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A comparative study on persuasive health message design: effects of message framing and formatting on comprehensibility, persuasiveness, emotion, intention, and action

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3 A comparative study on persuasive health message design: effects of message framing and
4 formatting on comprehensibility, persuasiveness, emotion, intention, and action.
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ABSTRACT

Objective: To examine the effects of message framing and formatting on persuasive message effectiveness in the context of developing depression help-seeking messages.

Design: Cross-sectional followed by 2-month follow-up study

Setting and participants: A web-based survey was conducted in July 2017 among Japanese adults aged 35-45 years. Of 1,957 eligible respondents without psychiatric history, 1,805 people (92.2%) completed the 2-month follow-up questionnaire.

Main outcome measures: Six depression help-seeking messages were prepared with 3 frames (neutral-, loss-, and gain-framed) × 2 formats (formatted and unformatted). Participants were asked to rate the messages in terms of comprehensibility, persuasiveness, emotional responses, design quality, and intended future use. Help-seeking intention for depression was measured using vignette methodology before and after exposure to the messages. Subsequent 2-month help-seeking action for their own mental health (medical service use) was monitored by the follow-up survey.

Results: Compared with the neutral-framed, the loss- and gain-framed messages more strongly influenced emotions and consequently increased help-seeking intentions. The message formatting applied the CDC Clear Communication Index increased the likelihood that the message will be read and enhanced the emotional responses. Any messages had little effect on maintaining help-seeking intention or increasing help-seeking action.

Conclusion: The results of this study confirmed the effectiveness of depression help-seeking messages in middle-aged Japanese people. Providers should consider that message framing and formatting may have a significant effect on persuasive message effectiveness, when they design their messages. Further studies are needed to identify the most effective pattern of message frame and format for changing people's behaviors toward mental illness.

Key words: depression, help-seeking, persuasive message, questionnaire survey

STRENGTH AND LIMITATIONS

- Health communication research has revealed that the effect of persuasive messages can depend on message characteristics, but less is known about what kind of message will more satisfactorily motivate people to seek mental health care. This study represents the first attempt to examine the effects of message framing and formatting on persuasive message effectiveness in the context of developing depression help-seeking messages.
- The experimental comparison of 6 differently framed and formatted messages successfully revealed that message framing and message formatting would play different roles in the persuasion process.
- The study participants were limited to 35-45 years old selected from a nationwide panel of a research company. It is uncertain whether the messages will work equally well in other age groups or in other settings.

Introduction

Health communication is the study and use of communication strategies to inform and influence individual and community decisions that enhance health [1]. Communicating persuasive messages is a critical component of public health programs, which can produce beneficial changes in people's behaviors toward health issues [2,3]. Failure and delay in initial treatment contact for mental disorders has been recognized as an important public health problem [4,5], and some public health programs have been launched to tackle this problem [6]. Meanwhile previous studies have suggested that depression help-seeking messages have the potential to backfire; exposure to the messages may result in increased self-stigma and increased reluctance to help-seeking (i.e. boomerang effect) [7,8]. Further evidence is needed to identify strategies for successful public health messaging with the aim of promoting access to mental health care.

Health communication research has revealed that the effect of persuasive messages can depend on message characteristics. Well known is the framing effect, that is, health messages framed to highlight either the benefits of performing a behavior (i.e. gain-framed) or the consequences of not performing a behavior (i.e. loss-framed) will lead to different decisions and different health behaviors [9]. Gain-framed messages are more likely than loss-framed messages to promote prevention behaviors [10]. Meanwhile there seems to be some contexts in which loss-framed messages are equally or more effective than gain-framed messages [10,11]. It is uncertain whether gain-framed messages will more satisfactorily motivate people to seek mental health care.

Reading a message is the first step of the persuasion process. If recipients find difficulty in reading and understanding the given message, it is unlikely to have any persuasive impact. The Centers for Disease Control and Prevention (CDC) proposed a set of evidence-based criteria to develop and assess public health communication materials for diverse audiences,

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2
3 namely the Clear Communication Index [12]. The Index represents the most important items that
4
5 enhance clarity and aid understanding of public health messages and materials. The six core items
6
7 applicable to all materials are: 1) include one main message statement, 2) put the main message
8
9 first, 3) use visual cues to emphasize the main message, 4) include a visual that conveys the main
10
11 message, 5) include one call to action, and 6) use active voice. Applying the Index items probably
12
13 help develop audience-appropriate health messages and materials [13]. However, to our
14
15 knowledge, there have been no attempts to confirm whether health messages designed to conform
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17 to the Index items function better as a stimulus to change people's behaviors toward health
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19 issues. Moreover, little is known about the interaction between message frame and message
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21 format. If message format significantly influences the comprehensibility of health message, it
22
23 is likely to modify the framing effect of health message to some extent.
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26 The objective of this study was to examine the effects of message framing and formatting
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28 on persuasive message effectiveness in the context of developing depression help-seeking
29
30 messages. Although the mechanism of persuasive message effectiveness has not been clearly
31
32 elucidated, a number of factors can serve to mediate or moderate the effect of persuasive
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34 messages. Emotional responses to messages influence perceptions of effectiveness of
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36 messages [14,15]. Perceived message effectiveness is strongly correlated with and may be
37
38 casually related to actual message effectiveness [15,16]. Intention is the best determinant of
39
40 behavior in a wide range of health domains [17], and it has been commonly used as an
41
42 outcome measure in health communication research [10]. We previously found that reading
43
44 comprehension of health information was significantly associated with recognition of health
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46 risk and intention to perform health behaviors [18]. Based on these findings, the present study
47
48 compared audience's responses to 6 differently framed and formatted messages in terms of
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50 comprehensibility, persuasiveness, emotion, intention, and action.
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1. Methods

We launched a research project to develop effective health communication interventions for encouraging help-seeking in people at risk of suicide. As the first step in the research project, we developed rating scales for measuring audience's perceptions of effectiveness of health messages in Japanese people [19]. Using these and other quantitative assessment tools, we pretested 3 differently framed texts of depression help-seeking messages (neutral-, loss-, and gain-framed) by possible audience members [20]. The present study attempted to clarify further details about the recipients' responses to the depression help-seeking messages, focusing especially on difference between the formatted and unformatted messages.

The study protocol was approved by the ethics committees of the Jikei University School of Medicine and has been conducted in accordance with the Ethical Guidelines for Medical and Health Research Involving Human Subjects by the Japanese Government.

2.1 Messages

In order to examine the effects of message framing and formatting, six messages were prepared with 3 frames (neutral-, loss-, and gain-framed) \times 2 formats (formatted and unformatted). The aim of messaging was to increase people's help-seeking intentions for depression. The target audience were either depressed or non-depressed people. The messages were designed as print advertisements to be inserted in the form of web-based surveys.

The preparation of 3 differently framed texts of depression help-seeking messages were described previously [20]. In brief, the main message statements were selected from the text message list developed by Bell and colleagues [21] so as to be matched against the beliefs related to the top 3 reasons for having no help-seeking intention for depression, respectively [22]: 1) depression can happen to anyone, 2) depression needs treatment, and 3) depression improves with treatment. The first one (Message 1) was neutral-framed with additional

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3 information on incidence of depression: about one out of 15 people experience depression
4 during their lifetime. The second one (Message 2) was loss-framed (threat appeal) with
5 additional information on prognosis of untreated patients: about 80% of untreated patients
6 will not recover. The third one (Message 3) was gain-framed (benefit appeal) with additional
7 information on prognosis of treated patients: about 80% of treated patients will recover. Each
8 message consisted of three part. The first part was the main message statement. The second
9 part provided information on early signs of depression: depression can be recognized early by
10 mental symptoms such as depressed mood, loss of interest, etc. and physical symptoms such
11 as disturbed sleep, increased fatigue, etc. The last part was the call to action: if you suspect
12 your depression, consult your family doctor.
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24 For each of the 3 differently framed text, the formatted (P) and unformatted (N) messages
25 were prepared containing the identical sentences. The formatted messages (Messages 1P, 2P,
26 and 3P) were visually designed in accordance with the CDC Clear Communication Index
27 User Guide [12]. The unformatted messages (Messages 1N, 2N, and 3N) were in plain text
28 without any colors or visuals. The formatted versions of depression help-seeking messages
29 were shown in Appendix A.
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41 2.2 Participants

