Developing a measure of communicative and critical health literacy: a pilot study of Japanese office workers

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SUMMARY

With the increase in media reports and rapid diffusion of the Internet, the skills in finding and utilizing health information (health literacy; HL) are becoming important in maintaining and promoting health. This study aimed to examine the psychometric properties of a brief measure to assess major components of communicative and critical HL among Japanese office workers, in order to consider its applicability to health promotion at workplace. The participants were 190 male office workers at a Japanese company. A self-administered questionnaire was distributed at the annual health checkup, in which HL, health-related behaviors and coping with job stress were asked. Also, the number of somatic symptoms reported by the worker was counted out of the eight symptoms in the health checkup questionnaire. The higher HL group was more likely to have regular eating patterns and exercise weekly, and tended to be a never smoker. In coping with job stress, those with higher HL were more likely to actively solve the problems or seek support from others, whereas those with lower HL were more likely to be resigned to the situation. Further, lower HL group reported significantly greater number of somatic symptoms than higher HL group. These findings were generally as hypothesized, supporting the validity of the HL scale among office workers. Further research on HL is needed to explore the extent and impact of HL on health outcomes.

Key words: health-related behaviors; health literacy; somatic symptoms; stress coping

INTRODUCTION

Health information is an important resource for people to understand and engage in the management of their health conditions. With the increase in media reports and rapid diffusion of the Internet, the number of health information sources that are easily accessible by the general public, but of which the quality may not be assured, has increased (Napoli, 2001; Passalacqua *et al*., 2004; Hesse *et al*., 2005; Rutten *et al*., 2005). Thus, individual's skills in finding and applying information about health

issues may have a substantial impact on their future well-being (Gray *et al*., 2005).

Recently, such skills have been conceptualized as health literacy (HL). According to the World Health Organization, HL is 'the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health' (Nutbeam, 1998). On the basis of this definition, Nutbeam (Nutbeam, 2000) proposed a model of HL that includes three levels and assumes both *individual* and *population* benefits at each level: (i)

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functional/basic literacy as sufficient basic skills in reading and writing to be able to function effectively in everyday situations, broadly compatible with the narrow definition of HL; (ii) communicative/interactive literacy as more advanced skills to participate in everyday activities actively, to extract information and derive meaning from different forms of communication and to apply new information to changing circumstances; and (iii) critical literacy as more advanced skills to analyze information critically and use this information to exert greater control over life events and situations.

Over the past decade, problems with limited functional HL have been frequently explored in the US population (Nielsen-Bohlman *et al.*, 2004), whereas there have been fewer studies outside the USA. In addition, most existing measures of HL have been designed to measure HL at the level of functional HL, focusing predominantly on the skills to read written materials, such as the Rapid Estimate of Adult Literacy (REALM) (Davis *et al.*, 1993), the Test of Functional Health Literacy in Adults (TOFHLA) (Parker *et al.*, 1995) and their abbreviated versions; REALM-R (Bass *et al.*, 2003) and S-TOFHLA (Baker *et al.*, 1999). Few attempts have been made to examine other components of HL, such as the ability of extracting and critically analyzing the information and using it to make decisions, which should be a part of the communicative and critical HL.

It is considered that individuals with adequate HL are likely to adopt healthy behaviors and have improved health. Indeed, limited functional HL is acknowledged to have negative impacts on various health-related behaviors and health outcomes, including less knowledge of disease management and health-promoting behaviors, poorer health status, less use of preventive services and a higher rate of hospitalization and emergency services use [for systematic reviews: (Dewalt *et al.*, 2004; Nielsen-Bohlman *et al.*, 2004)]. Thus, it is plausible that lower communicative and critical HL is related to less optimal health-related behaviors and health as well.

This study aimed to examine the psychometric properties of a brief measure to assess major components of communicative and critical HL among Japanese office workers, in order to consider its applicability to health promotion at workplace.

METHODS

Participants

The participants of this study were office workers at a Japanese company. A self-administered questionnaire was distributed to all employees ($N = 414$) at the annual health checkup, and 229 agreed to participate in this study (response rate 55.3%). Of those, female workers ($N = 39$) were excluded because the sample was not large enough to allow stratified analyses by gender. Consequently, 190 male workers were analyzed in this study.

