proficient in English ^a (0 = no, 1 = yes)	< .001	0.21	0.09–0.48
University education (0 = no, 1 = yes)	< .001	0.32	0.25–0.40
Employed (0 = no, 1 = yes)	< .001	0.34	0.28–0.41
Married (0 = no, 1 = yes)	< .001	0.42	0.32–0.52
Location (0 = urban, 1 = rural/remote)	0.917	0.99	0.77–1.26
Seen GP about mental health (0 = no, 1 = yes)	0.208	0.89	0.73–1.06
Seen another health professional about mental health (0 = no, 1 = yes)	0.065	0.84	0.70–1.01
Suicidal risk (0 = low, 1 = elevated/high risk)	< .001	1.59	1.32–1.91
	<i>p</i>	B	95 % CI
Depressive symptoms at baseline (PHQ9)	< .001	2.65	2.10–3.19
Anxiety symptoms at baseline (GAD7)	< .001	1.99	1.52–2.45

Note. Analyses based on *n* = 4578. Health literacy coded as 1 for limited health literacy;

LoTE; Language other than English. PHQ9; Patient Health Questionnaire 9-item, GAD7; Generalised Anxiety Disorder 7-item, GP; General Practitioner.

^a For those who speak a main language other than English (*n* = 824).

sociodemographic variables. These included: being younger, identifying as Aboriginal and/or Torre Strait Islander Australian, having limited English proficiency (for those who spoke a main language other than English), not having university-level education, not being in current employment, and not being married (*ps* < .001). Associations with all other sociodemographic variables were non-significant (*ps* > .025).

Regarding baseline clinical variables, reporting limited health literacy was significantly associated with higher symptoms of depression and anxiety, and indicating elevated or high suicide risk (*ps* < .001).

No significant associations were found between limited health literacy and past help-seeking behaviours, namely having ever seen a GP or another health professional for mental health reasons (*ps* > .025).

3.4. Associations between limited health literacy and service use outcomes

Table 4 displays associations between limited health literacy and service use outcomes. No significant associations were found between reporting limited health literacy and treatment enrolment nor uptake (*ps* = 0.314–0.985).

Table 4

Associations between limited health literacy and service use outcomes (NB health literacy treated as continuous variable).

Treatment outcomes	Analyses based on <i>n</i>	<i>p</i>	Odds ratio	95 % CI
Enrolled in treatment (0 = no enrolment, 1 = enrolment)	4578	0.314	0.92	0.81–1.07
Treatment enrolment type (0 = therapist enrolled, 1 = self-enrolled)	333	0.985	1.00	0.75–1.32
Treatment format type (0 = unguided/self-guided, 1 = guided/therapist-guidance)	333	0.322	0.84	0.60–1.17
Started lesson 1 (0 = no, 1 = yes)	254	0.393	1.17	0.82–1.65

Note. PHQ9; Patient Health Questionnaire 9-item, GAD7; Generalised Anxiety Disorder 7-item.

4. Discussion and conclusion

4.1. Discussion

This is the first study to characterise the prevalence and correlates of limited health literacy among people accessing dMH assessment and/or treatment in a routine care setting. Findings suggest that around 1 in 10 (or 11.4 %) people accessing a national, publicly funded dMH service report limited basic or functional health literacy. Similar proportions of the sample had limited health literacy among those who went on to enrol in (10.2 %) and start treatment (9.4 %). Moreover, service users with limited health literacy appeared to have a more complex and potentially higher need profile in terms of **some of their** sociodemographic and clinical characteristics. Namely, those with limited health literacy were more likely to have less proficiency in English, lower educational attainment (i.e., less than University-level education), and not be in current employment. From a clinical perspective, these users presented with higher symptoms of depression and anxiety and were more likely to endorse thoughts or intentions of suicide. In addition, service users with greater health literacy difficulties were more likely to belong to priority populations that already face significant barriers to accessing and using healthcare services, such as younger adults and Australian Aboriginal and Torres Islander peoples. Promisingly, however, having limited health literacy was not associated with people's prior mental health help-seeking, nor did it appear to negatively impact on their dMH service use outcomes, in terms of treatment enrolment and uptake.

