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## Short Communication

# Preferences for health information in middle-aged Japanese workers based on health literacy levels: a descriptive study



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## ABSTRACT

**Objectives:** To describe the health information preferences in middle-aged Japanese workers based on health literacy (HL) levels and presence of medications.

**Study design:** A cross-sectional study.

**Methods:** We performed a web-based questionnaire survey with Japanese workers aged below 60 years. HL was assessed using the total score of communicative skills (five items) and critical skills (four items) from the 14-item Health Literacy Scale. Regarding their health information preferences, participants were asked about the health information they wanted (four items), could easily understand (six items), or easily use (two items) and answered on a 4-point scale (strongly agree/agree/disagree/strongly disagree). The percentages of the affirmative responses (strongly agree or agree) were compared among tertiles based on the HL score.

**Results:** We obtained data from a total of 3387 volunteers, of whom 510 participants were on either antihypertensive, lipid-lowering, or antidiabetic drugs. Compared with the high HL and middle HL groups, low HL had fewer affirmative responses to most health information items. Health information items received 70% of affirmative responses even in the low HL level. They were visually shown by figures or pictures, highlighted by colors for important points, could be read in 1–2 min, and were accessed on the Internet, regardless of the presence of medications. Additionally, the explanation for mechanisms of medications or lifestyle to prevent or improve diseases showed high affinity in all HL levels, only for those on medications.

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**Conclusions:** This result generates a hypothesis that low HL individuals have a low interest in health information. Our data showed several possible forms of health information with high affinity based on HL levels that would help plan future population approaches.

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The reduction of non-communicable diseases (NCDs) is a major health concern globally as they are the leading cause of mortality and disability.<sup>1,2</sup> Additionally, NCDs have an enormous impact on the social economy because most NCDs are chronic and increase social costs as the disease progresses. A large percentage of NCDs are preventable through lifestyle modifications that target causes such as smoking, physical inactivity, and unhealthy diet. For these reasons, people in modern society are expected to engage in self-management for primary or secondary prevention of NCDs.

Health information is an important resource to understand the person's own health condition and engage in self-management. Currently, a large amount of health information is available to the general public. Health literacy (HL) is the ability to obtain, process, communicate, and understand basic health information and services needed to make appropriate health decisions.<sup>3</sup> A recent study in Japan demonstrated that HL was associated with health status through access to health information and health behavior.<sup>4</sup> This result suggests that individuals with a high level of HL are willing to engage in health behavior, whereas those with low HL may be left behind. If so, public health practice should consider the affinity of health information for people with low HL to raise the effectiveness of population approaches. However, health information preferences based on HL levels have remained uncertain.

This study, therefore, aimed to describe health information preferences based on the HL levels in middle-aged Japanese workers and provide preliminary data for future population approaches for preventing NCDs.

## Methods

### Study design and participants

This was a cross-sectional descriptive study. Participants, aged below 60 years, were employees of a Japanese company who registered for a web service providing health information. We performed a web-based questionnaire survey using this service. Volunteers were recruited via interoffice email, which included an explanation of the study and survey URL. When the survey was conducted, 8827 workers (approximately 52% of all employees) had registered for the web service.

### Measures and data analysis

HL was assessed using the 14-item Health Literacy Scale (HLS-14).<sup>5</sup> The HLS-14 consists of functional HL (five items), communicative skills (five items), and critical skills (four

items). Functional HL includes basic skills to read health information such as booklets. Communicative HL includes advanced skills to obtain health information and use the same in daily life. Critical HL includes more advanced skills to choose or interpret the information critically. Each item is answered using a 5-category response scale (1 = strongly disagree to 5 = strongly agree). Because the participants were well-educated, the items of functional HL were expected to show a ceiling effect. Therefore, only communicative and critical HL were surveyed, and we obtained the total score of nine items (range: 9–45 points).

Health information preferences were assessed using a total of 12 questions. Participants were asked about the health information they wanted (4 items), could easily understand (6 items), or easily use (2 items) and responded on a 4-point scale (strongly agree/agree/disagree/strongly disagree).

