Int Marit Health
10.5603/imh.101675
www.intmarhealth.pl

ISSN 1641-9251
eISSN 2081-3252

VIA MEDICA

ORIGINAL ARTICLE

The relationship between health literacy and health behaviours amongst a South African Navy sample

Sonja Nicolene Mostert[1], Jarred Martin[1], Charles Van Wijk[2]

[1]University of Pretoria, South Africa
[2]University of Stellebosch, South Africa

ABSTRACT

Background: *Health literacy (HL) is the ability to access, process and understand information about health. It has been established that HL mediates health-related decisions and behaviours. In the naval environment, sailors are expected to responsively address their healthcare needs and maintain a holistic state of physical and psychological wellbeing to meet the operational demands of their work. While studies of HL in military populations have been undertaken, none of these have explicitly examined active-duty naval personnel. The aim of this study was to examine the levels of HL amongst a sample of active-duty sailors in the South African Navy (SAN) and determine to what extent HL predicted health behaviours.*

Materials and methods: *A total of 977 active-duty sailors completed a demographic questionnaire and the Health Literacy Questionnaire (HLQ) during their annual health screening. The HLQ is 44-item questionnaire with Likert scale response options that assesses several domains of health literacy across nine subscales. The HLQ data was paired with several health indicators. The following health information was recorded; blood pressure readings (diastolic and systolic), body mass index, hip, and waist measurements, as well as if diabetes and/or hypertension had been diagnosed. Descriptive statistics were used to analyse the data along with a regression analysis to determine the nature and predictability of HL and the health indicators.*

Results: *The findings supported high levels of HL across all nine subscales with the active management subscale significantly predicting several health outcomes including reduced blood pressure; body mass index and waist and hip measurement.*

Conclusions: *The HLQ was used to assess HL amongst SAN sailors. Results indicate that SAN personnel have above average HL knowledge and skills which may be attributed to the accessibility of health support information and services as well as mandatory health screenings and evaluations.*

(Int Marit Health 2025)

Keywords: health literacy, health management, health maritime, naval medicine, sailors

INTRODUCTION

This quantitative study examined the health literacy (HL) of members of the South African Navy (SAN), an arm of service within the South African National Defence Force (SANDF) responsible for safeguarding the territorial integrity of the country, both at and from the sea [1]. SAN members have access to multidisciplinary military healthcare services designed to monitor, evaluate, promote, and support their physical, mental, and social wellbeing (South African Military Health Service [SAMHS]) [2]. This health surveillance strategy is designed to maintain mission readiness and a fit and healthy fighting force, especially within the naval context where maritime operations and deployments place unique operational demands on the physical and mental health

Sonja Nicolene Mostert, University of Pretoria, Lynwood road, 0028 Pretoria, South Africa, e-mail: sonja.mostert@up.ac.za

Received: 21.07.2024 Accepted: 2.09.2024 Early publication date: 16.01.2025

of naval personnel [3–6]. However, access to health support services does not guarantee voluntary utilization of such services outside the mandatory health screenings that take place annually or during pre-deployment mobilisation. Weld et al. [7] has argued that while "military personnel have financial and structural access to care, there may be ... real or perceived personal barriers to receiving or obtaining health care" (p. 1137), potentially compromising their capacity to address their health care needs and maintain the required degree of operational health and readiness. It is, in this regard, that HL has been studied as a factor of interest in understanding how military personnel make sense of the context specific health information and services available to them and how this informs their health-related decisions and behaviours.

HL is the ability to access, process and understand information about health [8, 9], and includes people's capacity to use and apply health-related information [8]. The significance of being health literate is evidenced by practicing health promoting behaviours and implementing precautionary measures to mitigate the development of chronic diseases [10–13]. HL is central to behaviour change [10] and enables people to make educated decisions to manage and promote their health [10, 11] ultimately predicting better health outcomes [12, 14–16]. Practicing healthy habits reduces the prevalence of health complications and decreases the burden of noncommunicable diseases [17–19]. Paasche-Orlow and Wolf [16], however, explicate that the complexity of HL necessitates the need to approach the concept within a specific context and in relation to specific tasks or goals to be achieved.

SAN members undergo an all-inclusive occupational health assessment annually, enabling them to access medical and psycho-social support services that together constitute their holistic health and wellbeing. HL impacts the use of health services, but the question remains how different domains of HL are linked to guiding subsequent health behaviour management. The role played by HL in mediating the responsive use of health care services offered to military members has come to find expression in a small but growing body of studies [20]. However, much of this work has reported on militaries located in upper middle income as well as high income countries [7, 21] focused on military members who are not in active duty [22], military college students [23], or who are themselves military healthcare service providers [23–25]; have adopted a narrow focus on a specific form of health literacy and associated support services [26]; or have sampled non-naval/maritime populations of military personnel, for example, army members [27]. This study builds on extant studies of HL within the military context by specifically examining the levels of HL amongst a sample of active-duty SAN personnel. The study was guided by the research question: To what extent does health literacy predict health behaviours in a SAN sample? To this effect, it was hypothesized that higher levels of HL will predict better health outcomes. The study intended to explore the relation between HL and health outcomes and no causal inferences are thus made.

MATERIALS AND METHODS

A quantitative cross-sectional research approach, specifically a correlational research design was used. Several variables were measured to determine the predictive nature of HL and specific health-related behaviours [28, 29]. HL was measured in addition to several health-related markers including hypertension status (correlated with blood pressure readings), diabetes status, and BMI readings (including hip and waist measurements).