42 A web-based survey was conducted in July 2017 among Japanese adults aged 35-45 years
43 [20]. Participants in the survey were recruited from an online research panel of a leading
44 research company in Japan (Cross Marketing Inc., Tokyo, Japan). Medical professionals were
45 excluded through a prescreening process. Applicants for participation in the survey were
46 accepted in the order of receipt until the number of participants reached the quotas for gender,
47 area, and K6 score (a measurements of depressive status). A total of 2,520 responses were
48 obtained over two days of recruitment.
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3 A follow-up survey was conducted in September 2017 to monitor subsequent changes in
4 help-seeking intention and action. Of the 2,520 participants in the initial survey, 2,315 people
5 (91.9%) completed the follow-up questionnaire.
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9 All participants voluntarily agreed to participate in the survey after reading a description
10 of the purpose and procedure of the survey. Consent to participate was implied by the
11 completion and submission of the survey.
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15 Excluding those who had an experience of receiving treatment for their mental illness, the
16 remaining 1,957 participants were included in the study. The 2-month follow-up data were
17 available for 1,805 people (92.2%).
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23 24 2.3 Measures

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26 Participants were randomly assigned to one of the depression help-seeking messages.
27 After they read the message for at least 15 seconds, they were asked to rate it in terms of
28 comprehensibility, persuasiveness, emotional responses, design quality, and intended future
29 use. Help-seeking intention for depression was measured using vignette methodology before
30 and after exposure to the messages. Moreover, participants in the 2-month follow-up survey
31 were asked about help-seeking intention for depression and help-seeking action for their own
32 mental health (medical service use).
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41 The web questionnaire forms presented the questions one by one through the operation of
42 a 'Next' button. Respondents answered one question per page and could not go back to the
43 previous page.
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50 2.3.1 Comprehensibility

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52 Using the perceived effectiveness rating scales [19], the five items asked how easy or hard
53 the information is to: 1) read, 2) understand, 3) remember, 4) locate important information,
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3 and 5) keep for future reference. All item scores (range 1-5 points) were averaged to produce
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5 the comprehensibility score.
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8 9 2.3.2 Persuasiveness

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11 Using the perceived effectiveness rating scales [19], the seven items asked to what extent
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13 they agree or disagree that the information is: 1) believable, 2) convincing, 3) important to me,
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15 4) help me feel confident about how best to do, 5) would help my family and friends, 6) put
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17 thoughts in my mind about wanting to do, and 7) agreeable. All item scores (range 1-5 points)
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19 were averaged to produce the persuasiveness score.
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24 2.3.3 Emotional responses

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26 Participants were asked 'when you read the message, to what extent you feel: 1) surprise,
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28 2) anger, 3) fear, 4) sadness, 5) guilt, 6) anxiety, and 7) happiness?' [14,15]. Response options
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30 were from 1 (not at all) to 5 (extremely).
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35 2.3.4 Design quality

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37 Participants were asked to rate the message on a 5-point scale in terms of 1) organization,
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39 2) attractiveness, 3) size, 4) tone, 5) helpfulness, and 6) spacing [23]. Higher scores indicate
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41 higher quality.
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46 2.3.5 Intended future use

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48 Participants were asked 'If you saw the information in a newspaper or magazine, how
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50 likely would you [use, read, and keep] it?' [23]. Response options were from 1(very unlikely)
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52 to 5 (very likely).
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2.3.6 Help-seeking intention

Help-seeking intention for depression was measured using vignette methodology. Participants were presented with a vignette describing a man (or woman) with depression and were then asked 'If you had health problems right now like Mr. A (or Ms. A), would you see a doctor?' [19,20,22]. Those who gave affirmative answers (certainly yes and probably yes) were counted as having a positive help-seeking intention.

2.3.7 Help-seeking action

Help-seeking action for their own mental health was measured in the follow-up survey by asking participants whether they had seen a doctor for their mental health problem in the previous 2 months.

2.4 Statistical Analysis

All statistical analyses were performed using the SAS ver. 9.4 (SAS Institute, Cary, NC, USA). Main and interaction effects of frame and format were assessed using two-way analysis of variance. The proportions of people who reported a positive help-seeking intention for depression before and after exposure to the messages were compared using McNemar test. Multiple logistic regression analysis was conducted to identify the effects of frame and format on help-seeking intention for depression. Odds ratios (ORs) with 95% confidence intervals (CIs) for help-seeking intention for depression were calculated with adjustment for gender, depressive status, and underlying help-seeking intention. Significant levels were set at $p < 0.05$.

3. Results

Table 1 shows the characteristics of the study participants. According to the national census [24], the percentage of the Japanese population aged 35-44 years with university

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3 degrees were 22.0% in 2010, considerably lower than that of this study (45.6%). However, we
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5 confirmed that the distribution of HLS-14 score (a measurement of generic health literacy) in
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7 the study participants is quite similar to that obtained from our previous paper-based survey in
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9 a Japanese healthcare facility [25]. The numbers of participants assigned to Messages 1P, 1N,
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11 2P, 2N, 3P, and 3N were 335, 317, 325, 324, 323, and 333 people, respectively. There were no
12
13 significant differences between the message groups in sociodemographic characteristics.

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16 Table 2 shows the assessment of the depression help-seeking messages. The
17
18 comprehensibility and persuasiveness scores showed no significant differences between the
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20 frames or between the formats. For the emotional responses, significant main effects of frame
21
22 were observed in 5 out of 7 items (surprise, fear, sadness, anxiety, and happiness). There were
23
24 a significant effect of format on 'surprise' and significant frame×format interaction effects on
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26 'happiness' and 'anxiety'. Compared with the neutral-framed (Message 1), the loss-framed
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28 message (Message 2) and the gain-framed message (Message 3) showed significant
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30 enhancements of emotional responses to the formatted messages (P). For the design quality,
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32 significant main effects of format were observed in 4 out of 6 items (attractiveness, size,
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34 helpfulness, and spacing). There were significant main effects of frame on 3 items
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36 (attractiveness, tone, and helpfulness) but no significant frame×format interaction. For the
37
38 intended future use, a significant main effect of format was observed in 1 out of 3 items (read).
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40 There were no significant main effects of frame and no significant frame×format interaction.

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43 Table 3 shows the changes in help-seeking intension for depression before and after
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45 exposure to the messages. All messages except Message 1N produced significant increase in
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47 help-seeking intention. Since our previous study suggested that depressed people are likely to
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49 be more susceptible to persuasive messages [20], the changes in help-seeking intension were
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51 further examined in participants stratified into depressed ($K6 \geq 5$) and non-depressed ($K6 < 5$)
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53 groups. Significant increase in help-seeking intention was observed in all messages except
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3 Message 1N in the depressed group, whereas significant changes were observed in Messages
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5 2P and 3N in the non-depressed group.
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7 Of the 1,805 participants in the 2-month follow-up survey, 1,141 people had not possessed
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9 help-seeking intention before exposure to the messages, and 249 people (21.8%) developed
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11 their help-seeking intentions after exposure to the messages. Of these, 143 people (57.4%)
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13 reported a positive help-seeking intention for depression again at the follow-up survey. The
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15 proportion of participants with stable help-seeking intention was 55.8% (58/104) in the
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17 depressed group and 58.6% (85/145) in the non-depressed group. These proportions were not
18
19 significantly different by message frame or message format regardless of depressive status
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21 (p=0.227 and p=0.939, respectively in the depressed group; p=0.760 and p=0.931,
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23 respectively in the non-depressed group).
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26 There were 66 people (3.7%) who had seen a doctor for their mental health problem
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28 during the follow-up period. The proportion of participants with help-seeking action was
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30 5.5% (42/769) in the depressed group compared with 2.3% (24/1,036) in the non-depressed
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32 group (p<0.001). This proportion was not significantly different across the given messages
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34 regardless of depressive status (p=0.516 in the depressed group; p=0.708 in the non-depressed
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36 group).
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41 4. Discussion

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43 This study examined audience's responses to 6 differently framed and formatted messages
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45 which targeted either depressed or non-depressed people and aimed at increasing their
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47 help-seeking intentions for depression. The results of this study successfully confirmed the
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49 effectiveness of depression help-seeking messages in middle-aged Japanese people. The main
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51 message statements were respectively matched against the beliefs related to the top 3 reasons
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53 for having no help-seeking intention for depression [22], so that most of the messages could
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3 make the recipients change their help-seeking intentions. Although depression help-seeking
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5 messages have the potential to backfire [7,8], such boomerang effect was not evident in this
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7 study.

