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Health literacy in people living with mental illness: A latent profile analysis

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ABSTRACT

Health literacy comprises cognitive and social skills that enable people to understand health information and maintain good health. Research examining the health literacy of people living with mental illness is scarce. The aim of the present study was to identify distinct subgroups of health literacy in individuals attending mental health treatment and determine if profiles and health literacy levels differ from other populations accessing healthcare services and on health characteristics. Participants ($N = 325$) were attending Neami National Australia services. Participants completed the multidimensional Health Literacy Questionnaire. Latent profile analysis was conducted to identify health literacy profiles. Participants reported lowest health literacy scores in appraising health information, navigating the healthcare system, and finding good health information. Three health literacy profiles were identified; low (20.4%), moderate (61.3%), and high (18.3%). Compared to the other populations (i.e. private hospital patients, men with prostate cancer, older individuals with diabetes, general population, people attending substance dependence treatment), the current sample tended to have lower health literacy scores. The findings highlight the need to increase overall health literacy and consider an individualised approach to enhance specific health literacy domains.

1. Introduction

The World Health Organisation defines health literacy [HL] as cognitive and social skills which influence an individual's motivation and ability to access, understand and use information to maintain and promote good health (World Health Organization, 2009). Previous reviews have concluded that individuals with higher levels of HL are better able to make positive health decisions for themselves and others. They are also able to seek, apply and address health concerns appropriately (Australian Government Department of Health, 2011; Smith et al., 2013; Sørensen et al., 2012; Van Der Heide, 2015). Conversely, individuals with low HL struggle to access healthcare or make successful health decisions, and lack knowledge around positive health behaviours (Adams et al., 2009; Andrus and Roth, 2002; Australian Bureau of Statistics, 2006; Australian Commission on Safety and Quality in Health Care, 2013).

To date, the majority of research examining HL has focused on general populations and measuring HL from a functional perspective (Baker, 2006; Ishikawa and Yano, 2008; Simonds, 1974). This typically involves measuring participants reading, comprehension or numeracy skills and is referred to as functional health literacy [FHL] (Batterham et al., 2014; Kanj and Mitic, 2009; Passamai et al., 2012). Using these approaches, studies have found relationships between low FHL levels and poor adherence to treatment recommendations, poor social support, feelings of shame, increased self-consciousness and unhealthy behaviours in the general population (lee et al., 2004; Menendez et al., 2016; Parikh et al., 1996; Zhang et al., 2014; Zoellner et al., 2011). Low rates of FHL have also been associated with an increase in hospitalisations, poorer aftercare engagement, and negative attitudes and actions towards healthcare treatments compared to those with higher HL (Andrus and Roth, 2002; Guntzviller et al., 2017; Parikh et al., 1996; Smith et al., 2013). However, HL is increasingly being viewed as a multidimensional construct (Beauchamp et al., 2015; Bo et al., 2014; Institute of Medicine, 2009), and there are calls to use a multidimensional approach in the assessment of HL.

Theoretical perspectives (e.g.Nutbeam, 2000) have emphasised the importance of capturing two other HL levels ('interactive' and 'critical' HL) in addition to an individual's FHL skills. This is often referred to as multidimensional health literacy [MHL]. This MHL approach includes the assessment of personal skill development for an individual to

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navigate the healthcare system and have the ability to evaluate health information critically (Nutbeam, 2000). Another advantage of this approach is that it allows various strengths and weaknesses of samples to be identified. For example; the Health Literacy Questionnaire [HLQ] is a recent MHL tool that was developed in light of limitations to FHL approaches (HLQ; Osborne et al., 2013). This tool captures nine dimensions of HL which provide a comprehensive picture of HL levels and experiences. A recent study by Beauchamp et al. (2015) used the HLQ to examine the MHL levels of a representative sample of 813 people from the general population in the state of Victoria, Australia. They concluded that there were large differences observed between various HL domains (Beauchamp et al., 2015). Studies that have used the HLQ in other samples (e.g., people in hospital or those with a physical illness), have also highlighted the benefits of this multidimensional approach (Bourne et al., 2018; Goeman et al., 2016; Goodwin et al., 2018). The primary advantage of a MHL approach is the capacity to discriminate between different components of HL.

Despite established research into both FHL and MHL levels of general populations, there is limited research examining the HL of people living with mental illness.[1] Such research is particularly important due to the high health service needs of people living with mental illness (Odlaug et al., 2015; World Health Organization, 2014). Individuals accessing community mental health services present with lower health care use, lower treatment adherence, receive poorer quality of health care, have low socio-economic status and poorer health outcomes (Clausen et al., 2016; Schoeyen et al., 2011). People living with a mental illness need to regularly access the healthcare system and often require a complex treatment mix, upon which good HL skills are required for successful management (Galletly et al., 2012). Some studies have examined the FHL of people living with a mental illness. These studies have found mixed results. Some studies found that most of their sample had adequate levels of FHL (Galletly et al., 2012) and others finding most of their sample experiencing inadequate FHL levels (Christensen and Grace, 1999). Finally, some studies produced differences in HL based on mental illness type. For example; one study found a higher proportion of inadequate FHL levels amongst those diagnosed with schizophrenia compared to other mental illnesses (Clausen et al., 2016). Despite this, most studies examining the FHL of people living with a mental illness have identified that some of their population experience levels of inadequate FHL (Bacon et al., 2017; Christensen and Grace, 1999; Clausen et al., 2016; Lincoln et al., 2006, 2015; Rose et al., 2014).