The proportion of dMH service users indicating limited health literacy in our sample (11.4 %) mirrors findings from the 2018 National Health Literacy Survey of ~18000 Australian adults [25]. Although the national survey employed a multidimensional measure of health literacy, 11 % of the ~4500 participants with a mental health condition indicated difficulties on the domain most similar to the SILS: "*understand health information well enough to know what to do*". In contrast to these and our own findings, a systematic review reported rates of inadequate health literacy of around a quarter (27 %) to a half (48 %) of people attending treatment for or living with a diagnosis of mental illness [26]. Of note, these estimates were the sample-weighted means of percentages across studies also employing a measure of basic or functional health literacy, like the SILS. Taken together, it could be that our findings reflect differences in study characteristics (with the studies cited in Degan et al. conducted in a range of settings and including people with more severe mental illness) and/or measurement (with the measures in Degan et al. being performance-based as opposed to self-report), along with a nationally representative proportion of Australian adults experiencing both mental health concerns and health literacy difficulties. It is also plausible that the single-item, self-report estimate of health literacy in our sample is somewhat conservative and that a greater proportion of dMH service users experience difficulties. This is not unlikely given that people tend to overestimate their reading abilities [27] or are reticent to admit difficulties due to social desirability bias, embarrassment or shame [28], [29].

It is noteworthy that in our sample, some of the groups who reported limited health literacy were also those who tend to experience higher levels of social and economic disadvantage (e.g., less proficiency in English, lower educational attainment, not in employment, Aboriginal and Torres Strait Islander peoples), and are more likely to be affected by the "digital divide" [30] and inequities in healthcare access and outcomes [31]. Similarly, associations between sociodemographic characteristics and lower health literacy have been shown in the community [32] in face-to-face primary care settings [23] and in mental health samples undertaking unguided iCBT as part of research [33]. Therefore, it is important that dMH services and treatment providers are cognisant of the links between limited health literacy and other types of disadvantage in their users, so that they do not inadvertently perpetuate existing inequities in healthcare [34]. This also is especially pertinent

when these users may also be experiencing more complex mental health needs, as evidenced in the current study and elsewhere by higher baseline symptoms of depression and anxiety, elevated/high suicide risk, and greater use of crisis/emergency services [33], [35]. To accommodate and respond to diverse health literacy levels among users, dMH services and treatment providers can adopt a variety of communication strategies. Widely researched and well-endorsed strategies in verbal and written communication include avoiding and/or defining medical jargon in lay terms, routinely asking patients "*what questions do you have?*" and using "teach back" to check for understanding and providing easy-to-read materials incorporating appropriate visual aids and written at a 6th grade level or lower [36], [37], [38]. In addition to these strategies, dMH services and treatment providers also need to be aware of and make efforts to mitigate barriers related to limited internet access and digital literacy among users, along with making appropriate cultural and social adaptations to ensure that a diverse range of users are able to access and take up their offerings.

Finally, the current study found no relationship between service users' limited health literacy and their dMH service use. Regardless of their health literacy, service users enrolled in and started treatment at similar rates. Of note, this finding contrasts with a systematic review finding that other types of health literacy (specifically mental health and digital health literacy) influence user engagement with a range of dMH interventions [39]. This said, this finding accords with those from a recent clinical research trial showing no relationship between participants' scores on a multidimensional measure health literacy and their uptake of iCBT [33]. This finding further suggests that routine care services offering dMH treatment are accessible for and taken up by people with limited health literacy. In interpreting this finding, it should be noted that around half the sample were enrolled by a therapist into treatment (after discussing their assessment results) and most started in a guided treatment offering weekly phone and/or email contact with a therapist. As a result, people were exposed to multiple modes of communicating health information and did not have to rely on their functional health literacy skills alone. Having access to therapist support and guidance may have acted as an impromptu health literacy promotion strategy [40], which mitigated some of the negative impacts of limited health literacy on treatment enrolment and uptake. Indeed, in recent qualitative studies with dMH service users and therapists, both groups noted health literacy-related benefits in reviewing initial assessment results and then having opportunities to discuss these and decide on treatment with a therapist [41], [42]. Noted benefits included improved user insight and understanding into their mental health symptoms and supporting users to navigate the available treatment options and be active and informed participants in decision-making [41], [42]. Although beyond the scope of the current research, future studies may wish to investigate associations between limited health literacy and later service use outcomes (e.g., early drop out from treatment, ongoing engagement with and response to treatment), as well as the influence of therapist support and guidance on these outcomes (e.g., self-enrolment versus enrolment by a therapist, unguided versus therapist-guided treatment). Knowing this could help target limited therapist resources in high volume dMH services and ensure that they are directed towards users with the greatest need who are likely to benefit the most from such interventions.