This study relied on survey data collected from a sample of SAN personnel stationed with the SAN Fleet, in the Western Cape province of South Africa. Between March and December of 2023 active-duty sailors in the SAN reporting for their annual mandatory health screening at a specialist maritime military health support unit were recruited to participate. During their health screening introduction, participants were provided with an information leaflet which outlined the scope of the study and requirements of participation. Those who opted to participate received an informed consent form and, after consenting to participate, completed the short anonymous questionnaire booklet during their waiting period. The completed booklet was then filed in their medical file. The administrative officer signing off on the file recorded the deidentified medical information [blood pressure readings (diastolic and systolic), body mass index, hip, and waist measurements, as well as if diabetes and/or hypertension had been diagnosed]. Thereafter the questionnaire booklet was removed from the file for data capturing and analysis.

MEASURES

Within the questionnaire booklet, participants were requested to complete two paper-based questionnaires. The demographic questionnaire requested biographical information including, age, gender, race, years of service in the SAN, education level and rank.

In addition to the demographic questionnaire, participants were asked to complete the Health Literacy Questionnaire (HLQ), developed by Osborne et al. [30, 31]. The HLQ includes nine sub-scales and a total of 44 items. Each subscale assesses a different domain of HL. The HLQ is a multidimensional tool that assesses several domains of health literacy amongst the general population. It has been widely used to measure HL [11, 32–38]. Scale one to five includes several statements and participants are asked to rate their

Table 1. HLQ Cronbach alpha values

HLQ SCALE	HLQ SCALE HEADING	Cronbach α
Scale 1	Feeling understood and supported by healthcare providers — 4 items	α = 0.81
Scale 2	Having sufficient information to manage my health — 4 items	α = 0.82
Scale 3	Actively managing my health — 5 items	α = 0.87
Scale 4	Social support for health — 5 items	α = 0.80
Scale 5	Appraisal of health information — 5items	α = 0.82
Scale 6	Ability to actively engage with healthcare providers — 5 items	α = 0.89
Scale 7	Navigating the healthcare system — 6 items	α = 0.88
Scale 8	Ability to find good healthcare information — 5 items	α = 0.86
Scale 9	Understanding health information well enough to know what to do — 5 items	α = 0.85

level of agreement with each statement using a 4-point Likert scale: 1 = Strongly disagree; 2 = Disagree; 3 = Agree; and 4 = Strongly agree. Scales six to nine requests participants to rate their level of difficulty when performing certain tasks. A 5-point Likert Scale is used: 1 = Cannot do or always find difficult; 2 = Usually difficult; 3 = Sometimes difficult; 4 = Usually easy; 5 = Always easy. The questionnaire is considered a valid and reliable measure and has been used with a South African population [39]. Boateng et al. [40] also validated the measure for a sub-Saharan Africa population. Cronbach alpha coefficients are used to measure the internal consistency of a measure. High Cronbach alpha values suggest consistency across response items for all participants [41]. The Cronbach alpha values of the nine dimensions of the HLQ for this study ranged between 0.81 and 0.89 indicating good reliability (Table 1).

The data was analysed using the Statistical Package for the Social Sciences' (SPSS Version 29). Descriptive — and inferential statistical analysis was conducted. Several physiological variables were included as a measure of health outcomes: diastolic and systolic readings, hip and waist size in cm, body mass index (BMI) and whether the respondents have been diagnosed with diabetes and/or hypertension. All distributions were examined for normality and the assumptions of multiple regression were addressed [42, 43]. Regression analysis was conducted to determine the nature and predictability of HL and several health variables.

Ethical approval was received from the ethics committees of The Faculty of Humanities and the Faculty of Health Sciences. Participation was voluntary and participants gave their informed consent to participate.

RESULTS

HLQ guidelines provided SPSS syntax for dealing with missing values [30]. The syntax used the raw HLQ items with missing items to impute values and create a new data set with fully imputed items (in this case, n = 977). The subscale scores were calculated from the fully imputed data set only if the number of original missing values for items on a subscale was between 40–50% or less. This means that almost half of the original items on a subscale had imputed items. If more than 40–50% were missing, the person's subtotal for a subscale was not calculated. Forty percent means 2 out of 5 items and 50% 3 out of 6 items. Most subscales have 5 items except for scale 7, which has 6. Thus, the subscales are reported with imputed values given the requirement above, but the original items are reported with missing values with imputation. The descriptive results are presented first followed by the regression results.

DESCRIPTIVE STATISTICAL ANALYSIS

The sample included 977 SAN members (n = 977). Most of the sample self-identified as male/man (65%), while 34% identified as female/woman. In terms of ethnicity, the sample comprised of 65% African (n = 638), 21.5% Mixed race (n = 211), 9.1% Caucasian (n = 89), 1.7% Indian (n = 17), and 1.1% Asian (n = 11). The mean age of was 34.35 years (standard deviation [SD]: 6.27, range: 20–62), of which almost 73% were younger than 40 years of age. The sample was entirely composed of operationally active SAN personnel with an average number of years of service ranging from one to 41 years (M: 13.25; SD: 9.10). The rank profile of the sample was 46.7% Junior Ratings, 27.4% Senior Ratings, 10.2% Warrant Officers, 7.8% Junior Officers, and 7% Senior Officers. Concerning the highest level of education across the sample, 66.5% possessed a standard school-leaving qualification (i.e., a matric), while the remaining portion held a post-school diploma or undergraduate/postgraduate degree (33.5%). Regarding marital status, 36% reported to be married and 48% were unmarried.