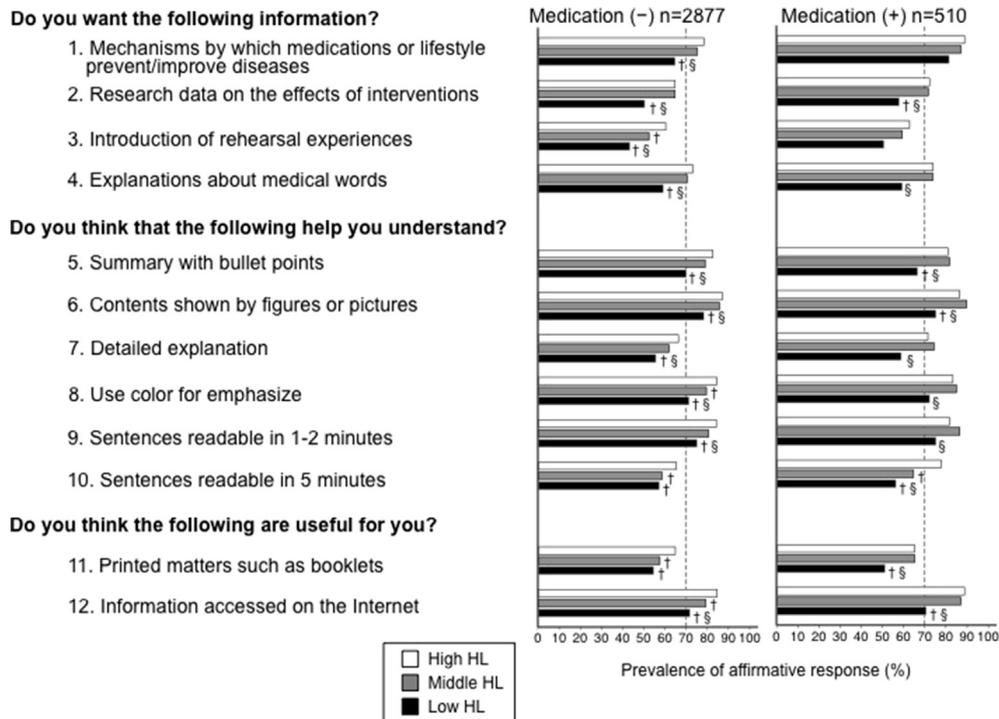
In Japan, medical receipts are collected monthly by health insurance unions. These receipts describe any medical treatment received and its corresponding fee. In this study, the prescription of antihypertensive, lipid-lowering, or antidiabetic drugs—major medications for NCDs among middle-aged Japanese—was ascertained based on these data.

For each health information item, either 'strongly agree' or 'agree' was considered as an affirmative response. The percentages of the affirmative response were compared using the Chi-squared test among tertiles based on the HL score. Bonferroni correction was used for multiple comparisons. We explored the health information items having favorable affinity (defined as  $\geq 70\%$  of affirmative responses, which was considered sufficient for use in educational materials). We divided the analysis based on the presence of medications because resources and priority of health information may differ depending on this factor.

## Results

We obtained responses from a total of 3387 volunteers (response rate: 38.4%; median age [interquartile range {IQR}]: 47 [40–53] years, men: 82.4%, body mass index [BMI]: 22.5 [20.6–24.6] kg/m<sup>2</sup>). In total, 510 participants (17.7%) were on antihypertensive, lipid-lowering, or antidiabetic drugs (age: 53 [49–57] years, men: 87.9%, BMI: 24.1 [22.1–26.6] kg/m<sup>2</sup>). Another 2877 volunteers were not on medication (age: 46 [39–52] years, men: 81.5%, BMI: 22.2 [20.4–24.2] kg/m<sup>2</sup>). Median [IQR] of the HL score was 32 [29–35] points for the entire sample and was not different between those with and without medications (32 [29–34] vs 32 [29–35]).

Results of the health information preferences are summarized in Fig. 1. Compared with the high HL groups, the low



**Fig. 1 – Health information preferences based on HL levels. Prevalence of affirmative response for each question is shown divided by tertiles based on the HL score. High, middle, and low HL groups are shown in white, gray, and black, respectively. HL, health literacy. †:  $P < 0.0167$  for vs high HL. §:  $P < 0.0167$  for vs middle HL.**

HL group had less affirmative responses to most health information items, whereas the middle HL group showed an almost similar prevalence of affirmative responses as the high HL group, especially among participants on medication.

Several health information items received 70% of the affirmative responses even in the low HL level. They were visually shown by figures or pictures, highlighted by colors for important points, could be read in 1–2 min, and were accessed on the Internet, regardless of the use of medications. Moreover, health information that explains the working of medications or lifestyle modification to prevent or cure diseases showed high affinity in all HL levels only for those on medication.

## Discussion

We examined the health information preferences based on HL levels in middle-aged Japanese workers. Our data showed several possible forms of health information with high affinity even in the low HL group. This study provided preliminary data that is expected to support the planning of future population approaches.