Only a few studies have examined the HL of a population living with mental illness using a multidimensional approach (i.e. including functional, interactive and critical HL levels). In one study the HLQ was used to examine the MHL of 298 individuals attending treatment for a substance use disorder Degan et al. (2018). They followed recommendations (Dodson et al., 2014) to use Latent Profile Analysis [LPA], a technique that produces HL 'profiles', formed by grouping participants together based on their similar responses. Three HL profiles were identified within their sample and labelled low, moderate and high HL. Eighty-seven percent of their sample were identified as having low to moderate levels of HL (Degan et al., 2018). The advantage of using a MHL approach was the ability to identify the samples HL strengths (e.g., understand health information well enough to know what to do) and weaknesses (e.g., appraise health information, Degan et al. (2018). In another population-based study of Danish citizens which used two out of nine HLQ scales, people with mental health disorders had the lowest HL levels compared to other long-term conditions (e.g., cancer, diabetes) (Friis et al., 2016). Lastly, a study examining the MHL of those undergoing treatment for alcohol abuse, concluded that there was a high prevalence of limited HL (Rolová et al., 2018). Despite only few studies existing that examine the MHL of people living with a mental illness, their multidimensional nature captures a broad and true representation of HL experiences. Studies that have only focused on the FHL conceptualisation in mental illness samples have acknowledged its limitations (Bacon et al., 2017; Christensen and Grace, 1999; Clausen et al., 2016; Galletly et al., 2012).

The current study aims to examine the MHL levels of individuals attending mental health treatment provided by a community managed mental health organisation. This study uses the multidimensional HLQ (Osborne et al., 2013). The developers of the HLQ (Dodson et al., 2014) recommended that LPA be used to identify whether there are distinct MHL profiles within a sample. The study will also explore whether these profiles are related to specific health determinants (i.e. age, physical conditions). Furthermore, the study will compare mean scores on each of the nine HLQ domains to other Australian samples also accessing healthcare services i.e. a substance use disorder sample accessing residential treatment (Degan et al., 2018), older people with diabetes accessing home service support (Goeman et al., 2016), men with prostate cancer accessing a support network (Goodwin et al., 2018), private hospital patients (Bourne et al., 2018) and a general population (Beauchamp et al., 2015). This will provide perspective into the differences in HL across populations and give a reference point to compare the HL of a mental illness sample to others and to determine the potential impact that the service accessed has on HL experiences. It was hypothesised that (1) The HL levels of the sample will be low to average; (2) There will be multiple profiles of HL, (3) These profiles will differ on a range of health determinants (i.e. physical health, mental health), and (4) The HL levels of the current sample will be lower on average compared to the other non-mental illness samples, however will be similar to the substance use disorder sample.

2. Methods

2.1. Participants

Participants were all living with a mental illness and accessing Neami National. This is an Australian service which provides a range of services in a community setting, to support people living with a mental illness and their wellbeing. Participants involved in the study were accessing one of the 48 different Neami National mental health support services across multiple Australian states. Convenience sampling was used, with participants being selected for the study based on their availability and willingness to participate. A total of 325 participants were included in the study (51% female). The mean age of the sample was 43.6 years (SD = 12.4). Six percent of the sample identified as Aboriginal Torres Strait Islander descent and 20% were born out of Australia. A total of 52% of the sample had a highest education level of primary school/high school, and 38% were permanently unable to work or were ill. The most common physical condition was back pain (28%) and depression/anxiety were the most common mental illnesses experienced amongst the sample (67%). Table 1 describes further participant characteristics. These characteristics are consistent with those from the wider Neami population at the time of recruitment. The general Neami population consist of approximately 48.3% females, 50% of the population were between the ages of 36 and 55 years old, and depression and anxiety were the second and third most common primary diagnosis (Neami National, 2017).

2.2. Measures

2.2.1. Background Characteristics and determinants

Questions for age, gender, ethnicity, education, living arrangement, employment and smoking were included.

[1] For the purposes of this paper mental illness will be defined as "health condition involving changes in emotion, thinking or behaviour (or a combination of these). Mental illnesses are associated with distress and/or problems functioning in social, work or family activities" (American Psychiatric Association, 2018).

Table 1
Demographic and Clinical Characteristics.

	n	%
Gender (n = 319)		
Male	158	49%
Female	161	51%
Country of Birth (n = 329)		
Australia	264	80%
Other	65	20%
Education level (n = 322)		
Primary school/High school	167	52%
Technical qualifications	104	32%
University	51	16%
Employment (n = 323)		
Working full/part-time/student	69	21%
Home duties/retired	47	15%
Permanently unable to work/ill	123	38%
Other	84	26%
Living arrangement (n = 314)		
Alone	159	51%
Not alone	155	49%
Attended emergency	159	50%
Physical health condition		
Arthritis	61	19%
Asthma	68	21%
Backpain	91	28%
Cancer	3	1%
Diabetes	42	13%
Heart problems	20	6%
Stroke	8	2%
Mental health condition		
Depression/anxiety	219	67%
Personality disorder	6	2%
Schizophrenia	39	12%
Bipolar	20	6%
Alcohol consumption (n = 315)		
Never	146	46%
Monthly or less	91	29%
2–4 times a month	35	11%
2 or more times a week	43	14%
Fruit consumption (n = 319)		
1 serve or less	198	62%
2–3 serves	103	32%
4 or more serves	18	6%
Vegetable consumption (n = 318)		
1 serve or less	166	52%
2–3 serves	118	37%
4 or more serves	34	11%
Physical activity (n = 320)		
None-10 min	220	69%
10–30 min	100	31%
Smoker	136	57%
Have healthcare card	285	90%
Have private health insurance	59	18%
Mean age years ($M(SD)$)	43.60	12.38

Note. Sample sizes vary across characteristics due to incomplete responses. SD = standard deviation.

2.2.2. Health Literacy

MHL was measured using the HLQ (Osborne et al., 2013) which comprises 44 items capturing nine distinct domains (see Table 2 for domains). Item response formats for domains 1 through 5, utilise a 4-point Likert scale ranging from 'strongly disagree' (1) to 'strongly agree' (4). Responses to domains 6 to 9 use a 5-point Likert scale ranging from 'cannot do' (1) to 'very easy' (5). Items are summed for each domain with higher scores representing higher HL relative to the population. The Cronbach α for the HLQ domains ranged from 0.78 to 0.90 in the current study (see Table 2 for individual Cronbach α). Our assessment of reliability and validity is consistent with previous research that has found the HLQ to be a robust and distinctive MHL measure that shows both strong construct validity and reliability (Dodson et al., 2014; Osborne et al., 2013).