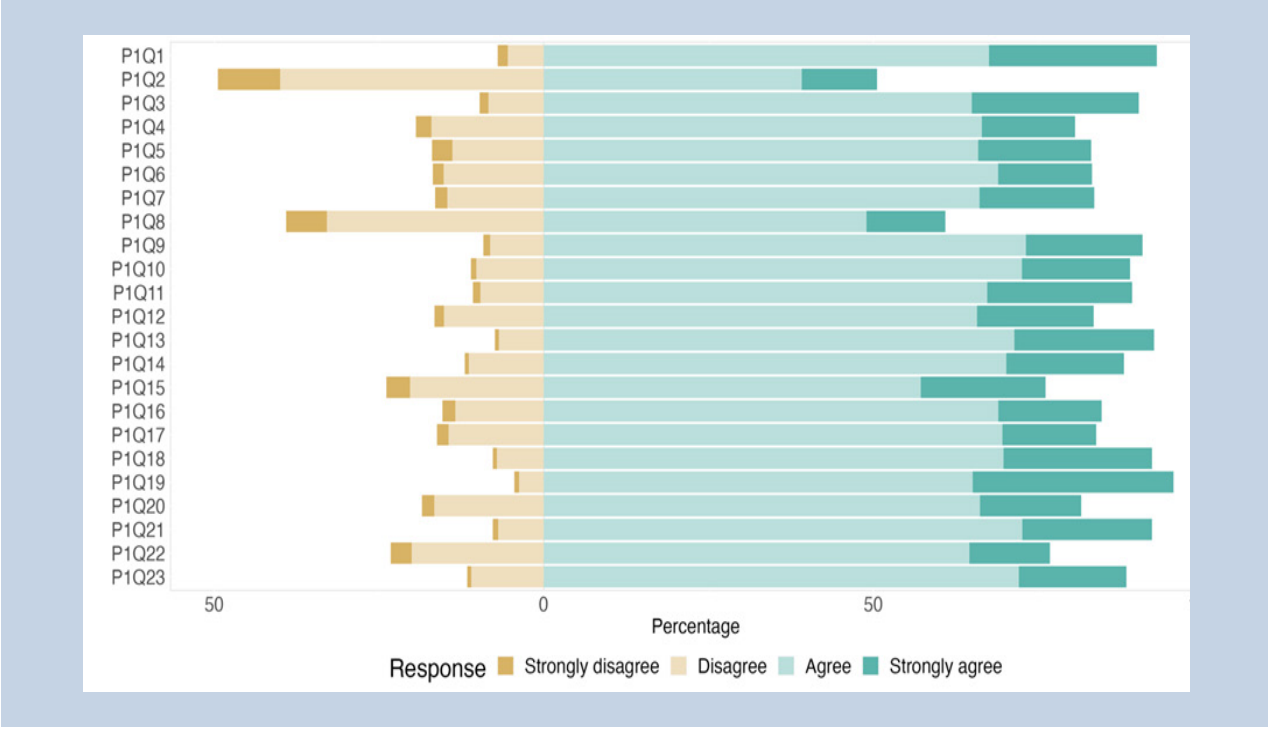

Figure 1. HLQ Part 1 descriptive statistics

The scores for the five scales of Part 1 of the HLQ were calculated from the 23 HL questions. For each scale, an average score across all the questions was calculated to demonstrate a domain of HL. In this study participants mostly agreed with the statements demonstrating average to higher levels of HL. *Scale 1* focuses on feeling understood and supported by healthcare providers. Participants scored the lowest on this scale (*M = 2.75; SD = 0.57*). *Scale 2* is about having adequate information to manage health conditions. In this study, participants showed above average levels of HL mostly agreeing with the statements (*M = 3.08; SD = 0.45*). *Scale 3* is about actively managing one's health. Participants mostly demonstrated high levels of HL on this scale (*M = 3.08; SD = 0.45*). *Scale 4* focuses on social support and health. Participants mostly reported high levels of HL on this scale (*M = 3.08; SD = 0.47*). *Scale 5* concerns the appraisal of health information. Participants in this study demonstrated above average but lower HL scores (*M = 2.97; SD = 0.47*) in this domain. Figure 1 presents an overview of the data for part 1 of the HLQ. The graph shows the participants' responses for each item of part one of the HLQ. Participants mostly agreed with the statements suggesting high levels of HL.

The scores for Part 2 of the HLQ were calculated from the 21 HL questions. An average score across all the items was calculated. Participants mostly noted that they usually find it easy to perform the tasks detailed in the statements. *Scale 6* concerns active management with healthcare providers. In this study participants demonstrated high levels of HL (*M = 4.05; SD = 0.59*). *Scale 7* focuses on the ability to navigate the healthcare system. Participants showed relatively high levels of HL in this domain (*M = 3.96; SD = 0.59*). *Scale 8* concerns the ability to find health information. Participants scored high on this scale demonstrating good HL skills (*M = 4.01; SD = 0.53*). *Scale 9* explores the ability to understand health information to apply it. The participants scored the highest in this domain of HL (*M = 4.13; SD = 0.50*). Overall, the scales with the highest scores are scales 6, active engagement with health care providers, scale 8 the ability to find good health information, and scale 9 understanding health information well enough to know what to do. Figure 2 presents an overview of the results. The graph details the responses for each item of part 2 of the HLQ demonstrating that most participants found it 'usually easy' to perform the tasks.

Several health outcomes were measured including blood pressure readings, body mass index and waist and hip measurements. Table 2 presents an overview of the descriptive information on the health outcomes.