Providing health information with high affinity to the person or target population may be key to promoting their health behavior. A previous randomized controlled trial in hypertensive patients demonstrated that those who were given personalized materials based on their HL level and learning preferences showed greater gains in knowledge than the control group.<sup>6</sup> However, such a tailored approach at the

individual level cannot be used for population approaches. To this end, we explored health information items having high affinity even for the low HL groups. Health information that can be visually understood in a short time (possibly 1–2 min) via the Internet had high affinity regardless of HL levels in our participants. These forms of information could be widely applied if the target population includes those with low HL.

Another finding was that only the low HL group showed low affirmative responses to most items compared with the middle and high HL groups. This result generates a hypothesis that low HL individuals may not have an interest in health information even after starting medications. Considering this, to promote health behavior in such groups, the explanation on how medications and lifestyle modifications prevent or cure diseases can be made available. Based on these results, web-based interventions stratified by subjects' backgrounds may contribute to an effective population approach by providing relevant health information to the target population.

This study has several limitations. First, the generalizability of the findings may be limited owing to a selection bias. We included workers who registered for the web service and voluntarily participated in this study. Additionally, most participants were men of around 50 years of age, and further studies including more women and younger individuals are needed. Second, we did not assess sociodemographic variables such as academic or economic backgrounds that may confound our findings. Third, the HLS-14 excluding functional HL items has a possibility to result in a misclassification of HL levels because it was not re-validated. For instance, because of differences in eyesight, well-educated people may have different

responses to the size of the print of the instructions or leaflets from hospitals or pharmacy; therefore, they may need someone to help them. Additionally, the omission of functional HL may cause the difficulty in comparing future studies, although HL score consisting of communicative and critical HL has been reported to be associated with healthy lifestyle.<sup>7,8</sup> Finally, the causal relationship between the high affinity health information and health behaviors needs to be studied.

In conclusion, this study described the health information preferences in middle-aged Japanese workers and proposed possible forms of health information with high affinity based on HL levels. The findings of this study will serve as preliminary data for planning effective public health practices.

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## Author statements

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### Ethical approval

The study protocol was approved by the Ethics Committee of Nagoya University School of Health Sciences (approval number: 15–517). Consent to participate in the study was obtained along with the answers to the questionnaire from each volunteer.

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None declared.

### Competing interests

None declared.

## REFERENCES

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1. Murray CJ, Vos T, Lozano R, Naghavi M, Flaxman AD, Michaud C, et al. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 2012;**380**(9859):2197–223. [https://doi.org/10.1016/S0140-6736\(12\)61689-4](https://doi.org/10.1016/S0140-6736(12)61689-4).
2. Lim SS, Vos T, Flaxman AD, Danaei G, Shibuya K, Adair-Rohani H, et al. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 2012;**380**(9859):2224–60. [https://doi.org/10.1016/S0140-6736\(12\)61766-8](https://doi.org/10.1016/S0140-6736(12)61766-8).
3. Sørensen K, Van den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, et al. Health literacy and public health: a systematic review and integration of definitions and models. *BMC Public Health* 2012;**12**(1):80. <https://doi.org/10.1186/1471-2458-12-80>.
4. Suka M, Odajima T, Okamoto M, Sumitani M, Igarashi A, Ishikawa H, et al. Relationship between health literacy, health information access, health behavior, and health status in Japanese people. *Patient Educ Counsel* 2015;**98**(5):660–8. <https://doi.org/10.1016/j.pec.2015.02.013>.
5. Suka M, Odajima T, Kasai M, Igarashi A, Ishikawa H, Kusama M, et al. The 14-item health literacy scale for Japanese adults (HLS-14). *Environ Health Prev Med* 2013;**18**(5):407–15. <https://doi.org/10.1007/s12199-013-0340-z>.
6. Giuse NB, Koonce TY, Storrow AB, Kusnoor SV, Ye F. Using health literacy and learning style preferences to optimize the delivery of health information. *J Health Commun* 2012;**17**(Suppl. 3):122–40. <https://doi.org/10.1080/10810730.2012.712610>.
7. Ishikawa H, Nomura K, Sato M, Yano E. Developing a measure of communicative and critical health literacy: a pilot study of Japanese office workers. *Health Promot Int* 2008;**23**(3):269–74. <https://doi.org/10.1093/heapro/dan017>.
8. Yokokawa H, Fukuda H, Yuasa M, Sanada H, Hisaoka T, Naito T. Association between health literacy and metabolic syndrome or healthy lifestyle characteristics among community-dwelling Japanese people. *Diabetol Metab Syndrome* 2016;**8**(1):1–9. <https://doi.org/10.1186/s13098-016-0142-8>.