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9 The differently framed messages brought different emotional responses in a predictable
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11 way. The loss-framed message (Message 2) more strongly induced negative emotions
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13 (surprise, fear, sadness, and anxiety), while the gain-framed message (Message 3) more
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15 strongly induced a positive emotion (happiness). There was no significant difference in
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17 persuasiveness, however, significant increase in help-seeking intention was observed among
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19 those who read the loss-framed (Message 2) and gain-framed (Message 3) messages. Previous
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21 studies have suggested that emotional responses play a significant role in the persuasion
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23 process [14,15]. Compared with the neutral-framed (Message 1), the loss-framed (Message 2)
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25 and the gain-framed (Message 3) messages more strongly influenced the recipients' emotions
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27 and were consequently more likely brought out the recipients' help-seeking intentions. A
28
29 literature review suggested that gain-framed messages are more likely than loss-framed
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31 messages to promote prevention behaviors [10]. However, there was no marked difference
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33 between the loss-framed (Message 2) and the gain-framed (Message 3) messages in
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35 help-seeking intention. According to these results, it is still unclear which message frame is
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37 recommendable for depression help-seeking messages, loss frame or gain frame.

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41 The formatted messages (Messages 1P, 2P, and 3P) were judged superior to the
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43 unformatted messages (Messages 1N, 2N, and 3N) in design quality. The formatted messages
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45 consequently succeeded in increasing the likelihood that the message will be read. The
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47 significant frame×format interaction effects on 'happiness' and 'anxiety' indicated that the
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49 message formatting enhanced the recipients' emotional responses, both negative and positive.
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51 These results support the effectiveness of the CDC Clear Communication Index which helps
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53 provide easily understandable health messages and materials [12]. However, the effect of
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3 message format was not significantly observed in persuasiveness, help-seeking intention, or
4 help-seeking action. A literature review suggested that adding pictures to written text will
5 increase the likelihood that the text will be read, however, the effects of pictures on
6 comprehension, recall, and adherence have not yet been established [26]. The results of this
7 study are insufficient to conclude, but it is likely that message formatting has a limited impact
8 on the persuasion process.

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16 Of those who developed their help-seeking intention after exposure to the messages,
17 57.4% kept their help-seeking intention up to the 2-month follow-up survey. This proportion
18 was not significantly different across the given messages. The depression help-seeking
19 messages succeeded in possessing help-seeking intention for a short time after exposure, but
20 the effect could not be sustained over time. Moreover, those who had taken help-seeking
21 action during the 2-month follow-up period accounted for 5.5% of the depressed ($K6 \geq 5$)
22 group compared with 2.3% of the non-depressed ($K6 < 5$) group. Seeing a message only once
23 may be insufficient to induce help-seeking action. Although a number of interventions have
24 been conducted to promote access to mental health care, very little is known about what
25 interventions increase help-seeking action [27]. To our knowledge, there is no successful
26 precedent that proved the effect of public health messaging on help-seeking action. Further
27 studies are needed to find out effective strategies for maintaining help-seeking intention and
28 increasing help-seeking action.

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44 This study provides evidence for the effectiveness of depression help-seeking messages in
45 middle-aged Japanese people. On the contrary, it has a number of potential limitations. First,
46 the web-based survey was self-administered, so that the accuracy of responses would depend
47 on participants' understanding of the questions and their motivation to answer questions
48 accurately. The understandability of the wording of items was checked prior to the survey.
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The use of the Internet and the provision of anonymity would be expected to elicit more

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3 truthful responses, by minimizing social desirability pressures [28]. However, it is almost
4 impossible to eliminate the information bias completely. Second, the study participants were
5 limited to 35-45 years old selected from a nationwide panel of a research company. The
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7 results of this study demonstrated the effectiveness of depression help-seeking messages,
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9 however, it is uncertain whether the messages will work equally well in other age groups or in
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11 other settings. Moreover, because of cultural differences, the findings from this study may not
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13 be applicable to non-Japanese populations. Now we are planning to conduct a
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15 population-based interventional study to assess the effectiveness of a public health
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17 communication program using the depression help-seeking messages. We will discuss the
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19 channels and activities that will be most likely to successfully reach target audience in the
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21 future study.
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28 5. Conclusion

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31 This study examined the effects of message framing and formatting on persuasive
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33 message effectiveness in the context of developing depression help-seeking messages. The
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35 experimental comparison of 6 differently framed and formatted messages revealed that
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37 compared with the neutral-framed, the loss- and gain-framed messages more strongly
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39 influenced the recipients' emotions and were consequently more likely to bring out the
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41 recipients' help-seeking intentions. The message formatting applied the CDC Clear
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43 Communication Index increased the likelihood that the message will be read and enhanced
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45 the recipients' emotional responses. According to these results, communicating persuasive
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47 messages will change people's attitudes and intentions toward help-seeking for depression if
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49 the messages are developed carefully and appropriately. Providers should consider that
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51 message framing and formatting may have a significant effect on persuasive message
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53 effectiveness, when they design their messages. Unfortunately, any messages had little effect
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3 on maintaining help-seeking intention or increasing help-seeking action. Further studies are
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5 needed to identify the most effective pattern of message frame and format for changing
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7 people's behaviors toward mental illness.
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10 11 12 13 Contributors

14
15 MS was responsible for the design and conduct of the study, the collection, analysis, and
16
17 interpretation of data, and the writing of the article. TY and HY contributed to the data
18
19 interpretation and discussion of the implications of this work. All authors read and approved
20
21 the final manuscript.
22
23

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31
32

33 34 35 Competing interest

36
37 The authors declare that they have no competing interest.
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40 41 42 Ethics approval

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44 The study protocol was approved by the ethics committees of the Jikei University School
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46 of Medicine and has been conducted in accordance with the Ethical Guidelines for Medical
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48 and Health Research Involving Human Subjects by the Japanese Government.
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51 52 53 Data sharing statement

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55 No additional data are available.
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Table 1 Characteristics of the study participants

| | | N | |
|------------------|----------------------------------|------|-------|
| Gender | Male | 980 | 49.8% |
| | Female | 987 | 50.2% |
| Age | Mean (SD) | 40.9 | (3.0) |
| Education | Compulsory education/high school | 540 | 27.6% |
| | Junior college/vocational school | 524 | 26.8% |
| | University or higher | 893 | 45.6% |
| Marital status | Married | 1101 | 56.3% |
| | Unmarried | 767 | 39.2% |
| | Divorced/widowed | 89 | 4.5% |
| Occupation | Full-time job | 1176 | 60.1% |
| | Temporary or part-time job | 329 | 16.8% |
| | No occupation | 452 | 23.1% |
| Household income | <2.0 million yen † | 230 | 11.8% |
| | 2.0–3.9 million | 394 | 20.1% |
| | 4.0–5.9 million | 552 | 28.2% |
| | 6.0–7.9 million | 400 | 20.4% |
| | 8.0–9.9 million | 205 | 10.5% |
| | 10.0+ million | 161 | 8.2% |
| | Missing | 15 | 0.8% |

†1 million yen was about 10,000 U.S. dollars at the time of the survey.