Table 2
Health Literacy Questionnaire domain Cronbach alphas, M (SD) on the nine domains for each sample and comparing populations.

HLQ Domain	Cronbach alpha	Current study	Substance Use disorder[1]	Private hospital patients[2]	Older people with diabetes[3]	Men with cancer[4]	General population[5]
HLQ1. Feeling understood and supported by healthcare providers[a]	0.83	3.27 (0.55)	2.86 (0.52)[-]	3.35 (0.48)[+]	3.23 (0.44)	3.12 (0.47)[-]	3.21 (0.54)
HLQ2. Having sufficient information to manage my health[a]	0.83	2.91 (0.57)	2.84 (0.50)	3.07 (0.48)[+]	3.02 (0.43)	2.89 (0.45)	2.98 (0.54)
HLQ3. Actively managing my health[a]	0.83	2.91 (0.54)	2.70 (0.53)[-]	3.07 (0.49)[+]	2.99 (0.42)	2.93 (0.41)	3.02 (0.50)[+]
HLQ4. Social support for health[a]	0.78	2.85 (0.63)	2.83 (0.68)	3.26 (0.49)[+]	3.07 (0.48)[+]	3.00 (0.46)[+]	3.03 (0.55)[+]
HLQ5. Appraisal of health information[a]	0.80	2.69 (0.59)	2.59 (0.58)[-]	2.85 (0.53)[+]	2.78 (0.42)	2.83 (0.44)[+]	2.78 (0.54)[+]
HLQ6. Ability to actively engage with healthcare providers[b]	0.88	3.56 (0.88)	3.76 (0.73)[+]	4.07 (0.58)[+]	3.99 (0.57)[+]	4.02 (0.57)[+]	3.97 (0.69)[+]
HLQ7. Navigating the healthcare system[b]	0.90	3.41 (0.88)	3.64 (0.68)[+]	3.91 (0.57)[+]	3.79 (0.60)[+]	3.93 (0.54)[+]	3.82 (0.67)[+]
HLQ8. Ability to find good health information[b]	0.87	3.41 (0.87)	3.71 (0.67)[+]	3.85 (0.62)[+]	3.55 (0.77)	3.89 (0.56)[+]	3.65 (0.75)[+]
HLQ9. Understand health information well enough to know what to do[b]	0.82	3.62 (0.86)	3.97 (0.66)[+]	4.11 (0.58)[+]	3.72 (0.72)	4.04 (0.52)[+]	3.85 (0.74)[+]

Note. M= mean; SD= Standard Deviation; HLQ= Health Literacy Questionnaire.
[a] = Likert scale of 1 – 4.
[b] = Likert scale of 1 – 5.
[+] = significantly higher when compared to the current study, $p > 0.05$ (two-tailed).
[-] = significantly lower when compared to the current study, $p > 0.05$ (two-tailed).
[1] (Degan et al., 2018).
[2] (Bourne et al., 2018).
[3] (Goeman et al., 2016).
[4] (Goodwin et al., 2018).
[5] (Beauchamp et al., 2015).

2.2.3. Mental health, physical health and health behaviours

In an attempt to reduce survey burden on participants, a series of single-item questions were used. These included: Do you have a long-standing illness or disability? (Arthritis/Asthma/Backpain/Cancer/Diabetes/Stroke/Heart problems); Do you have a mental health condition? (Depression/anxiety/Personality disorder/Schizophrenia/Bipolar); How many serves of fruit and vegetables do you consume weekly? (1 serve or less/2–3 serves/4 or more serves); How much do you exercise a week? (none-10 min/10–30 min/30 min or more); How often do you consume alcohol (never/monthly or less/2–4 times a month/2 or more times a week); Have you attended the emergency department? (yes/no); Do you have private health insurance[2]? (yes/no); Do you have a healthcare card[3]? (yes/no).

2.3. Procedure

All individuals attending Neami services were invited to take part in the study via key-workers at Neami National. Those indicating interest in the study were provided with a participant information sheet. Key Neami researchers attended training around the promotion and delivery of the survey by the Public Health Innovation team at Deakin University. These researchers then trained health promotion staff at Neami, who then trained the key workers who delivered the survey to participants. Participants at 36 of the sites completed paper versions of the questionnaire. Participants at six of the sites had the option of completing a paper version or electronic version using an iPad. The questionnaire was given to consumers by their Neami National support worker. Participants completing the paper questionnaires were provided with an envelope to return their responses directly to the researchers in order to maintain confidentiality.

2.4. Analytic strategy

To examine the sample and its demographic data and characteristics, the Statistical Package for the Social Sciences (SPSS) Version 21 (IBM Corp, 2012) was used. Descriptive and frequency analyses were used to examine the overall HL of the sample.

The sample's average responses on the nine HLQ domains were used to identify distinct subgroups within the sample using Latent Profile Analysis (LPA), in Mplus software (Version 8; Muthen and Muthen, 2012–2017). Multiple model fit indices were used to determine the optimal sample profile membership. This ranged from a 2-profile solution to a 5-profile solution. These model fit indices included the Bayesian information criterion (BIC), the Akaike information criterion (AIC), bootstrapped Lo-Mendell- Rubin parametric likelihood ratio test (BLMRT) and Entropy (Kelly et al., 2017; Lubke and Neale, 2006; Nylund et al., 2007). Chi square analysis and one-way Analysis of Variance (IBM Corp, 2012) were used to examine the differences in health determinants between the identified latent profiles. A p-value of less than 0.01 indicates statistical significance. Lastly, to compare the MHL levels of the current study to other samples, multiple independent samples t-tests were carried out using SPSS Version 21 software (IBM Corp, 2012). Those studies used for this comparison were selected due to broadly representing different health conditions and use of services across Australia. These studies were all selected based on their use of the nine HLQ domains which enabled the current study to be comparable.