This study was approved by the Occupational Safety and Health Committee, which comprised representatives from the company managers and workers. The content of the study was explained to the candidate participants, with written information on the study protocol, and only those who provided written consent were included in the study.

Measures

Communicative and critical HL

The scale items were constructed to directly reflect the WHO definitions of communicative and critical HL as cited in the Introduction. On the basis of our previous study of measuring HL among diabetes patients (Ishikawa *et al.*, in press), three items for communicative HL (items i–iii) and two items for critical HL (items iv–v) were prepared. These items asked whether the participant would be able to (i) collect health-related information from various sources, (ii) extract the information he wanted, (iii) understand and communicate the obtained information, (iv) consider the credibility of the information and (v) make decisions based on the information, specifically in the context of health-related issues. Each item was rated on a 5-point scale, ranging from 1, 'strongly disagree', to 5, 'strongly agree', that he has the ability.

Health-related behaviors

Participant's lifestyle was asked in terms of five health-related behaviors that have been identified as important lifestyles to be improved in the national health promotion initiative, 'Health Japan 21' (Health and Welfare Statistics Association & S, 2006); *diet* (have regular eating patterns versus sometimes/rarely), *exercise* (exercise on a weekly basis or more versus

on a monthly basis/rarely), *sleep* (always have quality sleep versus sometimes/rarely), *smoking* (smoker/ex-smoker versus never smoker) and *drinking* (drink almost everyday versus sometimes/rarely).

Coping

Coping with job stress was measured by a coping scale, which had been developed as a part of the Job Stress Scale, Japanese version (Kosugi, 2000). The scale consist of five subscales representing different coping strategies; active problem-solving (nine items, $\alpha = 0.88$), escape (seven items, $\alpha = 0.63$), support seeking (five items, $\alpha = 0.79$), reconciliation (five items, $\alpha = 0.75$) and emotional suppression (five items, $\alpha = 0.54$). Participants were asked to rate the extent to which they had used particular strategies described by the items of the scale on a 4-point scale, ranging from 1, 'not used at all', to 4, 'used a great deal'. The score of each item was summed-up for each subscale.

The number of somatic symptoms

Participants were asked how often they perceived eight somatic symptoms (i.e. headache, dizziness, shoulder stiffness, back pain, shortness of breath, abdominal pain, general fatigue and skin itching) in the most recent month. For each symptom, the answer was rated on a 3-point scale (i.e. 'never', 'sometimes' and 'always'). Responses of 'always' or 'sometimes' were regarded to be affirmative answers, and each somatic symptom was divided into a binary variable (i.e. 'always' and 'sometimes' versus 'never') (Nomura *et al.*, 2007). The sum of the somatic symptoms reported was calculated for each participant.

Controlling variables

Age was used as a continuous variable. Also, the comorbidities of *hypertension, diabetes* and *obesity* were assessed based on the following definition: hypertension was characterized by systolic blood pressure ≥ 130 or diastolic blood pressure (DBP) ≥ 80 mmHg, diabetes by HbA1c $\geq 6.4\%$ and obesity by body mass index > 25 kg/m^2.

Statistical analysis

The participants were divided into two groups at the median score of communicative and critical HL (higher HL group, ≥ 4; lower HL group, < 4). Controlling for age and comorbidities, the prevalence of each health-related behavior was compared between the higher and lower HL groups, and the differences in coping and the number of the somatic symptoms between the groups were examined by multiple regression analysis. The data were analyzed using Stata version 9.2 (Stata Corp., TX, USA).

RESULTS

Participant characteristics and descriptive results

The mean age of the participants was 43.2 years (SD = 9.8). There were 96 participants with hypertension (50.5%), 9 with diabetes (4.7%) and 58 with obesity (30.5%). The descriptive results of the communicative and critical HL scale items are summarized in Table 1. Great majority of the participants answered that they had the ability to seek information from various sources and extract relevant information, whereas making decisions based on the information were regarded more difficult by the participants. The mean score on the total scale was 3.72 (SD = 0.68).