Table 2 Assessment of the depression help-seeking messages

| | | Message | | | | | | p Frame (A) | Format (B) | A × B |
|---------------------|------|---------|------|------|------|------|------|-------------------|---------------|-------|
| | | 1N | 1P | 2N | 2P | 3N | 3P | | | |
| Comprehensibility | | | | | | | | | | |
| | Mean | 3.74 | 3.81 | 3.79 | 3.80 | 3.82 | 3.82 | 0.554 | 0.472 | 0.757 |
| | SD | 0.79 | 0.78 | 0.87 | 0.83 | 0.83 | 0.78 | | | |
| Persuasiveness | | | | | | | | | | |
| | Mean | 3.15 | 3.13 | 3.20 | 3.18 | 3.10 | 3.17 | 0.168 | 0.732 | 0.352 |
| | SD | 0.59 | 0.63 | 0.66 | 0.62 | 0.67 | 0.64 | | | |
| Emotional responses | | | | | | | | | | |
| 1) surprise | Mean | 2.47 | 2.57 | 2.60 | 2.81 | 2.49 | 2.63 | 0.005 | 0.002 | 0.636 |
| | SD | 1.03 | 1.10 | 1.06 | 1.01 | 1.10 | 1.02 | | | |
| 2) anger | Mean | 1.91 | 1.91 | 1.94 | 2.01 | 1.90 | 1.99 | 0.411 | 0.202 | 0.596 |
| | SD | 0.95 | 0.92 | 0.92 | 0.96 | 0.92 | 0.93 | | | |
| 3) fear | Mean | 2.51 | 2.43 | 2.55 | 2.64 | 2.22 | 2.41 | <0.001 | 0.163 | 0.061 |
| | SD | 1.03 | 1.05 | 1.06 | 1.07 | 1.01 | 0.98 | | | |
| 4) sadness | Mean | 2.44 | 2.43 | 2.53 | 2.61 | 2.24 | 2.38 | <0.001 | 0.124 | 0.413 |
| | SD | 1.03 | 1.10 | 1.05 | 1.04 | 1.01 | 0.95 | | | |
| 5) guilt | Mean | 2.09 | 2.07 | 2.08 | 2.18 | 2.02 | 2.09 | 0.326 | 0.247 | 0.440 |
| | SD | 0.91 | 0.96 | 0.93 | 0.94 | 0.92 | 0.86 | | | |
| 6) anxiety | Mean | 2.63 | 2.50 | 2.59 | 2.74 | 2.34 | 2.45 | <0.001 | 0.370 | 0.035 |
| | SD | 1.04 | 1.12 | 1.06 | 1.08 | 1.02 | 1.03 | | | |
| 7) happy | Mean | 1.93 | 1.83 | 1.99 | 1.98 | 2.17 | 2.35 | <0.001 | 0.657 | 0.024 |
| | SD | 0.96 | 0.92 | 0.98 | 0.98 | 0.98 | 0.95 | | | |
| Design quality | | | | | | | | | | |
| 1) organization | Mean | 3.67 | 3.65 | 3.72 | 3.80 | 3.64 | 3.71 | 0.113 | 0.258 | 0.557 |
| | SD | 0.87 | 0.90 | 0.91 | 0.84 | 0.88 | 0.87 | | | |
| 2) attractiveness | Mean | 3.10 | 3.22 | 3.18 | 3.37 | 3.08 | 3.26 | 0.029 | <0.001 | 0.749 |
| | SD | 0.84 | 0.89 | 0.86 | 0.84 | 0.91 | 0.90 | | | |
| 3) size | Mean | 3.38 | 3.38 | 3.37 | 3.52 | 3.32 | 3.41 | 0.177 | 0.037 | 0.296 |
| | SD | 0.81 | 0.88 | 0.91 | 0.86 | 0.79 | 0.86 | | | |
| 4) tone | Mean | 3.16 | 3.11 | 3.20 | 3.13 | 3.22 | 3.33 | 0.004 | 0.966 | 0.084 |
| | SD | 0.72 | 0.79 | 0.82 | 0.83 | 0.77 | 0.83 | | | |
| 5) helpfulness | Mean | 3.38 | 3.36 | 3.39 | 3.57 | 3.37 | 3.48 | 0.048 | 0.019 | 0.109 |
| | SD | 0.82 | 0.84 | 0.90 | 0.80 | 0.87 | 0.87 | | | |
| 6) spacing | Mean | 3.35 | 3.50 | 3.26 | 3.56 | 3.24 | 3.52 | 0.633 | <0.001 | 0.220 |
| | SD | 0.77 | 0.80 | 0.91 | 0.78 | 0.85 | 0.80 | | | |
| Intended future use | | | | | | | | | | |
| 1) read | Mean | 3.17 | 3.23 | 3.28 | 3.28 | 3.12 | 3.36 | 0.286 | 0.016 | 0.052 |
| | SD | 0.90 | 0.91 | 0.92 | 0.95 | 0.95 | 0.87 | | | |
| 2) use | Mean | 2.77 | 2.71 | 2.87 | 2.83 | 2.72 | 2.86 | 0.063 | 0.666 | 0.065 |
| | SD | 0.84 | 0.86 | 0.84 | 0.85 | 0.82 | 0.79 | | | |
| 3) keep | Mean | 2.36 | 2.34 | 2.38 | 2.48 | 2.34 | 2.46 | 0.332 | 0.142 | 0.332 |
| | SD | 0.98 | 0.95 | 0.97 | 0.98 | 0.91 | 0.90 | | | |

Message 1P, 2P, and 3P were visually formatted versions of Message 1N, 2N, and 3N, respectively. All items were scored on a 1-to-5 point scale. Two-way analysis of variance was used to assess main and interaction effects of frame and format.

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Table 3 Changes in help-seeking intention for depression

| Message | All | | | | | Non-depressed (K6<5) | | | | | Depressed (K6≥5) | | | | |
|---------|-----|--------------------|-------|--------|--------|----------------------|--------------------|-------|--------|-------|------------------|--------------------|-------|--------|--------|
| | N | Positive intention | | | p | N | Positive intention | | | p | N | Positive intention | | | p |
| | | Before | After | Change | | | Before | After | Change | | | Before | After | Change | |
| 1N | 335 | 115 | 128 | | 0.128 | 193 | 75 | 80 | | 0.456 | 142 | 40 | 48 | | 0.131 |
| | | 34.3% | 38.2% | 11.3% | | | 38.9% | 41.5% | 6.7% | | | 28.2% | 33.8% | 20.0% | |
| 1P | 317 | 116 | 139 | | 0.003 | 189 | 82 | 87 | | 0.384 | 128 | 34 | 52 | | <0.001 |
| | | 36.6% | 43.8% | 19.8% | | | 43.4% | 46.0% | 6.1% | | | 26.6% | 40.6% | 52.9% | |
| 2N | 325 | 126 | 146 | | 0.017 | 195 | 85 | 95 | | 0.149 | 130 | 41 | 51 | | 0.033 |
| | | 38.8% | 44.9% | 15.9% | | | 43.6% | 48.7% | 11.8% | | | 31.5% | 39.2% | 24.4% | |
| 2P | 324 | 117 | 151 | | <0.001 | 187 | 77 | 95 | | 0.009 | 137 | 40 | 56 | | 0.003 |
| | | 36.1% | 46.6% | 29.1% | | | 41.2% | 50.8% | 23.4% | | | 29.2% | 40.9% | 40.0% | |
| 3N | 323 | 117 | 144 | | 0.001 | 186 | 81 | 96 | | 0.029 | 137 | 36 | 48 | | 0.011 |
| | | 36.2% | 44.6% | 23.1% | | | 43.5% | 51.6% | 18.5% | | | 26.3% | 35.0% | 33.3% | |
| 3P | 333 | 135 | 158 | | 0.003 | 183 | 77 | 86 | | 0.128 | 150 | 58 | 72 | | 0.004 |
| | | 40.5% | 47.4% | 17.0% | | | 42.1% | 47.0% | 11.7% | | | 38.7% | 48.0% | 24.1% | |


Message 1P, 2P, and 3P were visually formatted versions of Message 1N, 2N, and 3N, respectively. Help-seeking intention for depression was assessed before and after exposure to the messages. McNemar test was used to assess changes in help-seeking intention

Appendix A. Depression help-seeking messages (formatted versions)

Message 1P - Depression can happen to anyone (neutral-framed message)

うつ病は、だれでもかかる可能性がある病気です。

つらい出来事やストレスなどをきっかけに、
およそ**15人にひとり**が生涯のうちうつ病を経験すると言われています。



うつ病になると、「ゆううつだ」「やる気が出ない」などの**“こころ”のサイン**と
「疲れているのに眠れない」「全身がだるい」などの**“からだ”のサイン**が表われます。


うつ病かも…と思ったら、ひとりで悩まず、
かかりつけの医師や最寄りの医療機関、相談窓口にご相談しましょう。

- Main message
- Depression happens to one out of 15 people.
- Information on early signs of depression
- Call to action

Message 2P - Depression needs treatment (loss-framed message)

うつ病は、治療が必要な病気です。

放っておくと、**日常生活にも支障をきたす**ような、つらい状態が続きます。
適切な治療を受けなければ、**約80パーセントが以前の状態に回復しません**。



うつ病になると、「ゆううつだ」「やる気が出ない」などの**“こころ”のサイン**と
「疲れているのに眠れない」「全身がだるい」などの**“からだ”のサイン**が表われます。