3. Results

Sample mean scores on each of the nine HLQ domains are presented in Table 2. Domain 1, 'Feeling understood and supported by healthcare providers', ($M = 3.27$, $SD = 0.55$) was the highest score overall for the sample from domains 1 to 5. The lowest score from domains 1 to 5 was on domain 5, 'Appraisal of health information', ($M = 2.69$, $SD = 0.59$). In regards to domains 5 to 9 on the HLQ, the highest score was on domain 9, 'Understand health information well enough to know what to do', ($M = 3.62$, $SD = 0.86$), whereas the lowest score on domains 5 through 9 was on domain 7 'Navigating the healthcare system', ($M = 3.41$, $SD = 0.88$), and equally domain 8 'Ability to find good health information', ($M = 3.41$, $SD = 0.87$).

3.1. Latent Profile analysis

The study was able to successfully identify distinct subgroups of health literacy. Table 3 displays the LPA model fit statistics for models from a 2-profile solution up to a 5-profile solution. Based on these fit statistics, the 3-profile solution was deemed the best fit. This is due to profile 3 having the minimum AIC and BIC values, maximum entropy value and minimum significant BLMRT value compared to the other profile solutions (Kelly et al., 2017; Lubke and Neale, 2006; Nylund et al., 2007).

Three distinct MHL profiles were identified by the LPA. Profile 1 included participants with the lowest HL scores relative to the sample across all nine HLQ domains. Profile 1 was termed 'low health literacy' ($n = 67$, 20.4%). Profile 2 included participants with moderate HL scores relative to the sample across all nine HLQ domains. Profile 2 was termed 'moderate health literacy' ($n = 201$, 61.3%). Lastly, profile 3 included participants with the highest HL scores relative to the sample across all nine HLQ domains. Profile 3 was termed 'high health literacy' ($n = 60$, 18.3%). Table 4 details the differences across the three profiles on the nine HLQ domains.

3.2. Characteristics of each profile

The characteristics of each of the three profiles are outlined in Table 5. There were no significant differences identified across the three HL profiles on any of the characteristics which included; age, gender, country of birth, education level, employment, living arrangement, attending emergency, having a healthcare card, alcohol and fruit consumption, physical activity, having a mental health condition, having a physical health condition, smoking and having private health insurance.

3.3. Sample comparisons

Table 2 outlines the comparisons between the current sample and the nine mean scores for the substance use disorder sample (Degan et al., 2018), older people with diabetes accessing home service support (Goeman et al., 2016), men with prostate cancer accessing a support network (Goodwin et al., 2018), private hospital patients (Bourne et al., 2018) and a general population (Beauchamp et al., 2015). There was a trend observed for people in the current study to have lower levels of health literacy across most domains. For example; the current study had the lowest level of health literacy on domains four (except for the substance use disorder group which was non-significant), five (except for the substance use disorder group, and the non-significant diabetes group) eight and nine (except for the diabetes group which was non-significant), and six and seven for all groups. However, people in the current study tended to have consistent or higher levels of health literacy on domain one compared to the substance use disorder

[2] Pays for some or all costs of public or private hospitals and other health services not covered by other Australian government schemes such as Medicare. Australia has a Medicare scheme that is a universal health insurance scheme, which guarantees all Australians access to a wide range of health and hospital services at low or no cost. 54% of the Australian population have private health insurance (Australian Government Department of Health, 2019).

[3] A government provided card that is used to subsidise the health care costs for individuals. It is made available to people who are currently receiving government benefits and is linked to an individual's level of income i.e. Sickness allowance (Australian Government Department of Human Services, 2019).

Table 3
Fit statistics of the Latent Profile Analysis.

Profiles	df	AIC	BIC	Entropy	BLMRT
2 profile	28	5268.675	5374.879	0.871	3009.963*
3 profile	38	4884.658	5028.792	0.895	2606.337*
4 profile	48	4904.658	5086.723	0.614	2404.329

Note. AIC = Akaike information criterion; BIC = Bayesian information criterion; BLMRT = bootstrapped Lo-Mendell-Rubin parametric likelihood ratio test; df = degrees of freedom.
* $p > .001$ (two-tailed).

group and those with prostate cancer, and domains three and five for the substance use disorder group. See Table 2 for more details.

4. Discussion

This study was the first to examine the MHL levels of people attending community mental health treatment for a mental illness. Three distinct HL profile groups were identified; 'low health literacy' (profile 1), 'moderate health literacy' (profile 2) and 'high health literacy' (profile 3) (terms identified based on their average scores relative to the sample). Most of the sample fell into the 'moderate health literacy profile' (61.3%), with 18.3% of participants obtaining higher levels of HL, and 20.4% of the sample falling into the lower HL category. It is evident that the current sample varied in their HL abilities, with some of the population falling into the low HL profile and others into the high HL profile. Regardless, strengths and weaknesses experienced by the current sample were identified. The current sample struggled most when appraising health information, navigating the healthcare system and finding good health information. On the other hand, they felt that they were supported and understood by healthcare providers the most, compared to the other domains, and felt most able when needing to understand health information well enough to know what to do. The identification of various profiles highlight how different HL abilities can be, even for samples with similar characteristics (i.e., mental illness of some form). The ability to identify these profiles and the various HL strengths and weaknesses of the current sample opens the opportunity to target those individuals who need the most help. It is important that services such as the current mental health service use information such as this, to tailor programs and interventions to meet their service users' specific needs. The importance for people accessing health services to have good HL skills is known, and therefore identifying that there are a number of individuals who struggle with HL skills in various populations is crucial to help improve their service use and overall health.

