Promotion of physical activity guidelines and behavior change

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Abstract Physical activity guidelines have been published by governments to increase physical activity at a national level. Such guidelines commonly include behavior change techniques. To allow guidelines to contribute to physical activity promotion, it is necessary to enhance people’s awareness of these physical activity guidelines. The present article reviews trends regarding studies on the prevalence and socio-demographic correlates of the awareness of physical activity guidelines, and on the relationship between the awareness of guidelines and physical activity behavior change. Compared with the awareness of physical activity guidelines in Canada (20.7-37.3%) and the United States (32.0-36.1%), awareness of physical activity guidelines was less prevalent in Japan (6.1-12.3%). More intensive campaigns promoting physical activity guidelines are necessary in Japan. Regardless of country, those with higher socioeconomic status (higher educational background or household income level) were more likely to be aware of physical activity guidelines. Promotion campaigns targeting those with low socioeconomic status are needed to reduce inequalities in the awareness level of such guidelines. Positive relationships between guideline awareness and physical activity levels have been reported in cross-sectional studies. However, longitudinal studies have not revealed any such positive relationships. Moreover, intervention studies have failed to show any effects of the guidelines on physical activity behavior change. Thus, the awareness of physical activity guidelines appears to have limited influence on physical activity behavior change. Unlike physical activity guidelines, the promotion of Japanese dietary guidelines has been successful in increasing healthy eating behaviors in Japanese adults.

Keywords: health communication, health policy, information dissemination, health promotion, awareness, physical activity

Introduction

The health benefits of physical activity are now well known. Physical inactivity increases the risk of major non-communicable diseases and causes 9% of premature mortality1). Nevertheless, on a global scale, one-third of adults are physically inactive3). In Japan, the Ministry of Health, Labour and Welfare reviewed epidemiological studies of the relationships between physical activity and health outcomes. Based on the review, the Ministry34) recommends that Japanese adults should undergo at least 23 METs (metabolic equivalents)-hours of physical activity per week for health promotion. However, only 26.6% of Japanese adults met this recommended physical activity level in 20075), and the amount of physical activity among Japanese adults has decreased over time from a peak around 1998–20006). Thus, physical activity promotion is a public health priority7).

The governments of some countries have published guidelines to increase physical activity at a national level. In Canada, the Public Health Agency of Canada published Canada’s Physical Activity Guide to Healthy Active Living in 19988), and new guidelines were published in 20119). In the United States, Physical Activity and Health: a report of the Surgeon General10) was released in 1997, and the 2008 Physical Activity Guide for Americans11) was released in 2008. Make your move – Sit less – Be active for life12) outlines the current physical activity guidelines in Australia, and Start Active, Stay Active13) is the equivalent in the United Kingdom. In Japan, the Ministry of Health, Labour and Welfare published the Exercise and Physical Activity Guide for Health Promotion 200614) in 2006 and the Active Guide - Japanese Official Physical Activity Guidelines for Health Promotion15) in 2013.

Notably, common physical activity guidelines explain behavior change techniques as well as the health benefits and recommended level of physical activity. For example, the Exercise and Physical Activity Guide for Health Promotion 200614) includes information about goal setting, self-monitoring, and self-evaluation. Similarly, the 2008
Physical Activity Guide for Americans recommends goal setting and using social support to increase physical activity levels. Make your move – Sit less be active for life provides information about the action planning of physical activity.

To allow such guidelines to contribute to the promotion of physical activity, it is necessary to enhance people’s awareness of physical activity guidelines. According to the impact model of communication campaigns for promoting physical activity, communication campaigns initially increase the awareness of campaign elements, and then awareness has an influence on physical activity behavior, mediated by psychological factors (e.g., knowledge and attitude). Previous studies have employed this model to evaluate the effects of physical activity campaigns on behavior change (e.g., the VERB campaign and the COMMUNICATE study). Fig. 1 shows the impact model of the promotion of physical activity guidelines on physical activity behavior change, modified from Cavill & Bauman. The effects of promotion of physical activity guidelines can be evaluated by 1) who and how many people become aware of physical activity and 2) whether the awareness of physical activity guidelines lead to changes in physical activity behavior. Although previous studies have evaluated the effects of the promotion of physical activity guidelines, no review articles are available on this topic. It would be useful to have an overview of the effects of the promotion of physical activity guidelines on physical activity behavior change.

The present article looked at trends regarding studies on the prevalence and socio-demographic correlates of the awareness of physical activity guidelines, and on the relationship between the awareness of physical activity guidelines and physical activity behavior change.