うつ病かも…と思ったら、ひとりで悩まず、
かかりつけの医師や最寄りの医療機関、相談窓口にご相談しましょう。

- Main message
- If not treated, 80% cannot recover from depression.
- Information on early signs of depression
- Call to action

Message 3P - Depression improves with treatment (gain-framed message)

うつ病は、早期に気づいて治療を始めれば良くなります。

放っておくと、**日常生活にも支障をきたす**ような、つらい状態が続きますが、
適切な治療を受ければ、**約80パーセントが以前の状態に回復します**。



うつ病になると、「ゆううつだ」「やる気が出ない」などの**“こころ”のサイン**と
「疲れているのに眠れない」「全身がだるい」などの**“からだ”のサイン**が表われます。

うつ病かも…と思ったら、ひとりで悩まず、
かかりつけの医師や最寄りの医療機関、相談窓口にご相談しましょう。

- Main message
- If treated, 80% can recover from depression.
- Information on early signs of depression
- Call to action

BMJ Open

A comparative study on persuasive health message design: effects of message framing and formatting on comprehensibility, persuasiveness, emotion, intention, and action

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| Keywords: | depression, help-seeking, persuasive message, questionnaire survey |
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ABSTRACT

Objective: To examine the effects of message framing and formatting on persuasive message effectiveness in the context of developing depression help-seeking messages.

Design: Cross-sectional followed by 2-month follow-up study

Setting and participants: A web-based survey was conducted in July 2017 among Japanese adults aged 35-45 years. Of 1,957 eligible respondents without psychiatric history, 1,805 people (92.2%) completed the 2-month follow-up questionnaire.

Main outcome measures: Six depression help-seeking messages were prepared with 3 frames (neutral-, loss-, and gain-framed) \times 2 formats (formatted and unformatted). Participants were asked to rate the messages in terms of comprehensibility, persuasiveness, emotional responses, design quality, and intended future use. Help-seeking intention for depression was measured using vignette methodology before and after exposure to the messages. Subsequent 2-month help-seeking action for their own mental health (medical service use) was monitored by the follow-up survey.

Results: Compared with the neutral-framed, the loss- and gain-framed messages more strongly influenced emotions. The message formatting applied the CDC Clear

Communication Index increased the likelihood that the message will be read and enhanced the emotional responses. Multiple logistic regression analysis revealed that the loss-framed formatted message had much effect on increasing help-seeking intention for depression. All messages had little effect on maintaining help-seeking intention or increasing help-seeking action.

Conclusion: Communicating persuasive messages will change people's intentions toward help-seeking for depression if the messages are developed carefully and appropriately.

Providers should consider that message framing and formatting influence persuasive message effectiveness when they design their messages. It would be recommendable to apply

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loss-framing and formatting to depression help-seeking messages, to say the least, but further studies are needed to find a way to sustain the effect of messaging for a long time.

Key words: depression, help-seeking, persuasive message, questionnaire survey

For peer review only

STRENGTH AND LIMITATIONS

- Health communication research has revealed that the effect of persuasive messages can depend on message characteristics, but less is known about what kind of message will more satisfactorily motivate people to seek mental health care. This study represents the first attempt to examine the effects of message framing and formatting on persuasive message effectiveness in the context of developing depression help-seeking messages.
- The experimental comparison of 6 differently framed and formatted messages successfully revealed that message framing and formatting would play different roles in the persuasion process.
- The study participants were limited to 35-45 years old selected from a nationwide panel of a research company. It is uncertain whether the messages will work equally well in other age groups or in other settings.

Introduction

Mental disorders are the leading cause of disability worldwide, accounting for 21% of all non-fatal burden [1]. Failure and delay in initial treatment contact for mental disorders has been recognized as an important public health problem [2,3]. A systematic review and meta-analysis revealed that negative attitudes toward mental illness and help-seeking are associated with less active help-seeking in the general population [4]. There is a possibility that interventions for improving people's attitudes and intentions toward help-seeking could facilitate access to mental health care, in addition to those targeting the behavior itself.

A number of public health programs have been launched to eliminate negative attitudes toward mental illness and help-seeking to facilitate access to mental health care [5]. Communication is one of the components necessary for effective public health program implementation [6]. With better information, individuals and communities can make better decisions about their own health. Effective communication produce beneficial changes in people's behaviors toward health issues [7,8]. A systematic review revealed that communicating persuasive messages is effective in improving attitudes toward help-seeking for depression [9]. Meanwhile, previous studies have suggested that depression help-seeking messages have the potential to backfire; exposure to the messages may result in increased self-stigma and increased reluctance to help-seeking (i.e. boomerang effect) [10,11]. Further evidence is needed to identify strategies for successful public health messaging with the aim of promoting access to mental health care.

Health communication research has revealed that the effect of persuasive messages can depend on message characteristics. Well known is the framing effect, that is, health messages framed to highlight either the benefits of performing a behavior (i.e. gain-framed) or the consequences of not performing a behavior (i.e. loss-framed) will lead to different decisions and different health behaviors [12]. A systematic review and meta-analysis revealed that

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3 gain-framed messages are more likely than loss-framed messages to promote prevention
4 behaviors, particularly for skin cancer prevention, smoking cessation, and physical activity
5 [13]. Meanwhile, the Cochrane Review group reported that loss-framed messages led to more
6 positive perception of effectiveness than gain-framed messages for screening messages and
7 tended to be more persuasive for treatment messages [14]. These results do not unequivocally
8 support the framing effect of health message. There seems to be some contexts in which
9 loss-framed messages are equally or more effective than gain-framed messages. It is uncertain
10 which message frame will more satisfactorily motivate people to seek mental health care, loss
11 frame or gain frame.

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22 Reading a message is the first step of the persuasion process. If recipients find difficulty in
23 reading and understanding the given message, it is unlikely to have any persuasive impact.
24 The Centers for Disease Control and Prevention (CDC) proposed a set of evidence-based
25 criteria to plan and assess public health communication materials for diverse audiences, namely
26 the Clear Communication Index [15]. On the basis of existing research-based evidence, the
27 Index represents the most important items that enhance clarity and aid understanding of public
28 health messages and materials. The six core items applicable to all materials are: 1) include one
29 main message statement, 2) put the main message first, 3) use visual cues to emphasize the main
30 message, 4) include a visual that conveys the main message, 5) include one call to action, and 6)
31 use active voice. Previous studies have demonstrated that the materials revised using the Index
32 are rated more favorably than the originals by possible audience members. The application of
33 the Index makes it more likely that audience can correctly identify the intended main message
34 and understand the words in the materials [16,17]. However, to our knowledge, there have been
35 no attempts to confirm whether health messages designed to conform to the Index items
36 function better as a stimulus to change people's behaviors toward health issues. Moreover,
37 little is known about the interaction between message frame and format. If message format
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3 significantly influences the comprehensibility of health message, it is likely to modify the
4 framing effect of health message to some extent.
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7 The objective of this study was to examine the effects of message framing and formatting
8 on persuasive message effectiveness in the context of developing depression help-seeking
9 messages. Although the mechanism of persuasive message effectiveness has not been clearly
10 elucidated, a number of factors can serve to mediate or moderate the effect of persuasive
11 messages. Emotional responses to messages influence perceptions of effectiveness of
12 messages [18,19]. Perceived message effectiveness is strongly correlated with and may be
13 causally related to actual message effectiveness [19,20]. Intention is the best determinant of
14 behavior in a wide range of health domains [21], and it has been commonly used as an
15 outcome measure in health communication research [13]. We previously found that reading
16 comprehension of health information was significantly associated with recognition of health
17 risk and intention to perform health behaviors [22]. On the basis of these findings, the present
18 study compared audience's responses to 6 differently framed and formatted messages in terms
19 of comprehensibility, persuasiveness, emotion, intention, and action.
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37 1. Methods