The relationship between MHL and other characteristics such as physical health conditions was unclear. The non-association of the sample's MHL to demographics and general characteristics adds to the inconsistent findings within the literature (Bacon et al., 2017; Galletly et al., 2012). Research looking at HL in the general population have found some associations with characteristics (i.e. poor physical health) and low HL (Kanj and Mitic, 2009). Therefore, future studies with perhaps larger sample sizes may benefit from examining this in more detail. About half of the current sample (52%) had a highest education level of primary/high school. This was consistent with the general population sampled from and the other comparison studies used in the current study. For example, 48% of people from the general population had not completed secondary education (Beauchamp et al., 2015), and 56% of people attending substance dependence treatment had a highest education level of high school (Degan et al., 2018).

In order to determine where the HL levels of the current population lie in comparison to other similar groups (i.e. Australian samples, accessing services, used the HLQ), the current samples mean scores on the HLQ were compared to five other studies. It was expected that the results of the current sample would be similar to that of a substance use disorder sample accessing residential treatment (Degan et al., 2018). The comparisons revealed that the current sample were most closely aligned with this substance use disorder sample. People in the current study reported higher scores on domains feeling understood by healthcare providers, actively managing health, and appraising health information, and reported lower scores when engaging and navigating the healthcare system and finding/understanding health information when compared to the substance use disorder sample. The current sample had significantly lower HL levels on all domains when compared to private hospital patients (Bourne et al., 2018) and were significantly lower on three domains compared to older people with diabetes accessing home support (Goeman et al., 2016). The current sample had significantly lower health literacy levels on most of the domains compared to men with prostate cancer (Goodwin et al., 2018). As was expected, overall the current sample had significantly lower health literacy levels compared to the general population (Beauchamp et al., 2015). These results highlight the impact that various health services have on their consumers HL, as well as the need to be more specific and consumer tailored when looking at targeting and improving HL. These service users and consumers vary in their HL levels and experiences.

These comparisons provide evidence of the limited HL capabilities of a mental illness sample compared to other samples of people accessing services for other problems i.e. physical health. It was unsurprising that the substance use disorder sample (Degan et al., 2018) and the current study had interchangeable HL abilities across the various HLQ components, due to both samples being related to mental illness and especially due to mental illness comorbidity being high. The current study also provided evidence to suggest that those living with a mental illness may struggle more with their HL abilities compared to other populations and the general population, which was expected. Individuals living with a mental illness are known for their high health service needs and inequalities (i.e. poor quality of care and low treatment adherence) in comparison to the general population (Clausen et al., 2016; Odlaug et al., 2015; Schoeyen et al., 2011; World Health

Table 4
Differences across profiles on the Health Literacy Questionnaire domains.

HLQ *(M(SD))*	Total	Low health literacy (1)	Moderate health literacy (2)	High health literacy (3)	*F* or X^2	*p*	Profile differences
HLQ1[a]	319	3.16 (0.60)	3.22 (0.54)	3.54 (0.61)	9.57	.00	1<3; 2<3
HLQ2[a]	315	2.60 (0.65)	2.91 (0.48)	3.25 (0.57)	22.41	.00	1<2, 3; 2<3
HLQ3[a]	318	2.71 (0.59)	2.90 (0.49)	3.14 (0.59)	10.15	.00	1<2, 3; 2<3
HLQ4[a]	317	2.64 (0.69)	2.84 (0.55)	3.13 (0.71)	10.20	.00	1<3; 2<3
HLQ5[a]	314	2.56 (0.63)	2.64 (0.49)	2.97 (0.72)	9.51	.00	1<3; 2<3
HLQ6[b]	319	3.14 (1.03)	3.58 (0.76)	3.95 (0.92)	14.08	.00	1<2, 3; 2<3
HLQ7[b]	319	2.94 (0.98)	3.45 (0.76)	3.82 (0.92)	17.14	.00	1<2, 3; 2<3
HLQ8[b]	321	2.94 (0.94)	3.46 (0.76)	3.73 (0.94)	15.02	.00	1<2, 3
HLQ9[b]	318	3.27 (0.94)	3.64 (0.75)	3.91 (0.97)	9.12	.00	1<2, 3

Note. M = Mean; *SD* = standard deviation; HLQ = Health Literacy Questionnaire.
[a] = Likert scale of 1 – 4;.
[b] = Likert scale of 1 – 5.

Table 5
Determinants and characteristics of the three profiles and their differences.