### Prevalence of awareness of physical activity guidelines

Increasing the awareness of physical activity guidelines is the initial outcome of the promotion of the guidelines. Previous studies have examined how many people were aware of physical activity guidelines in each country (Table 1). As shown in Table 1, compared with the awareness of physical activity guidelines in Canada (20.7-37.3%) and in the United States (32.0-36.1%) and in the United States (32.0-36.1%),

![Fig. 1 Impact model for promotion of physical activity guidelines and behavior change (modified from Cavill & Bauman)](image-url)

### Table 1. Prevalence of awareness of physical activity guidelines

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Year</th>
<th>Country</th>
<th>Guidelines</th>
<th>Participants</th>
<th>Prevalence of awareness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cameron et al.</td>
<td>2007</td>
<td>Canada</td>
<td>Canada’s Physical Activity Guide</td>
<td>8892 adults</td>
<td>37.3%</td>
</tr>
<tr>
<td>Harada et al.</td>
<td>2009</td>
<td>Japan</td>
<td>Exercise and Physical Activity Guide for Health Promotion 2006</td>
<td>1613 adults</td>
<td>12.3%</td>
</tr>
<tr>
<td>Kay et al.</td>
<td>2014</td>
<td>United States</td>
<td>2008 Physical Activity Guide for Americans</td>
<td>4281 adults</td>
<td>36.1%</td>
</tr>
<tr>
<td>Plotnikoff et al.</td>
<td>2011</td>
<td>Canada</td>
<td>Canada’s Physical Activity Guide</td>
<td>2803 adults</td>
<td>27.3%</td>
</tr>
<tr>
<td>Spence et al.</td>
<td>2002</td>
<td>Canada</td>
<td>Canada’s Physical Activity Guide</td>
<td>2719 adults</td>
<td>20.7%</td>
</tr>
<tr>
<td>Tsuji et al.</td>
<td>2014</td>
<td>Japan</td>
<td>Active Guide</td>
<td>1800 adults</td>
<td>6.1%</td>
</tr>
</tbody>
</table>
the prevalence of awareness of physical activity guidelines was lower in Japan (6.1-12.3%). Therefore, more intensive campaigns promoting physical activity guidelines are necessary in Japan.

In Canada, three studies have reported the prevalence of awareness of Canadian physical activity guidelines (Canada’s Physical Activity Guide to Healthy Active Living published in 1998). Spence et al. revealed that among 2719 respondents of a mailed questionnaire, 20.7% were aware of the guidelines. Plotnikoff et al. also targeted randomly-sampled people living in Alberta. Among 2803 respondents of a telephone survey, the prevalence of awareness was 27.3%. Cameron et al. examined a nationally and provincially representative sample. They used the data (n = 8892) from the 2003 Physical Activity Monitor survey, and showed that 37.3% of respondents were aware of the guidelines.

In the United States, Morrow et al. investigated the prevalence of awareness of Physical Activity and Health: a report of the Surgeon General published in 1996. Morrow et al. conducted a national telephone survey targeting randomly-sampled American adults in 1997. Of 2002 respondents, 36.1% were aware of this report. To examine the awareness of the 2008 Physical Activity Guide for Americans, Kay et al. analyzed the data of HealthStyles, which is an annual consumer mail-panel survey that targets a nationally representative sample in the United States. Of the available 4281 respondents, 36.1% were aware of the 2008 Physical Activity Guide for Americans.

In Japan, the Exercise and Physical Activity Guide for Health Promotion was released by the Ministry of Health, Labour and Welfare in 2006. In the year following its release, Harada et al. examined the prevalence of awareness of the guidelines using a web-based survey. Among 5667 potential respondents, 1613 were analyzed by Harada et al. The results showed that 12.3% of respondents were aware of the guidelines. After publication of Active Guide, Tsuji et al. conducted a telephone survey on 1800 adults by using the random digit dialing method. Tsuji et al. found that the prevalence of awareness of Active Guide was 6.1%.

Additionally, some previous studies have examined how many people accurately know the recommended level of physical activity. In the United States, previous studies revealed that 25.6% to 33.0% of adults knew the accurate duration and frequency of moderate-intensity physical activity recommendations. A study in the United Kingdom also showed that the rates of those who accurately knew the recommended level of physical activity were 11.0% in 2007 and 18.0% in 2013 (not shown in Table 1).