REGRESSION ANALYSIS

A one-point increase in scale 3, actively managing health (AMH), reduces the systolic reading by 3.53. For systolic reading R^2 = 0.017, adjusted R^2 = 0.008; $F_{(9,958)}$ = 1.87,

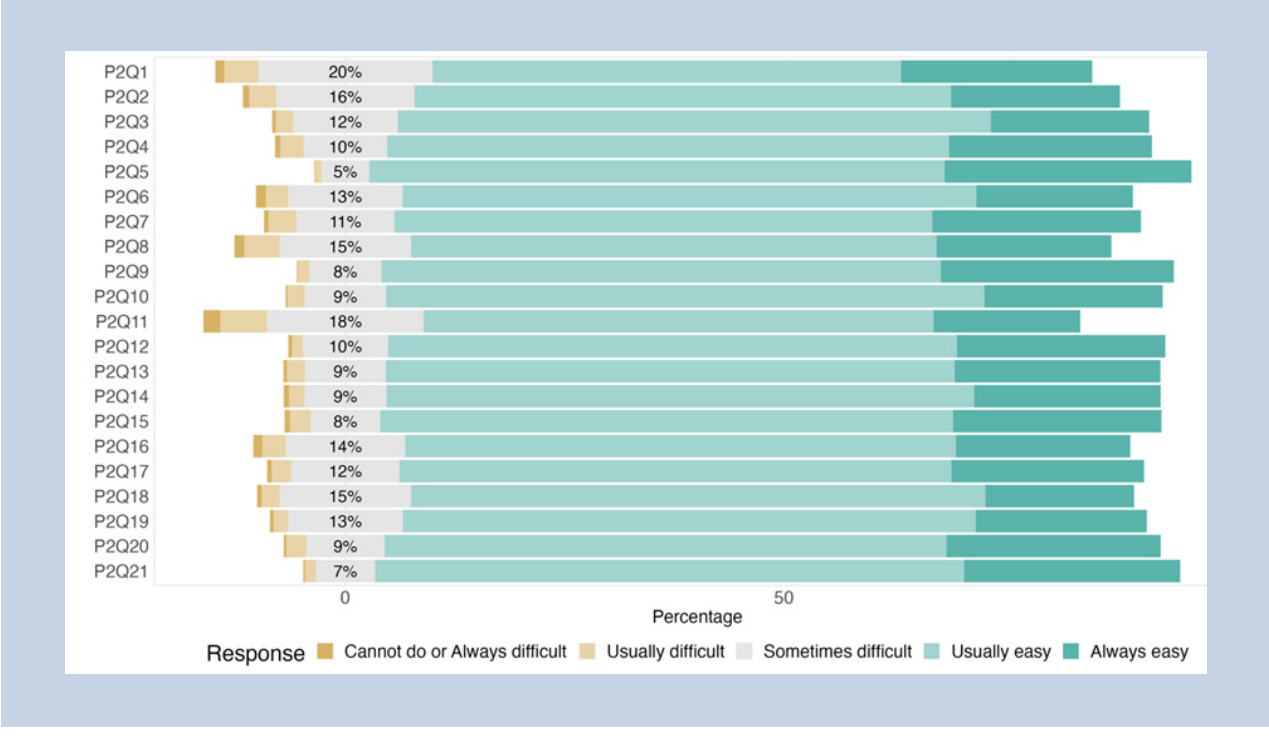

Figure 2. HLQ Part 2 descriptive statistics

Table 2. Health outcomes descriptives

N	Minimum	Maximum	Mean	Std. deviation	Skewness	Kurtosis	Normality[a]	
Systolic reading	976	95.00	200.00	127.96	13.32	0.75	2.34	**
Diastolic reading	976	36.00	122.00	79.08	11.49	0.01	0.77	**
Body mass index	976	17.20	52.60	27.80	5.51	1.03	1.75	**
Waist [cm]	977	58.00	172.00	90.73	13.44	0.77	1.44	**
HIP [cm]	977	20.00	172.00	107.82	11.81	0.41	7.01	**

[a]Significance for the normality tests for both Kolmogorov-Smirnov and Shapiro-Wilk: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

$p = 0.052$. This means that only 1.7% of systolic reading was explained by the independent variable. The model was not statistically significant. Diastolic reading is predicted by at least three subscale scores. A one-point increase in scale 1, feeling understood and supported by healthcare providers, increases diastolic reading by 2.43 whilst a one-point increase in scale 3, AMH decreases diastolic reading by 4.32. An increase in scale 1 should ideally reflect a decrease in diastolic readings, like the observation with scale 3. The authors reason that although SAN members feel supported and knowledgeable about communicating with healthcare professionals, this may not translate to improved healthcare management. SAN members may thus show adequate levels of HL in this domain but that does not necessarily translate to behavioural outcomes. A one-point increase in scale 8, the ability to find good health information (FHI) also showed an increase in diastolic reading by 3.48. Similar to the above, this domain of HL may not translate to behavioural outcomes. Note that the intercept represents the average Diastolic reading should the scores on the IVs be 0. For diastolic reading $R^2 = 0.04$, the adjusted $R^2 = 0.03$; $F_{(9,958)} = 4.38$, $p < 0.001$. This means that only 4% of diastolic reading was explained by the independent variable, although the model was statistically significant.

Scale 3, AMH, predicts BMI significantly. BMI is decreased by 3.06 with a one-point increase in actively managing health. However, an increase in scale 4, social support (SS) and scale 8, FHI, increases BMI. One would expect higher scores on the HLQ — i.e., positive ratings — to be associated with better health outcomes. The negative

Table 3. Diagnosed with Diabetes (Yes/No): t-test for HLQ subscales

	N		Mean		Std. deviation		p	
	No	Yes	No	Yes	No	Yes		
Healthcare provider support	923	32	2.74	2.93	0.57	0.47	0.03	*
Having sufficient information	923	32	3.07	3.12	0.45	0.41	0.56	
Actively managing health	922	32	3.08	3.01	0.45	0.42	0.39	
Social support	923	32	3.07	3.09	0.47	0.45	0.76	
Critical appraisal	922	32	2.96	3.01	0.47	0.43	0.56	
Active engagement with healthcare providers	925	32	4.04	4.15	0.59	0.48	0.31	
Navigating the healthcare system	925	32	3.95	4.10	0.59	0.49	0.14	
Ability to find good health information	925	32	4.00	4.13	0.52	0.45	0.20	
Reading and understanding health information	924	32	4.12	4.16	0.49	0.49	0.72	