There was no significant linear relationship between age and HL ($r = -0.06$, $p = 0.42$), HL tended to be lower among those in 60s (mean $\pm$ SD: 3.32 ± 0.88) compare with other age groups (mean $\pm$ SD: 3.74 ± 0.78, 3.76 ± 0.64, 3.73 ± 0.62 and 3.74 ± 0.76 in 20s, 30s, 40s and 50s, respectively). The differences in HL by morbidities of hypertension, diabetes or obesity were not statistically significant.

Table 1: Distribution of communicative and critical HL scale items

	$N = 190$	
	N^a	%
Seeking information from various sources	166	87.4
Extracting relevant information	150	78.9
Considering the credibility of the information	111	58.4
Understanding and communicating the information	112	58.9
Making decisions based on the information	102	53.7
Total scale score (mean, SD)	3.72	0.68

[a]The number of the participants who agreed/strongly agreed that they had the ability.

Table 2: Differences in health-related behaviors by HL

	Higher HL		Lower HL		OR[a]	95% CI
	N	%	N	%		
Diet (have regular eating patterns)	49	53.3	33	36.3	2.00	1.07–3.74
Exercise (exercise weekly)	30	32.6	16	17.6	2.21	1.10–4.45
Sleep (have quality sleep)	50	54.3	39	42.9	1.59	0.88–2.87
Smoking (smoker/ex-smoker)	40	43.5	51	56.0	0.57	0.31–1.04
Drinking (drink almost everyday)	29	31.5	29	31.9	0.94	0.49–1.81

[a]Odds ratios (higher HL group compared with lower HL group) were calculated based on logistic regression analyses controlling for age and comobidities. Missing values were deleted listwise.

Reliability: internal consistency

Although the items (i)–(iii) represented communicative HL and (iv)–(v) represented critical HL, all items loaded on a single factor in the exploratory factor analysis. The internal consistency of the five items was adequately high (Cronbach $\alpha = 0.86$). The item-total correlations were all positive and ranged from 0.77 to 0.85. Because the deletion of any item would not result in an increase in Cronbach's α, it was decided to retain all items in the scale and use them as a 5-item scale of communicative and critical HL. The score on each item was added up and divided by 5 to form a scale score (theoretical range: 1–5).

Construct validity

The prevalence of each health-related behavior in the higher and lower HL groups is summarized in Table 2. Those with higher HL were significantly more likely to have regular eating patterns and exercise on a weekly basis or more, and tended to be never smokers, controlling for age and comorbidities.

Similarly, coping strategies significantly differed between the groups after controlling for age and comorbidities. Individuals with higher HL were likely to cope with job stress by actively solving the problems or seeking support from others, whereas those with lower HL were likely to be reconciled to the situation (Table 3). Further, participants in lower HL group reported significantly greater number of somatic symptoms than those in higher HL group, controlling for age and comorbidities.

DISCUSSION

This study attempted to measure a broader concept of HL defined as communicative and

Table 3: Mean scores of the coping scale and the number of somatic symptoms by HL

	[score range]	Higher HL[a]	Lower HL[a]	P-value
Coping style				
Active	[9–36]	24.1	20.4	<0.001
Escape	[7–28]	11.2	11.2	0.873
Support seeking	[5–20]	9.7	8.7	0.034
Reconciliation	[5–20]	8.3	9.6	0.002
Emotional suppression	[5–20]	11.8	11.3	0.181
Number of somatic symptoms	[0–8]	2.5	3.5	<0.001

[a]Estimated mean scores based on regression analyses controlling for age and comobidities. Missing values were deleted listwise.

critical HL including the ability to extract, understand and utilize health-related information, unlike previous studies that focused solely on functional HL. The relationships of the communicative and critical HL scale with the health outcome variables examined in this study were generally as hypothesized, if not statistically significant, supporting the construct validity of the scale. Higher HL was associated with healthy lifestyles and more effective coping with job stress, as well as with fewer somatic symptoms.