Socio-demographic correlates of awareness of physical activity guidelines

Identifying the socio-demographic correlates of the awareness of physical activity guidelines is helpful when considering what kinds of subpopulations should be targeted to promote physical activity guidelines. As shown in Table 2, previous studies have investigated the socio-demographic characteristics of those with awareness of physical activity guidelines. In particular, regardless of country, higher socioeconomic status (educational background or household income) has been repeatedly identified as a correlate of awareness. Thus, promotion campaigns targeting those with low socioeconomic status are needed to reduce the inequality of awareness level of physical activity guidelines.

In Canada, all studies have consistently reported that higher educational background and gender (women) were socio-demographic correlates of the awareness of Canada’s Physical Activity Guide to Healthy Active Living. Cameron et al. and Spence et al. also revealed

| Table 2. Socio-demographic correlates of awareness of physical activity guidelines |
|----------------------------------|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Age (older)                      | 0                               | +               | +               | +               | –               | 0               | 0               |
| Gender (women)                   | +                               | 0               | +               | 0               | +               | +               | 0               |
| Higher education                 | +                               | 0               | +               | +               | +               | +               | +               |
| Higher household income          | +                               | +               | +               | +               | 0               | 0               | 0               |
| Race/ethnicity (white)           | +                               | +               | +               | +               | 0               | 0               | 0               |
| Living in large community        | –                               | +               | +               | 0               | 0               | 0               | 0               |
| Awareness of other guidelines    | +                               | +               | +               | +               | 0               | 0               | 0               |

+: positively associated with awareness of guidelines
–: negatively associated with awareness of guidelines
0: not significantly associated with awareness of guidelines
that ethnicity was not significantly associated with awareness. Further, Cameron et al.\(^{19}\) reported that community size was related to awareness. While Cameron et al.\(^{19}\) found a significant relationship between awareness and household income, Spence et al.\(^{30}\) found no significant relationship. Regarding age, Plotnikoff et al.\(^{23}\) found that younger adults were more likely to be aware of the guidelines. However, two other studies\(^{19,24}\) did not find a significant relationship between age and awareness.

In the United States, Kay et al.\(^{21}\) examined the socio-demographic correlates of awareness of the 2008 Physical Activity Guide for Americans\(^{11,14}\), and Morrow et al.\(^{22}\) examined that of Physical Activity and Health: a report of the Surgeon General\(^{10}\). Both studies\(^{21,22}\) revealed that older adults, those with higher education, and those who were white tended to be more aware of physical activity guidelines. Kay et al.\(^{21}\) also reported a significant relationship between higher household income and the awareness of the guidelines. For gender, Kay et al.\(^{21}\) showed that women were more likely to be aware of the guidelines. However, Morrow et al.\(^{22}\) did not find gender differences in the awareness of the guidelines.

In Japan, Harada et al.\(^{20}\) examined the socio-demographic correlates of awareness of the Exercise and Physical Activity Guide to Healthy Active Living\(^{8}\). Harada et al.\(^{20}\) found that older age, higher household income, and awareness of other guidelines were associated with awareness. Although Tsuji et al.\(^{25}\) examined the effects of age and gender on the awareness of the Activity Guide\(^{15}\), significant relationships were not found.

Additionally, socio-demographic correlates of accurate knowledge of recommended physical activity level were also examined. In the United States, older adults\(^{27}\), women\(^{20,27}\), those in employment\(^{27}\), foreign-born individuals\(^{27}\), married people\(^{26}\), those with a higher educational background\(^{26}\), and non-black people\(^{26}\) were more likely to accurately know the recommended physical activity level. Knox\(^{28}\) showed that marital status, gender, age, education and employment status were associated with accurate knowledge in the United Kingdom (not shown in Table 2).

### Relationship between awareness of physical activity guidelines and physical activity

Table 3 shows a summary of previous studies examining whether the awareness of physical activity guidelines leads to physical activity behavior change. Positive relationships between awareness of the guidelines and physical activity levels have been reported in cross-sectional studies\(^{19,23,29,30}\). However, longitudinal studies\(^{23,30}\) have not revealed positive relationships, and intervention studies\(^{31,32}\) have failed to show any effects of providing the guidelines on physical activity behavior change. Thus, the awareness of physical activity guidelines appears to have limited influence on physical activity behavior change.

Analyzing the cross-sectional data of a telephone interview (n = 8892), Cameron et al.\(^{19}\) revealed that awareness (unprompted recall) of Canada’s Physical Activity Guide to Healthy Active Living\(^{8}\) was positively associated with physical activity. Higo et al.\(^{30}\) conducted a cross-sectional web-based survey on 1436 adults and revealed that those with awareness of the Exercise and Physical Activity Guide for Health Promotion 2006\(^{24}\) were more likely to have walking habits (self-reported ≥ 10000 steps per day) than those without awareness of it.