The current study findings need to be considered in light of several limitations. Firstly, the single-item measure used (the SILS) only screened for limited basic or functional health literacy and as such provides a narrow snapshot of difficulties. It is plausible that a larger proportion of users had difficulties related to other aspects of health literacy (e.g., understanding, appraising, and applying health-related information). Consistent with this view, the Australian National Health Literacy survey found that the rates of respondents endorsing difficulties varied depending on the health literacy domain, from only 5.1 % having difficulties in "*feeling understood and supported by health-care providers*" up to 22.2 % having difficulties in "*appraisal of health*

information” [25]. Despite this, the SILS provided a quick and low burden measure of limited health literacy [22], [23], which was essential for maximising response rates in a routine care setting. Secondly, rates of limited health literacy observed in our sample may not generalise to the broader service cohort as the SILS was included as an optional measure towards the end of initial assessment. Keeping this measure optional was intended to discourage socially desirable responding and aligns with health literacy recommendations in primary care (e.g., to include a “don’t know” option) [36]. However, users with more limited health literacy may have been less able to navigate the website and initial assessment independently, less likely to complete the measure, or have dropped out at an earlier point in the assessment. We can have some confidence in the current health literacy findings generalising to the broader service cohort as all key sample characteristics (e.g., age, gender, educational attainment, symptoms of depression and anxiety, spoken to a GP about mental health) accorded with those reported elsewhere [43]. Regardless, a discussion with a health professional may yield more comprehensive and context-dependent insights into an individual’s health literacy difficulties. For example, in the current context, the therapist may gauge whether a person has limited health literacy during the follow-up assessment call by attending to the language used by the person to describe their condition (e.g., overly simplified), their word choice and capacity to ask questions, and the quality of their responses to “teach-back” questions (e.g., lacking coherence, confused) [40].

4.2. Conclusion

In conclusion, this is the first known study to characterise the prevalence and correlates of limited health literacy among people accessing a routine care dMH service. Findings suggest that around 1 in 10 service users have limited basic or functional health literacy, and that these users tend to have a more complex, and potentially higher need profile in terms of social and economic disadvantage, and clinical severity and risk. Despite this, these results suggest that limited health literacy does not necessarily impede people’s capacity to enrol in and take up treatment, perhaps in part because of opportunities for therapist support and guidance prior to and when starting treatment.

4.3. Practice implications

Findings lend support to the idea that people with limited health literacy can access routine care dMH services and take up treatments within these services. Future research and service development initiatives are needed to explore ways to further support and increase access among people with limited health literacy and determine which aspects of dMH service delivery are especially helpful for this group. Based on the current findings, dMH services may go part of the way in reducing inequities in mental healthcare for groups who have been traditionally underserved. This said, it is important that dMH service providers are aware of the fact people with limited health literacy do access their services, and adhere to the aforementioned best practice strategies for accommodating and responding to health literacy [36], [37], [38].

CRedit authorship contribution statement

Isabella Choi: Writing – review & editing, Methodology, Investigation, Funding acquisition, Conceptualization. **Atria Rezwan:** Writing – review & editing, Investigation. **Blake Dear:** Writing – review & editing, Supervision, Methodology, Investigation, Funding acquisition, Conceptualization. **Lauren Staples:** Writing – review & editing, Software, Resources, Methodology, Investigation. **Nickolai Titov:** Writing – review & editing, Software, Resources, Methodology, Funding acquisition, Conceptualization. **Alana Fisher:** Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Data curation,

Conceptualization. **Madelyne Bisby:** Writing – review & editing, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Taylor Hathway:** Writing – review & editing, Writing – original draft, Project administration, Investigation, Formal analysis. **Danielle Muscat:** Writing – review & editing, Methodology, Investigation, Funding acquisition, Conceptualization. **Julie Ayre:** Writing – review & editing, Methodology, Investigation, Funding acquisition, Conceptualization.

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Declaration of Competing Interest

The authors report there are no competing interests to declare. Authors NT and BD are the developers of the Wellbeing Course but derive no financial benefit from it. Author DM receives royalties from McGraw Hill Australia for the sale of the book ‘Health Literacy in a Nutshell’ and is a director of the company Health Literacy Solutions.

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Data availability

Based on current ethics approval, participants’ data is only accessible to members of the research team.

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