	Low health literacy (1)	Moderate health literacy (2)	High health literacy (3)	F or X^2	p	Profile differences
Class size (n(%))	67 (20.4)	201 (61.3)	60 (18.3)	–	–	
Age (*M*(*SD*))	43.44 (10.99)	43.37 (13.14)	44.78 (11.26)	0.30	.74	ns
Gender (n(%))				0.62	.73	ns
Male	34 (54.0)	96 (49.0)	28 (47.5)			
Female	29 (46.0)	100 (51.0)	31 (52.5)			
Country of birth				4.42	.11	ns
Australia	51 (76.1)	169 (84.1)	44 (73.3)			
Other	16 (23.9)	32 (15.9)	16 (26.7)			
Education				7.77	.10	ns
Primary School/High school	41 (64.1)	100 (50.8)	25 (41.7)			
Technical qualifications	17 (26.6)	66 (33.5)	21 (35.0)			
University	6 (9.4)	31 (15.7)	14 (23.3)			
Employment				8.38	.21	ns
Working full/part time/student	11 (17.2)	43 (21.7)	15 (25.0)			
Home duties/retired	6 (9.4)	29 (14.6)	12 (20.0)			
Permanently unable to work/ill	33 (51.6)	70 (35.4)	19 (31.7)			
Other	14 (21.9)	56 (28.3)	14 (23.3)			
Marital Status				0.40	.98	ns
Single	43 (60.0)	126 (60.0)	23 (56.1)			
Partnered	11 (15.5)	30 (14.3)	7 (17.1)			
Separated/Widowed	17 (23.9)	54 (25.7)	11 (26.8)			
Living arrangement				1.89	.39	ns
Alone	28 (43.8)	97 (51.1)	33 (55.9)			
Not alone	36 (56.3)	93 (48.9)	26 (44.1)			
Attended emergency	30 (46.9)	102 (51.5)	27 (46.6)	.70	.71	ns
Physical health condition						
Arthritis	16 (26.2)	38 (62.3)	7 (11.5)	3.15	.21	ns
Asthma	12 (17.9)	49 (24.4)	7 (11.7)	4.95	.08	ns
Back pain	26 (28.6)	54 (59.3)	11 (12.1)	6.82	.03	ns
Cancer	1 (33.3)	2 (66.7)	0 (0.0)	0.82	.67	ns
Diabetes	7 (16.7)	26 (61.9)	9 (21.4)	0.60	.74	ns
Stroke	0 (0.0)	7 (87.5)	1 (12.5)	2.75	.25	ns
Heart problems	4 (20.0)	15 (75.0)	1 (5.0)	2.71	.26	ns
Mental health condition						
Bipolar	6 (30.0)	10 (50.0)	4 (20.0)	1.43	.49	ns
Depression/Anxiety	49 (22.4)	133 (60.7)	37 (16.9)	1.96	.38	ns
Personality disorder	1 (16.7)	4 (66.7)	1 (16.7)	0.08	.96	ns
Schizophrenia	3 (7.7)	27 (69.2)	9 (23.1)	4.52	.10	ns
Alcohol consumption				8.39	.21	ns
Never	36 (57.1)	87 (45.1)	23 (39.7)			
Monthly or less	13 (20.6)	57 (29.5)	21 (36.2)			
2–4 times a month	9 (14.3)	22 (11.4)	4 (6.9)			
2 or more times a week	5 (7.9)	27 (14.0)	10 (17.2)			
Fruit consumption				5.37	.25	ns
1 serve or less	47 (73.4)	117 (59.7)	33 (56.9)			
2–3 serves	15 (23.4)	68 (34.7)	20 (34.5)			
4 or more serves	2 (3.1)	11 (5.6)	5 (8.6)			
Vegie consumption				1.85	.76	ns
1 serve or less	37 (58.7)	98 (50.0)	31 (53.4)			
2–3 serves	21 (33.3)	77 (39.3)	20 (34.5)			
4 or more serves	5 (7.9)	21 (10.7)	7 (12.1)			
Physical activity				3.57	.17	ns
None-10 min	47 (73.4)	138 (70.1)	34 (58.6)			
10–30 min	17 (26.6)	59 (29.9)	24 (41.4)			
Health care card	62 (96.9)	174 (89.7)	48 (82.8)	6.68	.04	ns
Health insurance	10 (15.6)	33 (16.8)	16 (27.6)	3.93	.14	ns
Smoker	34 (54.0)	110 (56.1)	36 (63.2)	1.18	.56	ns

Note * $p < .01$.

Organization, 2014). These results emphasise the importance of HL research for a population of people living with a mental illness. Research is needed in order to better understand the extent to which these low HL levels impact this population and their long-term experiences post treatment.

There are a number of limitations with the current study. Firstly, the cross-sectional design prevents capturing changes in health literacy over time or under varying circumstances. For example, changes in service access over time i.e. research would benefit from following individuals after they have accessed mental health services and over time. In addition, the current study was conducted with Neami National, whom to reduce respondent participant burden, chose to use a limited range of outcome variables. For example; the question regarding alcohol consumption was limited in the information it provided. A question measuring the amount of alcohol an individual consumes rather than how often would have provided improved details here. Likewise, questions around other substance use would have improved the survey. Lastly, the sample used were all accessing the same mental health service. This could have increased selection bias. All individuals sampled currently met criteria for access into the mental health service selected. Although the current sample were representative of the population that was sampled from (based on consistent demographics), other important samples such as those unable to access treatment were therefore not captured. The current sample were accessing services

which may mean that their HL could potentially be higher than those not captured in the study. Therefore, there could have been an underestimation of HL levels and abilities of people living with a mental illness. In addition to this, the use of an Australian sample only limits the generalisability of findings. However, the HLQ has been used across numerous countries and so it is therefore possible that these results could be similar to the experiences of people in other countries.

It is clear that health literacy research is crucial due to its known impact on people's ability to access health services and to maintain and manage positive health behaviours (Australian Bureau of Statistics, 2006; Australian Commission on Safety and Quality in Health Care, 2013). In particular, future research into the HL of people living with mental health issues is paramount. This is still an under researched area that needs attention. People living with mental illnesses are a disadvantaged population that are more recently being found to experience low levels of health literacy. We know the impact low health literacy levels have on the general population and so addressing this specific populations HL needs is crucial. The current study highlights the benefits of a MHL approach and research should consider this. This recommendation is consistent to other studies who emphasise the need for service providers to take on a MHL focused approach with consumers (Christensen and Grace, 1999; Lincoln et al., 2015). Research is needed to bring attention to the potential impact HL has on individuals living with a mental illness and its influence on improvements and 'recovery'. Examining the changes in HL over time for this population longitudinally would highlight the potential impact HL has on improvements or challenges, especially when individuals leave treatment services. Investigating current services and their ability to address HL would also help determine how HL can or is being addressed in within this population and what is working. The current study highlights that people have various HL needs, abilities, strengths and weaknesses relative to their population and setting (Dodson et al., 2014). Therefore an approach to treatment that steers away from a 'one size fits all' view is beneficial (Brooner and Kidorf, 2002).