Table 4. Diagnosed with Hypertension (Yes/No): t-test for HLQ subscales

	N		Mean		Std. deviation		p	
	No	Yes	No	Yes	No	Yes		
Healthcare provider support	893	79	2.74	2.91	0.57	0.58	0.01	*
Having sufficient information	893	79	3.07	3.10	0.45	0.47	0.65	
Actively managing health	892	79	3.09	3.01	0.45	0.49	0.14	
Social support	893	79	3.07	3.13	0.47	0.46	0.28	
Critical appraisal	892	79	2.96	3.03	0.48	0.41	0.24	
Active engagement with healthcare providers	895	79	4.05	4.09	0.58	0.67	0.60	
Navigating the healthcare system	895	79	3.95	4.02	0.58	0.65	0.31	
Ability to find good health information	895	79	4.01	4.10	0.52	0.57	0.15	
Reading and understanding health information	894	79	4.13	4.17	0.49	0.56	0.43	

association of the two variables (SS and FHI) with better BMI must be further explored. For Body mass index $R^2 = 0.04$, the adjusted $R^2 = 0.03$, $F_{(9,958)} = 4.48$, $p < 0.001$. The findings suggest that only 3% of BMI reading was explained by the independent variable, and the model was statistically significant.

Scale 3, AMH, plays a role in decreasing waist measurement by 9.4 cm. The following subscales have a negative effect on waist measurement: Scale 1, health care provider support, scale 4, SS, scale 5, critical appraisal and, scale 8 FHI. For Waist measurement $R^2 = 0.06$, the adjusted $R^2 = 0.05$, $F_{(9,959)} = 7.12$, $p < 0.001$. Hip measurement is negatively associated with scale 3, AMH. Thus, a high score on scale 3 is associated with a decreased hip measurement. For Hip measurements $R^2 = 0.02$, the adjusted $R^2 = 0.02$, $F_{(9,959)} = 2.60$, $p = 0.006$. The results show that only 5% of waist measurements and 2% of hip measurements were explained by the independent variable. The models were statistically significant.

Information on a hypertension and/or diabetes mellitus diagnosis was also requested. This information is presented in Table 3 (diabetes) and Table 4 (hypertension) in relation to the HLQ data.

The findings showed that scale 1, feeling understood and supported by healthcare providers, is significantly associated with a diagnosis of diabetes. Those that do have diabetes (n = 32), have a significantly higher score ($p < 0.05$) for feeling understood and supported. Similarly, the hypertension group scored significantly ($p > 0.05$) higher than the no-hypertension group on scale 1. No other subscales showed significant differences for having/not having diabetes or hypertension.

In summary scale 3, actively managing health, correlates prominently with all the physiological variables. An increase

in scores, thus suggests acknowledging more responsibility for one's health and recognising the value of proactive healthcare and decision-making. Active management thus translates to healthy indicators: smaller hip size, smaller waist, lower blood pressure and lower BMI.

DISCUSSION

This study explored HL amongst a SAN sample and its potential link to health-related outcomes. Understanding the factors that mediate or impact health behaviours can allow early intervention strategies to avert future health complications. Being health literate means that people can find, process, and understand health-related content to manage their health. Low HL is associated with poor health outcomes, higher prevalence of chronic conditions [19] and increased mortality [44]. HL essentially contributes to better health outcomes as people accept responsibility for managing their health [25, 37] while limited HL limits autonomous health management [12, 14]. Saeed et al. [9] explained that "...low health literacy ...[is] a stronger predictor of a person's health, than age, education, socio-economic status and employment status affecting health care and disease management outcomes" (p.9). In this study participants generally demonstrated above average levels of HL on most subscales. The active management subscale significantly predicted several health outcomes.

Mayberry et al. [44] supports the value of active management and routine selfcare following a chronic health diagnosis like cardiovascular disease and diabetes [45]. People scoring high on the active management scale take responsibility for their health and are empowered to take care of themselves. SAN members in this study demonstrated high levels of HL on this scale that significantly predicted several health outcomes. This means that participants invest time and resources in managing their health and set personal goals for optimising their health. Actively managing health significantly reduced systolic blood pressure readings. Systolic readings present the pressure in the arteries when the heart beats and is important for identifying risks of heart disease in people older than 50 [46]. Diastolic readings were also significantly predicted by the active management scale. The findings show that a one-point increase on the active management scale significantly decreases diastolic readings. Mayberry et al. [44] found that patients hospitalised for either decompensated heart failure or acute coronary syndrome presented with low HL and linked lower HL to reduced health, more health-compromising behaviours and limited social support. The average systolic reading for the SAN was 127.96 while the average diastolic reading was below 80 mg suggesting that the sample is relatively healthy in this regard and appear to manage their blood pressure adequately. Actively managing health also significantly predicted decreases in BMI, hip, and waist measurement.

Mayberry et al. [44] reported that insufficient HL and health outcomes are mediated by practising better health habits. Poor health outcomes among those with limited HL is thus partially explained by failing to practice health behaviours [19]. In this context, SAN members seem capable of accessing, understanding, and applying health information to actively manage their health. Given the primary healthcare strategies and support of the SAN, participants seem to have an established relationship with healthcare providers that offer advice and improve their understanding of health-related information. Having a good support system is also valuable in managing health conditions [47, 48] because people have access to resources to help manage their health.