It has been indicated that the health-related behavior is one of the potential intermediate factors that links HL and health outcomes (Lee *et al.*, 2004). Our findings suggested that higher HL was related to healthy lifestyles, such as having regular eating patterns and exercise habits. Also, higher HL was associated with better health status in terms of fewer reported somatic symptoms, which is consistent with previous studies examining the relationship

between functional HL and self-reported health (Baker *et al.*, 1997; Baker *et al.*, 2002). Although it is speculative, individuals with lower HL may be more likely to engage in health risk behaviors, while less likely to engage in health promoting behaviors because of the limited access and ability to understand health information and medical advice that facilitates healthy decisions.

Also, the observed differences in coping by the level of HL could be reasonably interpreted within the context of previous research on stress coping. It has been reported successful coping moderates the effect of stress on physical as well as mental health (Lindquist *et al.*, 1997; Shimazu *et al.*, 2005). In general, solution-oriented rational approaches to stress (such as active problem-solving) and positive external and social techniques (such as support seeking) have been regarded as positive and adaptive coping (Eriksen *et al.*, 1997; Lindquist *et al.*, 1997; Kageyama *et al.*, 2004). In contrast, reconciliation literally means that the individual did nothing but passively accepted the situation, indicating his/her lack of motivation or strategies to cope with the stress. Owing to the cross-sectional nature of this study, we cannot determine the causal relationship between HL and coping. Rather, it is plausible that there is a reciprocal feedback between higher HL and better coping; higher HL, in terms of the ability to utilize health information, may enable the individual to actively seek a solution of the problems and support from others, while adopting such coping strategies may in turn further enhance their HL by providing opportunities to interact with other workers and social resources.

There are several limitations with this study. First, the study sample was derived from a single company in Japan and the response rate was relatively low. It should be noted that the participants were well-educated white-collar workers at a well-known company in Japan, who were unlikely to have basic literacy problems. Although it is noteworthy that a difference in the degree of HL was observed in this relatively homogenous sample of office workers, further research is needed to explore the generalizablity of our findings. Further, it has been suggested that socioeconomic factors such as education and income might be potential confounders in investigating the relationships between HL and health-related behaviors, which were not included in our analyses because the participants were considered to be relatively homogenous in terms of such socioeconomic factors. Also, due to the small number of female workers, we were unable to examine gender effects on HL and other variables.

Second, HL was measured based on a self-reported questionnaire in this study. It has been reported that individuals with reading problems are often ashamed and hide their inability to read (Parikh *et al.*, 1996), which might have led to an overestimation of the HL level in this study. Also, our scale items may not cover the whole concept of the communicative and critical HL as defined by Nutbeam (Nutbeam, 2000). Further research is necessary to refine and validate the instrument to measure communicative and critical HL. In particular, because standard measures of functional HL such as S-TOFHLA or REALM-R were not available in Japanese, we were unable to examine the relationship between our HL scale and these measures, an issue that should be explored in a future study with an English-speaking population.

Third, due to the cross-sectional nature of this study, we were unable to determine the causal relationship between HL and health outcomes. At least, this study revealed that higher HL was associated with healthy behaviors and coping, as well as with fewer reports of somatic symptoms. Although it is theoretically reasonable to expect higher HL facilitates more health-promoting behaviors and coping, which in turn lead to better health, longitudinal study is needed to confirm the causal relationship.

Traditionally, prevention and health education at workplace have tended to take a high-risk approach, which seeks to protect susceptible individuals (Rose, 1985), such as screening high-risk employees at health checkups to provide health counseling. On the contrary, the introduction of the concept of HL may increase the opportunity for a population approach that seeks to control the causes of incidence, such as providing educational sessions to improve HL among all employees, and eliminating barriers for limited HL employees by developing easy-to-understand health information materials. In the context of occupational health, improved HL could provide workers with the ability and motivation to find a way to solve health-related problems of their own as well as of their colleagues and the workplace. Thus, it would

contribute to the improvement of health of individual workers as well as of the workplace as a whole. HL might be critical to the empowerment of workers and health promotion at workplace. Further research on communicative and critical HL is needed to explore the extent and impact of HL on health outcomes.

FUNDING

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