Harada et al.\(^{20}\) and Plotnikoff et al.\(^{23}\) examined the longitudinal relationship between the awareness of physical activity guidelines and physical activity. Harada et al.\(^{20}\) analyzed the data of 1100 adults and completed both baseline and follow-up (13 months later) web-based surveys. At baseline, awareness of the Exercise and Physical Activity Guide for Health Promotion 2006\(^{24}\) was positively associated with physical activity\(^{22}\). However, in longitudinal examinations, a positive relationship between awareness of the guidelines and physical activity was not found (Fig. 2)\(^{29}\). From a telephone survey, Plotnikoff et al.\(^{23}\) showed similar results to Harada et al.\(^{29}\). Plotnikoff et al.\(^{23}\) revealed that those with awareness of Canada’s Physical Activity Guide to Healthy Active Living\(^{8}\) tended to be physically active at baseline, but that awareness of it was not significantly associated with a longitudinal change in physical activity.

Two intervention studies\(^{31,32}\) have examined the effects of the distribution of physical activity guidelines. However, neither study\(^{31,32}\) showed significant effects. Kliman and Rhodes\(^{31}\) allocated 130 randomly-sampled adults into an intervention or a control group. Canada’s Physical Activity Guide to Healthy Active Living\(^{8}\) was provided to the intervention group, and a post-test was implemented after 1 month. In the results, no effect of providing the guidelines on physical activity was found\(^{11}\). Plotnikoff et al.\(^{32}\) conducted a secondary analysis of the Physical Activity Workplace Study\(^{33}\). Long and short versions of Canada’s Physical Activity Guide to Healthy Active Living\(^{8}\) were provided to 202 adults at baseline and at 6 months, with a post-test carried out at 12 months. The results showed that participants did not significantly change their moderate or vigorous physical activity\(^{32}\).

### Other health behaviors: Japanese dietary guidelines

As mentioned above, the effects of physical activity guidelines on behavior change are not supported in longitudinal or interventional studies\(^{23,29,31,32}\). However, unlike the case of physical activity guidelines, the effectiveness of promoting dietary guidelines on behavior change for healthy eating is better supported.

Takaizumi et al.\(^{35}\) conducted a web-based longitudinal survey (n = 1012) to examine the longitudinal change of awareness of the Japanese Food Guide Spinning Top\(^{30}\). Takaizumi et al.\(^{35}\) revealed that 56.3% of respondents
were aware of it in 2007 and 60.4% were aware of it in 2008, and that the awareness of it increased particularly among those with health risk factors. Next, Takaizumi et al. conducted a follow-up survey to the participants of the baseline survey in Takaizumi et al. Then, changes in healthy eating behaviors were compared among three groups (group 1, aware of it in 2007; group 2, unaware of it in 2007 but had become aware by 2009; group 3, unaware of it in both 2007 and 2009). The results showed that healthy eating behaviors did not change from 2007 to 2009 in group 1 or group 3. In contrast, healthy eating behaviors in group 2 were significantly improved from 2007 to 2009.

Compared with the prevalence of the awareness of physical activity guidelines in each country, the prevalence of awareness of the *Japanese Food Guide Spinning Top* was remarkably higher. This might be because the ministries implemented nation-wide promotion campaigns of the *Japanese Food Guide Spinning Top*. Moreover, while the awareness of physical activity might not increase behavior change, a longitudinal study indicates that the awareness of the *Japanese Food Guide Spinning Top* does have an influence on healthy eating behaviors. Therefore, it can be concluded that the promotion of Japanese dietary guidelines has succeeded in increasing healthy eating behaviors among Japanese adults.
Conclusions

Compared with the awareness of physical activity guidelines in Canada (20.7-37.3%19,23,24) and in the United States (32.0-36.1%21,22), the prevalence of awareness of physical activity guidelines was lower in Japan (6.1-12.3%20,25). Regardless of country, those with higher socioeconomic status (higher educational background or household income level) were more likely to be aware of physical activity guidelines19-24). Positive relationships between awareness of the guidelines and physical activity level have been reported in cross-sectional studies. However, according to longitudinal and interventional studies, the awareness of physical activity guidelines has limited influence on physical activity behavior change. Unlike the case of physical activity guidelines, the promotion of Japanese dietary guidelines is successful in increasing healthy eating behaviors in Japanese adults.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this article.

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References