In this study, the ability to actively engage with healthcare providers, navigating the healthcare system, knowing how to find health information and the ability to understand and apply health information and instructions was identified as the highest HL domains. SAN members thus noted that they found it easy to perform health-related tasks like completing medical forms, accessing health information from diverse sources, and knowing where to seek help and who to consult. SAN members thus demonstrated the ability to engage with healthcare providers and actively reflect on the interactions supporting their ability to understand and apply health-related information. It is possible that these findings reflect the comprehensive health surveillance systems and cultures of health promotion typical of many navies. The SAN, through the SAMHS, employ a force health protection strategy which ties combat readiness and mission success to the health and wellbeing of personnel [49]. Thus, beyond the compulsory health evaluations which take place annually for each sailor or during pre-deployment mobilisation, there exist opportunities for frequent health interactions with military healthcare professionals, mandatory health education for military personnel, responsive referral pathways from primary healthcare service points to specialist consultations, and a focus on preventive care and health promotion through a healthy diet and active lifestyle which are encouraged and promoted in the SAN. All these factors collectively enhance the HL of sailors in the SAN, and it is therefore unsurprising that the levels of HL found in the present study mirror those of other active-duty military forces [7, 20].

The ability to appraise and critically reflect on information to assess its meaning corresponds with finding and comparing information from reliable sources. Macberry et al. [44] explained that people must understand their treatment and instructions to implement effective self-management practices. The SAN members demonstrated

lower levels on this domain of HL compared to other domains. The scores still reflect adequate skills in assessing the value and credibility of health information, but there is room for improvement. Similarly, SAN members scored the lowest in the domain of feeling understood and supported by healthcare providers. This an important part of healthcare as it defines patient-provider interactions [48, 50]. Lower levels of HL in this sense may compromise patient-provider communication, limiting proactive health behaviours [12, 51]. Due to the nature of the yearly health assessments, SAN members consult different healthcare professionals. They may thus find it difficult to build a relationship of trust or to confide in someone who personally knows them. Although participants have access to medical care, the personal connection with healthcare professionals seem restricted.

LIMITATIONS AND FUTURE DIRECTIONS

The study explored the relation and predictive value of HL and several health outcomes. The findings can thus not be used to make causal inferences and it is recommended that future research explore the causal link between HL and health outcomes. In addition, the findings of this study may be limited in generalizability to the entire SAN. The sample was drawn from personnel stationed with the SAN Fleet, which has immediate proximity and accessibility to the specialist maritime health support unit that served as the site of data collection. It cannot be assumed that SAN personnel staffed at other naval bases around the country will experience the same ease of access to health support services, information, or surveillance as this sample. The endorsement of HL amongst SAN members may also not be representative of the broader SANDF. Although the South African Army, Air Force, and Navy are all served by the SAMHS, there exist qualitative differences in the organisational and operational (sub)cultures of the fighting arms of service and their social (and gendered) constructions of toughness and help-seeking which could inform different attitudes towards health-seeking [6]. A future direction could be to examine HL in the other arms of service. This would enable more representative conclusions to be drawn about HL within the broader South African military population and permit cross-comparisons between arms of service to address service-specific HL differences and needs.

CONCLUSIONS

In conclusion, the study explored the predictive nature of HL in relation to several health outcomes. The findings support the value of SAN members' high levels of HL, especially in actively taking responsibility to manage their health. Ventura and Piña [52] reported that varied factors mediate HL and resulting poor health outcomes, but the causal nature of this link is yet to be fully explored. The current study provides valuable insights into the HL of SAN members but the nature of how HL impacts health behaviours are mediated by both personal factors and those that relate to healthcare support services. More research is thus needed to further explore the relations identified in this study. The results from the present study suggest that the long-term nature and employment stability of members of the SAN facilitates more consistent access to comprehensive and sustained health education and promotion initiatives, leading to improved HL for SAN personnel, compared to seafarers in the merchant fleet.

ARTICLE INFORMATION AND DECLARATIONS

Data availability statement: The data is available on request.

Ethics statement: Ethical approval was received from the ethics committees of the Faculty of Humanities and Health Sciences (Reference: HUM048/1022). Participation was voluntary and participants gave their informed consent to participate.

Author contributions: Authors SNM, JHM and CHVW contributed to the design and implementation of the research, the interpretation of the results and to the writing of the manuscript. SNM performed the analysis in collaboration with a statistician.

Funding: A Research Development Grant (RDP) for early career academics funded this project.

Acknowledgments: A licence to administer the HLQ was obtained from Swinburne University of Technology. The authors thank the IMM staff who assisted with the data collection, the participants for their contributions and Professor David Maree for the statistical analysis of the results.

Conflict of interest: The authors have no conflict of interest related to the submitted manuscript.

Supplementary material: None

REFERENCES

1. Bennett C, Söderlund AG. South Africa's navy: A navy of the people and for the people. South African Navy, 2008.
2. South African Military Health Service. South African Military Health Service: Conventional doctrine. South African Military Health Service, 2008.
3. Martin J, Van Wijk C, Hans-Arendse C, et al. "Missing in action": the significance of bodies in African bereavement rituals. Psychology in Society. 2013; 44: 42–63.
4. Van Wijk CH. Dispositional resilience predicts psychological adaptation of seafarers during and after maritime operations. Int Marit Health. 2023; 74(1): 45–53, doi: 10.5603/IMH.2023.0005, indexed in Pubmed: 36974492.
5. Wijk CV, Martin J. A brief sailor resiliency scale for the South African Navy. African Journal of Psychological Assessment. 2019; 1, doi: 10.4102/ajopa.v1i0.12.