The current study was the first to explore the MHL levels of people living with a mental illness seeking community mental health treatment. With the inclusion of participants from multiple Australian states, being representative of the sampled population, as well as having an equal representation of genders, the current study provides a clear and strong picture of the MHL needs of the current population. The HLQ and the recommended use of LPA allowed multiple MHL strengths and weaknesses to be identified for this sample, as well as highlighting that 20.4% of the current sample really struggle with their HL. Although it is seen that this population experience various HL levels in comparison to one another, when compared to the general population and other non-mental illness populations, the struggle for these individuals and their HL is significantly greater in most cases. The current study provides support for the use of a MHL tool. The findings emphasise a need to enquire further into the HL of this population as well as shifting away from a 'one size fits all' approach when addressing HL. The study indicates the need for services to develop HL programs and interventions to address and target specific HL needs and weaknesses.

Declaration of competing Interest

At the time that this research was conducted KW, RM and ST were all employed by Neami National which funded this study. There is no conflict of interest between RM and ST's current employment and completion of the study. KW is currently employed by Neami National.

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References

Adams, R.J., Appleton, S.L., Hill, C.L., Dodd, M., Findlay, C., Wilson, D.H., 2009. Risks associated with low functional health literacy in an Australian population. Med. J. Aust. 191 (10), 530–534.
American Psychiatric Association, 2018. What is Mental illness? American Psychiatric Association, Washington, DC.
Andrus, M.R., Roth, M.T., 2002. Health literacy: a review. Pharmacotherapy 22 (3), 282–302.
Australian Bureau of Statistics, 2006. Health literacy. In: A.B.o. (Ed.), Statistics. Australian Bureau of Statistics, Canberra.
Australian Commission on Safety and Quality in Health Care, 2013. Consumers, the Health System and Health Literacy: Taking Action to Improve Safety and Quality. In: ACSQHC (Ed.), Consumers, the Health System and Health Literacy: Taking Action to Improve Safety and Quality. ACSQHC, Sydney.
Australian Government Department of Health, 2011. Health literacy, Retrieved from http://www.health.gov.au/internet/publications/publishing.nsf/Content/womens-health-policy-toc~womens-health-policy-key~womens-health-policy-key-literacy.
Australian Government Department of Human Services, 2019. Health care card. In: D.o.H. (Ed.), Services, (Ed.).
Bacon, O., Vandenberg, A., May, M.E., 2017. Provider and patient perception of psychiatry patient health literacy. Pharm. Pract. (Granada) 15 (2), 908.
Baker, D.W., 2006. The meaning and the measure of health literacy. J. Gen. Intern. Med. 21 (8), 878–883.
Batterham, R., Buchbinder, R., Beauchamp, A., Dodson, S., Elsworth, G.R., Osborne, R.H., 2014. The OPtimising HEalth LIterAcy (Ophelia) process: study protocol for using health literacy profiling and community engagement to create and implement health reform. BMC Public Health 14 (1).
Beauchamp, A., Buchbinder, R., Dodson, S., Batterham, W.R., Elsworth, G.R., McPhee, C., Osborne, R.H., 2015. Distribution of health literacy strengths and weaknesses across socio-demographic groups: a cross-sectional survey using the Health Literacy Questionnaire (HLQ). BMC Public Health 15, 678.
Bo, A., Friis, K., Osborne, R.H., Maindal, H.T., 2014. National indicators of health literacy: ability to understand health information and to engage actively with healthcare providers — a population-based survey among Danish adults. BMC Public Health 14 (1), 1095.
Bourne, A., Perrbux, S., Jessup, R., Staples, M., Beauchamp, A., Buchbinder, R., 2018. Health literacy profile of recently hospitalised patients in the private hospital setting: a cross sectional survey using the Health Literacy Questionnaire (HLQ). BMC Health Serv. Res. 18, 877.
Brooner, R.K., Kidorf, M., 2002. Using behavioral reinforcement to improve methadone treatment participation. Sci. Pract. Perspect. 1 (1), 38–47.
Christensen, R.C., Grace, G.D., 1999. The prevalence of low literacy in an indigent psychiatric population. Psychiatr. Serv. 50 (2), 262–263.
Clausen, W., Watanabe, G.S., Bill, B.M., Britigan, D.H., 2016. Health literacy among people with serious mental illness. Community Ment. Health J.. 52 (4), 399–405.
Degan, T.J., Kelly, P.J., Robinson, L.D., Deane, F.P., 2018. Health literacy in substance use disorder treatment: a latent profile analysis. J. Subst. Abuse Treat. 96, 46–52.
Dodson, S., Beauchamp, A., Batterham, R.W., Osborne, R.H., 2014. Information sheet 10: About the Health Literacy Questionnaire (HLQ). Ophelia toolkit: A step-by-step guide for identifying and responding to health literacy needs within local, communities. Retrieved from https://www.ophelia.net.au/bundles/opheliapublic/pdf/The-HLQ.pdf.
Friis, K., Lasgaard, M., Osborne, R.H., Maindal, H.T., 2016. Gaps in understanding health and engagement with healthcare providers across common long-term conditions: a population survey of health literacy in 29,473 Danish citizens. BMJ Open 6 (1), e009627.
Galletly, C., Neaves, A., Burton, C., Liu, D., Denson, A.L., 2012. Evaluating health literacy in people with mental illness using the test of functional health literacy in adults. Nurs. Outlook 60 (5), 316–321.
Goeman, D., Conway, S., Norman, R., Morley, J., Weerasuriya, R., Osborne, R.H., Beauchamp, A., 2016. Optimising health literacy and access of service provision to community dwelling older people with diabetes receiving home nursing support. J. Diabetes Res. 2016, 1–12.
Goodwin, B.C., March, S., Zajdlewicz, L., Osborne, R.H., Dunn, J., Chamber, S.K., 2018. Health literacy and the health status of men with prostate cancer. Psychooncology 27, 2374–2381.
Guntzviller, L.M., King, A.J., Jensen, J.D., Davis, L.S.A., 2017. Self-Efficacy, health Literacy, and nutrition and exercise behaviors in a Low-Income, Hispanic population. J. Immigr. Minor. Health 19 (2), 489–493.
IBM Corp, 2012. IBM SPSS Statistics For Mac, 21.0 ed. IBM Corp, Armonk, NY.
Institute of Medicine, 2009. Measures of Health Literacy: Workshop Summary. National Academic Press, Washington, DC.
Ishikawa, H., Yano, E., 2008. Patient health literacy and participation in the health-care process. Health Expect 11 (2), 113–122.
Kanj, M., Mitic, W., 2009. Promoting health and development: closing the implementation gap. In: 7th Global Conference on Health Promotion. Nairobi, Kenya.
Kelly, P.J., Robinson, L., Baker, A., Deane, F.P., Mcketin, R., Hudson, S., Keane, C., 2017. Polysubstance use in treatment seekers who inject amphetamine: drug use profiles, injecting practices and quality of life. Addict. Behav. 71, 25–30.
lee, S.D., Arozullah, A.M., Cho, Y.I., 2004. Health literacy, social support, and health: a research agenda. Soc. Sci. Med. 58 (7), 1309–1321.
Lincoln, A., Paasche-Orlow, M.K., Cheng, D.M., Lloyd-Travaglini, C., Caruso, C., Saitz, R., Samet, J.H., 2006. Impact of health literacy on depressive symptoms and mental health-related quality of life among adults with addiction. J. Gen. Intern. Med. 21 (8),