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39 We launched a research project to develop effective health communication interventions
40 for encouraging help-seeking in people at risk of suicide. As the first step in the research
41 project, we developed rating scales for measuring audience's perceptions of effectiveness of
42 health messages in Japanese people [23]. At the second step, we intended to develop effective
43 public health messages that increase people's help-seeking intentions for depression. We
44 created different kinds of depression help-seeking messages on the basis of our previous
45 findings [24] and conducted a web-based survey to rate them by possible audience members.
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3 examine the effects of message framing and formatting on the effectiveness of depression
4 help-seeking messages, as reported in this paper. Another objective was to determine whether
5 the effects of depression help-seeking messages are influenced by audience's depressive status,
6 as reported elsewhere [25].
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10
11 The study protocol was approved by the ethics committees of the Jikei University School
12 of Medicine and has been conducted in accordance with the Ethical Guidelines for Medical
13 and Health Research Involving Human Subjects by the Japanese Government.
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18 19 20 2.1 Patient and public involvement

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22 There were no patients involved in the design of the study or the recruitment to and
23 conduct of the study.
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28 29 2.2 Messages

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31 In order to examine the effects of message framing and formatting, six depression
32 help-seeking messages were prepared with 3 frames (neutral-, loss-, and gain-framed) × 2
33 formats (formatted and unformatted). The aim of messaging was to increase people's
34 help-seeking intentions for depression. The target audience were either depressed or
35 non-depressed people. The messages were designed as print advertisements to be inserted in
36 the form of web-based surveys.
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44 The formatted versions of depression help-seeking messages were shown in Appendix A.
45 Each message consisted of three parts. The first part was the main message statement. The
46 second part provided information on early signs of depression: depression can be recognized
47 early by mental symptoms such as depressed mood, loss of interest, etc. and physical
48 symptoms such as disturbed sleep, increased fatigue, etc. The last part was the call to action:
49 if you suspect your depression, consult your family doctor.
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3 The 3 main message statements were selected from the text message list developed by
4 Bell and colleagues [26] so as to be matched against the beliefs related to the top 3 reasons for
5 having no help-seeking intention for depression, respectively [24]: 1) depression can happen
6 to anyone, 2) depression needs treatment, and 3) depression improves with treatment. The
7 first one was neutral-framed with additional information on incidence of depression: about
8 one out of 15 people experience depression during their lifetime. The second one was
9 loss-framed (threat appeal) with additional information on prognosis of untreated patients:
10 about 80% of untreated patients will not recover. The third one was gain-framed (benefit
11 appeal) with additional information on prognosis of treated patients: about 80% of treated
12 patients will recover.
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24 For each of the 3 differently framed messages, the formatted and unformatted versions
25 were prepared. The formatted (visual) messages were visually designed in accordance with
26 the CDC Clear Communication Index User Guide [15]. The unformatted (plain) messages
27 were in plain text without any colors or visuals.
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35 2.3 Participants

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37 A web-based survey was conducted in July 2017 among Japanese adults aged 35-45 years.
38 The Comprehensive Survey of Living Conditions revealed that people who were feeling
39 stressed or distressed were most frequently observed in the 40-49 age group (58.7% in men
40 and 48.6% in women) [27]. In addition, the World Mental Health Japan Survey revealed that
41 the 12-month prevalence of mental disorders was significantly higher in the younger age
42 groups [28]. Therefore, people aged 35-45 years seemed to be a suitable target for persuasive
43 messages encouraging help-seeking for depression.
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52 Participants in the survey were recruited from an online research panel of a leading
53 research company in Japan (Cross Marketing Inc., Tokyo, Japan). Medical professionals were
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3 excluded through a prescreening process. Applicants for participation in the survey were
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5 accepted in the order of receipt until the number of participants reached the quotas for gender,
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7 area, and K6 score (1-4 and $5 \leq$ points). The Japanese version of the 6-item Kessler
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9 Psychological Distress Scale (K6) has been established as a screener for depression in Japan
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11 [29]. A validation study revealed that a K6 score ≥ 5 is a reasonable cutoff to distinguish
12
13 between depressed and non-depressed people [30]. A total of 2,520 responses were obtained
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15 over two days of recruitment.
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18 A follow-up survey was conducted in September 2017 to monitor subsequent changes in
19
20 help-seeking intention and action. Of the 2,520 participants in the initial survey, 2,315 people
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22 (91.9%) completed the follow-up questionnaire.
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25 All participants voluntarily agreed to participate in the survey after reading a description
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27 of the purpose and procedure of the survey. Consent to participate was implied by the
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29 completion and submission of the survey.
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31 32 33 2.4 Measures 34

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36 Participants in the initial survey were asked to rate one of the depression help-seeking
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38 messages after they read the message for at least 15 seconds, in terms of comprehensibility,
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40 persuasiveness, emotional responses, design quality, and intended future use. Help-seeking
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42 intention for depression was measured using vignette methodology before and after exposure
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44 to the messages. Moreover, participants in the follow-up survey were asked about
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46 help-seeking intention for depression and help-seeking action for their own mental health
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48 (medical service use) during the 2-month follow-up period.
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51 The web questionnaire forms presented the questions one by one through the operation of
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53 a 'Next' button. Respondents answered one question per page and could not go back to the
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55 previous page.
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2.4.1 Comprehensibility

Using the perceived effectiveness rating scales [23], the five items asked how easy or hard the information is to: 1) read, 2) understand, 3) remember, 4) locate important information, and 5) keep for future reference. All item scores (range 1-5 points) were averaged to produce the comprehensibility score.

2.4.2 Persuasiveness

Using the perceived effectiveness rating scales [23], the seven items asked to what extent they agree or disagree that the information is: 1) believable, 2) convincing, 3) important to me, 4) help me feel confident about how best to do, 5) would help my family and friends, 6) put thoughts in my mind about wanting to do, and 7) agreeable. All item scores (range 1-5 points) were averaged to produce the persuasiveness score.

2.4.3 Emotional responses

Participants were asked 'when you read the message, to what extent you feel: 1) surprise, 2) anger, 3) fear, 4) sadness, 5) guilt, 6) anxiety, and 7) happiness?' [18,19]. Response options were from 1 (not at all) to 5 (extremely).

2.4.4 Design quality

Six items for design quality were derived from the Consumer Information Rating Form developed by Krass and colleagues [31]. Participants were asked to rate the message on a 5-point scale in terms of 1) organization, 2) attractiveness, 3) size, 4) tone, 5) helpfulness, and 6) spacing. Higher scores indicate higher quality.

2.4.5 Intended future use

Three items for intended future use were derived from the Consumer Information Rating Form developed by Krass and colleagues [31]. Participants were asked ‘If you saw the information in a newspaper or magazine, how likely would you [use, read, and keep] it?’. Response options were from 1(very unlikely) to 5 (very likely).

2.4.6 Help-seeking intention

Help-seeking intention for depression was measured using vignette methodology. Participants were presented with a vignette describing a man (or woman) with depression and were then asked ‘If you had health problems right now like Mr. A (or Ms. A), would you see a doctor?’ [23,24,25]. Participants answered the question on a four-point scale (certainly yes/probably yes/probably not/certainly not). Those who gave affirmative answers (certainly yes and probably yes) were counted as having a positive help-seeking intention.

Help-seeking intention for depression was measured at three time points: 1) before exposure to the messages in the initial survey, 2) after exposure to the messages in the initial survey, and 3) at the follow-up survey. Those who had a positive help-seeking intention at the second point but did not at the first point were counted as developing help-seeking intentions after exposure to the message. Those who had a positive help-seeking intention both at the second and third points were counted as maintaining help-seeking intention.

2.4.7 Help-seeking action

Help-seeking action for their own mental health was measured in the follow-up survey by asking participants whether they had seen a doctor for their mental health problem in the previous 2 months.

2.5 Statistical Analysis

All statistical analyses were performed using the SAS ver. 9.4 (SAS Institute, Cary, NC, USA). Main and interaction effects of frame and format were assessed using two-way analysis of variance. The proportions of people who reported a positive help-seeking intention for depression before and after exposure to the messages were compared using McNemar test. Multiple logistic regression analysis was further conducted to compare the effects of 6 differently framed and formatted messages on help-seeking intention for depression. Odds ratios with 95% confidence intervals for help-seeking intention for depression were calculated with adjustment for gender, depressive status, and help-seeking intention before exposure the messages. Significant levels were set at $p < 0.05$.

3. Results

Figure 1 shows the flow of participants through the study. In the initial survey, 2520 participants were randomly assigned to one of the 6 message groups. Excluding those who had an experience of receiving treatment for their mental illness, the remaining 1,957 participants were included in the study. Of these, 1,805 people (92.2%) who completed the follow-up questionnaire were included in the analysis of the follow-up data.