6. Wijk CV, Martin J. Promoting psychological adaptation among navy sailors. Scientia Militaria. 2021; 49(1), doi: 10.5787/49-1-1260.
7. Weld KK, Padden D, Ricciardi R, et al. Health literacy rates in a sample of active duty military personnel. Mil Med. 2009; 174(11): 1137–1143, doi: 10.7205/milmed-d-02-4308, indexed in Pubmed: 19960819.
8. Osborne R, Cheng C, Nolte S, et al. Health literacy measurement: embracing diversity in a strengths-based approach to promote health and equity, and avoid epistemic injustice. BMJ Global Health. 2022; 7(9): e009623, doi: 10.1136/bmjgh-2022-009623.
9. Saeed H, Saleem Z, Naeem R, et al. Impact of health literacy on diabetes outcomes: a cross-sectional study from Lahore, Pakistan. Public Health. 2018; 156: 8–14, doi: 10.1016/j.puhe.2017.12.005, indexed in Pubmed: 29353668.
10. Barsell D, Everhart R, Miadich S, et al. Examining health behaviors, health literacy, and self-efficacy in college students with chronic conditions. American Journal of Health Education. 2018; 49(5): 305–311, doi: 10.1080/19325037.2018.1486758.
11. Rababah JA, Al-Hammouri MM, Drew BL, et al. Health literacy: exploring disparities among college students. BMC Public Health. 2019; 19(1): 1401, doi: 10.1186/s12889-019-7781-2, indexed in Pubmed: 31664973.
12. Rueda-Medina B, Gómez-Urquiza JL, Tapia-Haro R, et al. Assessing health science students' health literacy and its association with health behaviours. Health Soc Care Community. 2020; 28(6): 2134–2139, doi: 10.1111/hsc.13024, indexed in Pubmed: 32462713.
13. Zareipour M, Sadaghianifar A, Moradi Z et al. Health literacy and its relationship with self-efficacy in health ambassadors. Journal of Health Literacy. Winter, 4(4), 56-63, doi: 10.22038/jhl.2020.44789.1090.
14. Kickbusch I, Pelikan JM, Apfel F, Tsouros AD (Eds.). (2013). Health literacy: The solid facts. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://apps.who.int/iris/bitstream/handle/10665/128703/e96854.pdf.
15. Klinker CD, Aaby A, Ringgaard LW, et al. Health literacy is associated with health behaviors in students from vocational education and training schools: a Danish population-based survey. Int J Environ Res Public Health. 2020; 17(2), doi: 10.3390/ijerph17020671, indexed in Pubmed: 31968667.
16. Paasche-Orlow M, Wolf M. The causal pathways linking health literacy to health outcomes. Am J Health Behav. 2007; 31(1): 19–26, doi: 10.5993/ajhb.31.s1.4.
17. Guntzviller LM, King AJ, Jensen JD, et al. Self-efficacy, health literacy, and nutrition and exercise behaviors in a low-income, hispanic population. J Immigr Minor Health. 2017; 19(2): 489–493, doi: 10.1007/s10903-016-0384-4, indexed in Pubmed: 26979167.
18. Janse van Rensburg Z. Levels of health literacy and English comprehension in patients presenting to South African primary healthcare facilities. Afr J Prim Health Care Fam Med. 2020; 12(1): e1–e6, doi: 10.4102/phcfm.v12i1.2047, indexed in Pubmed: 32129648.
19. McAnally K, Hagger MS. Health literacy, social cognition constructs, and health behaviors and outcomes: A meta-analysis. Health Psychol. 2023; 42(4): 213–234, doi: 10.1037/hea0001266, indexed in Pubmed: 37023324.
20. Portela-Pino I, Hernaiz-Sanchez A, Lomba-Portela L. Evaluation of health literacy and its predictive formative factors among Spanish military personnel. Mil Psychol. 2023 [Epub ahead of print]: 1–8, doi: 10.1080/08995605.2023.2274755, indexed in Pubmed: 37921646.
21. Morrison DA, Riley CA, Tolisano AM. Assessing the impact of military service on patient health literacy in an otolaryngology clinic. Mil Med. 2023; 188(1-2): e333–e338, doi: 10.1093/milmed/usab260, indexed in Pubmed: 34190320.
22. Williston SK, Vogt DS. Mental health literacy in veterans: What do U.S. military veterans know about PTSD and its treatment? Psychol Serv. 2022; 19(2): 327–334, doi: 10.1037/ser0000501, indexed in Pubmed: 33734727.
23. Rong H, Cheng X, Garcia JM, et al. Survey of health literacy level and related influencing factors in military college students in Chongqing, China: A cross-sectional analysis. PLoS One. 2017; 12(5): e0177776, doi: 10.1371/journal.pone.0177776, indexed in Pubmed: 28545133.
24. Isazadeh M, Asadi Z, Badiani E, et al. Electronic health literacy level in nurses working at selected military hospitals in Tehran in 2019. Annals of Military and Health Sciences Research. 2020; 17(4), doi: 10.5812/amh.99377.
25. Rong H, Lu Lu, Wang L, et al. Investigation of health literacy status and related influencing factors in military health providers of Chinese People's liberation Army, a cross-sectional study. BMC Public Health. 2023; 23(1): 4, doi: 10.1186/s12889-022-14958-0, indexed in Pubmed: 36593451.
26. Thomas J, Adrian A, Penix E, et al. Mental health literacy in U.S. soldiers: knowledge of services and processes in the utilization of military mental health care. Military Behavioral Health. 2016; 4(2): 92–99, doi: 10.1080/21635781.2016.1153541.
27. Portela-Pino I, Sal-de-Rellán A, Lomba-Portela L. Teamwork competencies and their influence on health literacy and other health variables. Health Educ Behav. 2024; 51(4): 592–600, doi: 10.1177/10901981231207079, indexed in Pubmed: 37920103.
28. Gravetter FJ, Forzano LAB. Research methods for the behavioral sciences (6th ed.). MA: Cengage, Boston 2018.
29. Siedlecki SL. Understanding descriptive research designs and methods. Clin Nurse Spec. 2020; 34(1): 8–12, doi: 10.1097/NUR.0000000000000493, indexed in Pubmed: 31789957.
30. Osborne RH, Batterham RW, Elsworth GR, et al. The grounded psychometric development and initial validation of the Health Literacy Questionnaire (HLQ). BMC Public Health. 2013; 13: 658, doi: 10.1186/1471-2458-13-658, indexed in Pubmed: 23855504.
31. Osborne RH, Batterham RW, Elsworth GR, et al. Psychometric properties of the Health Literacy Questionnaire (HLQ) among older adults who present to the emergency department after a fall: A Rasch analysis. BMC Health Services Research 2014; 14(1): 475.
32. Anwar WA, Mostafa NS, Hakim SA, et al. Health literacy strengths and limitations among rural fishing communities in Egypt using the Health Literacy Questionnaire (HLQ). PLoS One. 2020; 15(7): e0235550, doi: 10.1371/journal.pone.0235550, indexed in Pubmed: 32673345.
33. Evans AY, Anthony E, Gabriel G. Comprehensive health literacy among undergraduates: a ghanaian university-based cross-sectional study. Health Lit Res Pract. 2019; 3(4): e227–e237, doi: 10.3928/24748307-20190903-01, indexed in Pubmed: 31637363.
34. Leslie CJ, Hawkins M, Smith DL. Using the Health Literacy Questionnaire (HLQ) with Providers in the Early Intervention Setting: A Qualitative Validity Testing Study. Int J Environ Res Public Health. 2020; 17(7), doi: 10.3390/ijerph17072603, indexed in Pubmed: 32290295.
35. Mather C, Douglas T, Jacques A. Health literacy of undergraduate health profession students in Australia: A comparison of the island state of Tasmania and other Australian universities. Kontakt. 2018; 20(4): e386–e393, doi: 10.1016/j.kontakt.2018.08.008.