818–822.
Lincoln, A.K., Arford, T., Doran, M.V., Guyer, M., Hopper, K., 2015. A preliminary examination of the meaning and effect of limited literacy in the lives of people with serious mental illness. J. Community Psychol. 43 (3), 315–320.
Lubke, G.H., Neale, M.C., 2006. Distinguishing between latent classes and continuous factors: resolution by maximum likelihood. Multivariate Behav. Res. 4, 499–532.
Menendez, M.E., van Hoorn, B.T., Mackert, M., Donovan, E.E., Chen, N.C., Ring, D., 2016. Patients with limited health literacy ask fewer questions during office visits with hand surgeons. Clin. Orthop. Relat. Res. 475 (5), 1291–1297.
Muthen, L.K., Muthen, B.O., 2012–2017. Mplus User's Guide. Muthen and Muthen, Los Angeles, CA.
Neami National, 2017. 2016-17 Neami national 30th annual report. Retrieved from https://assets.neaminational.org.au/assets/Resources/Neami-publications/Annual-Reports/02f67186fe/2016-17-Neami-National-Annual-Report_digital.pdf
Nutbeam, D., 2000. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. Health Promot. Int. 15 (3), 259–267.
Nylund, K.L., Asparouhov, T., Muthen, B.O., 2007. Deciding on the number of classes in latent class analysis and growth mixture modeling: a Monte Carlo simulation study. Struct. Equ. Model. 14 (4), 535–569.
Odlaug, B.L., Gual, A., DeCourcy, J., Perry, R., Pike, J., Heron, L., Rehm, J., 2015. Alcohol dependence, co-occurring conditions and attributable burden. Alcohol 51 (2), 201–209.
Osborne, R.H., Batterham, R., Elsworth, G.R., Hawkins, M., Buchbinder, R., 2013. The grounded theory, psychometric development and initial validation of the Health Literacy Questionnaire (HLQ). BMC Public Health 13, 658.
Parikh, N.S., Parker, R.M., Nurss, J.R., Baker, D.W., Williams, M.V., 1996. Shame and health literacy: the unspoken connection. Patient Educ. Couns. 27 (1), 33–39.
Passamai, M.B., Sampaio, H.C., Dias, A.M.I., Cabral, L.A., 2012. Functional health Literacy: reflections and concepts on its impact on the interaction among users, professionals and the health system. Interface 16 (41), 301–314.
Rolová, G., Barták, M., Rogalewicz, V., Gavurová, B., 2018. Health literacy in people undergoing treatment for alcohol abuse – A pilot study. Kontakt 20 (4), e394–e400.
Rose, L.E., Sawyer, A.L., A, E., 2014. Cardiovascular health literacy and treatment adherence in persons with serious mental illness. Issues Ment Health Nurs. 35 (2), 88–99.
Schoeyen, H.K., Birkenaes, A.B., Vaaler, A.E., Auestad, B.H., Malt, U.F., Andreassen, O.A., Morken, G., 2011. Bipolar disorder patients have similar levels of education but lower socio-economic status than the general population. J. Affect. Disord. 129 (1–3), 68–74.
Simonds, S.K., 1974. Health education as social policy. Health Educ. Monogr. 2, 1–25.
Smith, S.K., Nutbeam, D., McCaffery, K.J., 2013. Insights into the concept and measurement of health literacy from a study of shared decision-making in a low literacy population. J. Health Psychol. 18 (8), 1011–1022.
Sørensen, K., Van Den Broucke, S., Fullam, J., Doyle, G., Pelikan, J., Slonska, Z., Brand, H., 2012. Health literacy and public health: a systematic review and integration of definitions and models. BMC Public Health 12 (1), 80.
Van Der Heide, I., 2015. Health Literacy: an asset for public Health. prevention and public health, Vrije Universiteit Amsterdam. Retrieved from https://www.nivel.nl/sites/default/files/bestanden/Proefschrift_vd_Heide.pdf
World Health Organization, 2009. Track 2: health literacy and health behaviour. In: Nairobi Global Conference on Health Promotion. Kenya.
World Health Organization, 2014. Global status report on alcohol and health, Geneva, Switzerland.
Zhang, N.J., Terry, A., McHorney, C.A., 2014. Impact of health literacy on medication adherence: a systematic review and meta-analysis. Ann. Pharmacother. 48 (6), 741–751.
Zoellner, J., You, W., Connell, C., Smith-Ray, R.L., Allen, K., Tucker, K.L., Davy, B.M., Estabrooks, P., 2011. Health literacy is associated with healthy eating index scores and sugar-sweetened beverage intake: findings from the rural lower mississippi delta. J. Am. Diet. Assoc. 111 (7), 1012–1020.