Table 1 shows the characteristics of the study participants. Of the 1,957 participants, 45.6% had a university degree, 56.3% were married, and 60.1% had a full-time job. As a result of the random assignment of participants to 6 message groups, no significant differences between the message groups were observed in sociodemographic characteristics.

Table 2 shows the assessment of the depression help-seeking messages. The comprehensibility and persuasiveness scores showed no significant differences between the frames or between the formats. For the emotional responses, significant main effects of frame were observed in 5 out of 7 items (surprise, fear, sadness, anxiety, and happiness). There were

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2
3 a significant effect of format on 'surprise' and significant frame×format interaction effects on
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5 'anxiety' and 'happiness'. Compared with the neutral-framed, the loss- and gain-framed
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7 messages showed significant enhancements of emotional responses to the formatted messages.
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For peer review only

Table 1 Characteristics of the study participants

| | | N | |
|------------------|----------------------------------|------|-------|
| Gender | Male | 980 | 50.1% |
| | Female | 977 | 49.9% |
| Age | Mean (SD) | 40.9 | (3.0) |
| Education | Compulsory education/high school | 540 | 27.6% |
| | Junior college/vocational school | 524 | 26.8% |
| | University or higher | 893 | 45.6% |
| Marital status | Married | 1101 | 56.3% |
| | Unmarried | 767 | 39.2% |
| | Divorced/widowed | 89 | 4.5% |
| Occupation | Full-time job | 1176 | 60.1% |
| | Temporary or part-time job | 329 | 16.8% |
| | No occupation | 452 | 23.1% |
| Household income | <2.0 million yen † | 230 | 11.8% |
| | 2.0–3.9 million | 394 | 20.1% |
| | 4.0–5.9 million | 552 | 28.2% |
| | 6.0–7.9 million | 400 | 20.4% |
| | 8.0–9.9 million | 205 | 10.5% |
| | 10.0+ million | 161 | 8.2% |
| | Missing | 15 | 0.8% |

†1 million yen was about 10,000 U.S. dollars at the time of the survey.

Table 2 Assessment of the depression help-seeking messages

| | | Message | | | | | | p | | A × B |
|---------------------|------|--------------------|---------------------|----------------|-----------------|----------------|-----------------|--------------|---------------|-------|
| | | Neutral - plain | Neutral - visual | Loss -plain | Loss -visual | Gain -plain | Gain -visual | Frame (A) | Format (B) | |
| Comprehensibility | | | | | | | | | | |
| | Mean | 3.74 | 3.81 | 3.79 | 3.80 | 3.82 | 3.82 | 0.554 | 0.472 | 0.757 |
| | SD | 0.79 | 0.78 | 0.87 | 0.83 | 0.83 | 0.78 | | | |
| Persuasiveness | | | | | | | | | | |
| | Mean | 3.15 | 3.13 | 3.20 | 3.18 | 3.10 | 3.17 | 0.168 | 0.732 | 0.352 |
| | SD | 0.59 | 0.63 | 0.66 | 0.62 | 0.67 | 0.64 | | | |
| Emotional responses | | | | | | | | | | |
| 1) surprise | Mean | 2.47 | 2.57 | 2.60 | 2.81 | 2.49 | 2.63 | 0.005 | 0.002 | 0.636 |
| | SD | 1.03 | 1.10 | 1.06 | 1.01 | 1.10 | 1.02 | | | |
| 2) anger | Mean | 1.91 | 1.91 | 1.94 | 2.01 | 1.90 | 1.99 | 0.411 | 0.202 | 0.596 |
| | SD | 0.95 | 0.92 | 0.92 | 0.96 | 0.92 | 0.93 | | | |
| 3) fear | Mean | 2.51 | 2.43 | 2.55 | 2.64 | 2.22 | 2.41 | <0.001 | 0.163 | 0.061 |
| | SD | 1.03 | 1.05 | 1.06 | 1.07 | 1.01 | 0.98 | | | |
| 4) sadness | Mean | 2.44 | 2.43 | 2.53 | 2.61 | 2.24 | 2.38 | <0.001 | 0.124 | 0.413 |
| | SD | 1.03 | 1.10 | 1.05 | 1.04 | 1.01 | 0.95 | | | |
| 5) guilt | Mean | 2.09 | 2.07 | 2.08 | 2.18 | 2.02 | 2.09 | 0.326 | 0.247 | 0.440 |
| | SD | 0.91 | 0.96 | 0.93 | 0.94 | 0.92 | 0.86 | | | |
| 6) anxiety | Mean | 2.63 | 2.50 | 2.59 | 2.74 | 2.34 | 2.45 | <0.001 | 0.370 | 0.035 |
| | SD | 1.04 | 1.12 | 1.06 | 1.08 | 1.02 | 1.03 | | | |
| 7) happy | Mean | 1.93 | 1.83 | 1.99 | 1.98 | 2.17 | 2.35 | <0.001 | 0.657 | 0.024 |
| | SD | 0.96 | 0.92 | 0.98 | 0.98 | 0.98 | 0.95 | | | |
| Design quality | | | | | | | | | | |
| 1) organization | Mean | 3.67 | 3.65 | 3.72 | 3.80 | 3.64 | 3.71 | 0.113 | 0.258 | 0.557 |
| | SD | 0.87 | 0.90 | 0.91 | 0.84 | 0.88 | 0.87 | | | |
| 2) attractiveness | Mean | 3.10 | 3.22 | 3.18 | 3.37 | 3.08 | 3.26 | 0.029 | <0.001 | 0.749 |
| | SD | 0.84 | 0.89 | 0.86 | 0.84 | 0.91 | 0.90 | | | |
| 3) size | Mean | 3.38 | 3.38 | 3.37 | 3.52 | 3.32 | 3.41 | 0.177 | 0.037 | 0.296 |
| | SD | 0.81 | 0.88 | 0.91 | 0.86 | 0.79 | 0.86 | | | |
| 4) tone | Mean | 3.16 | 3.11 | 3.20 | 3.13 | 3.22 | 3.33 | 0.004 | 0.966 | 0.084 |
| | SD | 0.72 | 0.79 | 0.82 | 0.83 | 0.77 | 0.83 | | | |
| 5) helpfulness | Mean | 3.38 | 3.36 | 3.39 | 3.57 | 3.37 | 3.48 | 0.048 | 0.019 | 0.109 |
| | SD | 0.82 | 0.84 | 0.90 | 0.80 | 0.87 | 0.87 | | | |
| 6) spacing | Mean | 3.35 | 3.50 | 3.26 | 3.56 | 3.24 | 3.52 | 0.633 | <0.001 | 0.220 |
| | SD | 0.77 | 0.80 | 0.91 | 0.78 | 0.85 | 0.80 | | | |
| Intended future use | | | | | | | | | | |
| 1) read | Mean | 3.17 | 3.23 | 3.28 | 3.28 | 3.12 | 3.36 | 0.286 | 0.016 | 0.052 |
| | SD | 0.90 | 0.91 | 0.92 | 0.95 | 0.95 | 0.87 | | | |
| 2) use | Mean | 2.77 | 2.71 | 2.87 | 2.83 | 2.72 | 2.86 | 0.063 | 0.666 | 0.065 |
| | SD | 0.84 | 0.86 | 0.84 | 0.85 | 0.82 | 0.79 | | | |
| 3) keep | Mean | 2.36 | 2.34 | 2.38 | 2.48 | 2.34 | 2.46 | 0.332 | 0.142 | 0.332 |
| | SD | 0.98 | 0.95 | 0.97 | 0.98 | 0.91 | 0.90 | | | |

All items were scored on a 1-to-5 point scale. Two-way analysis of variance was used to assess main and interaction effects of frame and format.