36. Morris RL, Soh SE, Hill KD, et al. Measurement properties of the Health Literacy Questionnaire (HLQ) among older adults who present to the emergency department after a fall: a Rasch analysis. BMC Health Serv Res. 2017; 17(1): 605, doi: 10.1186/s12913-017-2520-9, indexed in Pubmed: 28851344.
37. Štefková G, Čepová E, Kolarčik P, et al. The level of health literacy of students at medical faculties. Kontakt. 2018; 20(4): e363–e369, doi: 10.1016/j.kontakt.2018.10.011.
38. Sarhan MBA, Fuji Y, Kiriya J et al. (2020). OUP accepted manuscript. Health Promotion International., doi: 10.1093/heapro/daaa089.
39. Venter, C.C. (2023). Health literacy amongst a student population: A comparative study [Master's thesis, University of Pretoria]. UP-Space. https://repository.up.ac.za/handle/2263/94673.
40. Boateng MA, Agyei-Baffour P, Angel S, et al. Translation, cultural adaptation and psychometric properties of the Ghanaian language (Akan; Asante Twi) version of the Health Literacy Questionnaire. BMC Health Serv Res. 2020; 20(1): 1064, doi: 10.1186/s12913-020-05932-w, indexed in Pubmed: 33228648.
41. Frost J. (2024). Cronbach's Alpha: Definition, Calculations & Example. https://statisticsbyjim.com/basics/cronbachs-alpha/.
42. Darlington RB, Hayes AF. Regression analysis and linear models: Concepts, applications, and implementation. Guilford Publications2017.
43. Pallant J. (2011). SPSS survival manual: a step by step guide to data analysis using SPSS (6th ed.). http://www.dawsonera.com/abstract/9780335242405.
44. Mayberry L, Schildcrout J, Wallston K, et al. Health literacy and 1-year mortality: mechanisms of association in adults hospitalized for cardiovascular disease. Mayo Clinic Proceedings. 2018; 93(12): 1728–1738, doi: 10.1016/j.mayocp.2018.07.024, indexed in Pubmed: 30414733.
45. Ong-Artborirak P, Seangpraw K, Boonyathee S, et al. Health literacy, self-efficacy, self-care behaviors, and glycemic control among older adults with type 2 diabetes mellitus: a cross-sectional study in Thai communities. BMC Geriatr. 2023; 23(1): 297, doi: 10.1186/s12877-023-04010-0, indexed in Pubmed: 37193967.
46. American Heart Association. (2024). Understanding blood pressure readings. https://www.heart.org/en/health-topics/high-blood-pressure/understanding-blood-pressure-readings.
47. Chen YC, Chang LC, Liu CY, et al. The roles of social support and health literacy in self-management among patients with chronic kidney disease. J Nurs Scholarsh. 2018; 50(3): 265–275, doi: 10.1111/jnu.12377, indexed in Pubmed: 29569423.
48. Taylor SE, Stanton AL (2021). Health Psychology (11th ed.). McGraw Hill.
49. South African Military Health Service. Military health support doctrine: Landward conventional operations. South African Military Health Service, 2012.
50. Centers for Disease Control and Prevention. (2022). Understanding Health Literacy. https://www.cdc.gov/healthliteracy/learn/Understanding.html.
51. Buja A, Rabensteiner A, Sperotto M, et al. Health literacy and physical activity: a systematic review. J Phys Act Health. 2020; 17(12): 1259–1274, doi: 10.1123/jpah.2020-0161, indexed in Pubmed: 33129198.
52. Ventura HO, Piña IL. The impact of mediators of health literacy on clinical outcomes in cardiovascular diseases. Mayo Clin Proc. 2018; 93(12): 1700–1702, doi: 10.1016/j.mayocp.2018.10.016, indexed in Pubmed: 30522589.