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3 For the design quality, significant main effects of format were observed in 4 out of 6 items
4 (attractiveness, size, helpfulness, and spacing). There were significant main effects of frame
5 on 3 items (attractiveness, tone, and helpfulness) but no significant frame×format interaction.
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7 For the intended future use, a significant main effect of format was observed in 1 out of 3
8 items (read). There were no significant main effects of frame and no significant frame×format
9 interaction.
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15 Table 3 shows the changes in help-seeking intention for depression before and after
16 exposure to the messages. All messages except the neutral-plain message produced significant
17 increase in help-seeking intention. Similar results were obtained when only those who were
18 depressed (K6 score ≥ 5) were analyzed.
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24 Multiple logistic regression analysis was further conducted to compare the effects of 6
25 differently framed and formatted messages on help-seeking intention for depression.
26 Compared with the neutral-plain message as a reference group, the loss-visual message had a
27 significantly greater effect, but the others did not: the adjusted odds ratios (95% confidence
28 intervals) of the neutral-visual, loss-plain, loss-visual, gain-plain, and gain-visual messages
29 were 1.31 (0.89-1.92), 1.29 (0.88-1.89), 1.57 (1.07-2.29), 1.39 (0.95-2.04) and 1.41
30 (0.97-2.06), respectively.
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39 Of the 1,805 participants in the follow-up survey, 1,141 people had not possessed
40 help-seeking intention before exposure to the messages, and 249 people (21.8%) developed
41 their help-seeking intentions after exposure to the messages. Of these, 143 people (57.4%)
42 maintained their help-seeking intentions up to the follow-up survey. The proportion of
43 participants who maintain their help-seeking intentions was not significantly different across
44 the given messages: the percentages for the neutral-visual, loss-plain, loss-visual, gain-plain,
45 and gain-visual messages were 65.7% (23/35), 57.9% (22/38), 48.0% (25/50), 23/44 (52.3%)
46 and 67.5% (27/40), respectively ($p=0.423$).
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Table 3 Changes in help-seeking intention for depression

| Message | All | | | | Depressed (K6 score ≥ 5) | | | | | |
|---------|-----|--------------------|-------|--------|--------------------------------|-----|--------------------|-------|--------|--------|
| | N | Positive intention | | | p | N | Positive intention | | | p |
| | | Before | After | Change | | | Before | After | Change | |
| Neutral | 335 | 115 | 128 | | 0.128 | 142 | 40 | 48 | | 0.131 |
| -plain | | 34.3% | 38.2% | +11.3% | | | 28.2% | 33.8% | +20.0% | |
| Neutral | 317 | 116 | 139 | | 0.003 | 128 | 34 | 52 | | <0.001 |
| -visual | | 36.6% | 43.8% | +19.8% | | | 26.6% | 40.6% | +52.9% | |
| Loss | 325 | 126 | 146 | | 0.017 | 130 | 41 | 51 | | 0.033 |
| -plain | | 38.8% | 44.9% | +15.9% | | | 31.5% | 39.2% | +24.4% | |
| Loss | 324 | 117 | 151 | | <0.001 | 137 | 40 | 56 | | 0.003 |
| -visual | | 36.1% | 46.6% | +29.1% | | | 29.2% | 40.9% | +40.0% | |
| Gain | 323 | 117 | 144 | | 0.001 | 137 | 36 | 48 | | 0.011 |
| -plain | | 36.2% | 44.6% | +23.1% | | | 26.3% | 35.0% | +33.3% | |
| Gain | 333 | 135 | 158 | | 0.003 | 150 | 58 | 72 | | 0.004 |
| -visual | | 40.5% | 47.4% | +17.0% | | | 38.7% | 48.0% | +24.1% | |

Help-seeking intention for depression was assessed before and after exposure to the messages. McNemar test was used to assess changes in help-seeking intention.

Table 4 Help-seeking action during the follow-up period

| Message | All | | Depressed (K6 score ≥ 5) | |
|---------|---------|--------|--------------------------------|--------|
| | N | Action | N | Action |
| Neutral | 307 | 12 | 132 | 8 |
| -plain | | 3.9% | | 6.1% |
| Neutral | 295 | 12 | 121 | 5 |
| -visual | | 4.1% | | 4.1% |
| Loss | 296 | 8 | 120 | 4 |
| -plain | | 2.7% | | 3.3% |
| Loss | 305 | 9 | 128 | 6 |
| -visual | | 3.0% | | 4.7% |
| Gain | 301 | 14 | 127 | 11 |
| -plain | | 4.7% | | 8.7% |
| Gain | 301 | 11 | 141 | 8 |
| -visual | | 3.7% | | 5.7% |
| | p=0.815 | | p=0.516 | |

Help-seeking action for their own mental health in the previous 2 months was measured in the follow-up survey.

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4 Table 4 shows the help-seeking action during the follow-up period. There were 66 people
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6 (3.7%) who had seen a doctor for their mental health problem during the follow-up period.
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8 The proportion of participants with help-seeking action was not significantly different across
9
10 the given messages. Similar results were obtained when only those who were depressed (K6
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12 score ≥ 5) were analyzed.
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16 17 4. Discussion

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19 This study examined audience's responses to 6 differently framed and formatted messages
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21 that were developed with the aim of increasing people's help-seeking intentions for
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23 depression. Although depression help-seeking messages have the potential to backfire [10,11],
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25 such boomerang effect was not evident in this study. All messages except the neutral-plain
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27 message produced significant increase in help-seeking intention after exposure to the
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29 messages. This result supports the effectiveness of communicating persuasive messages for
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31 increasing people's help-seeking intentions for depression. Moreover, multiple logistic
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33 regression analysis indicated that the loss-visual message worked better than the other
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35 messages. Despite the potential limitations of this study, it would be recommendable to apply
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37 loss-framing and formatting to depression help-seeking messages.
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41 The differently framed messages brought different emotional responses in a predictable
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43 way. Compared with the neutral-framed, the loss- and gain-framed messages more strongly
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45 influenced the recipients' emotions. The loss-framed messages more strongly induced
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47 negative emotions (surprise, fear, sadness, and anxiety), while the gain-framed messages more
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49 strongly induced a positive emotion (happiness). Previous studies have suggested that
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51 emotional responses play a significant role in the persuasion process [18,19]. There was no
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53 significant difference in persuasiveness, however, the loss- and gain-framed messages seemed
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55 more likely to bring out the recipients' help-seeking intentions by inducing emotional
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3 responses than the neutral-framed messages.

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5 The formatted messages were judged superior to the unformatted messages in design
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7 quality. The formatted messages consequently succeeded in increasing the likelihood that the
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9 message will be read. These results support the effectiveness of the CDC Clear
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11 Communication Index which helps provide easily understandable health messages and materials
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13 [16,17]. The significant frame×format interaction effects on ‘anxiety’ and ‘happiness’
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15 indicated that the message formatting enhanced the recipients’ emotional responses, both
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17 negative and positive. There was no significant difference in persuasiveness, however, the
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19 formatted messages seemed more likely to be perceived as attractive and helpful by audience
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21 than the unformatted messages.
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25 As for the percentage changes in help-seeking intention for depression by message group
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27 (Table 3), it is hard to say that the loss-framed messages were more effective than the
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29 gain-framed messages or vice versa. The loss-plain message showed a smaller percentage
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31 increase than the gain-plain message (15.9% vs. 23.1%), and the proportions of participants
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33 who reported a positive help-seeking intension after exposure these messages were equivalent
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35 (44.9% vs. 44.6%). Meanwhile, the loss-visual message showed a greater percentage increase
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37 than the gain-visual message (29.1% vs. 17.0%), and the proportions of participants who
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39 reported a positive help-seeking intension after exposure these messages were equivalent
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41 (46.6% vs. 47.4%). The respective effects of loss-framing and formatting on help-seeking
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43 intention were not preeminent, but multiple logistic regression analysis revealed that the
44
45 loss-visual message had much effect on increasing help-seeking intention. Previous studies
46
47 have not provided a conclusive answer as to which message frame will more satisfactorily
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49 motivate people to seek mental health care, loss frame or gain frame [13,14]. A literature
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51 review suggested that adding pictures to written text will increase the likelihood that the text
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53 will be read, however, the effects of pictures on comprehension, recall, and adherence have
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3 not yet been established [32]. The results of this study are insufficient to conclude, but it is
4 likely that loss-framing and formatting act synergistically to increase help-seeking intention
5 for depression. It would be recommendable to apply loss-framing and formatting to
6 depression help-seeking messages, to say the least.
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11 Of those who developed their help-seeking intention after exposure to the messages,
12 43.6% did not maintain their help-seeking intentions up to the 2-month follow-up survey. The
13 depression help-seeking messages succeeded in possessing help-seeking intention for a short
14 time after exposure, but the effect could not be sustained over time. Moreover, those who had
15 taken help-seeking action during the 2-month follow-up period accounted for 3.7% of the
16 total and for 5.5% of those who were depressed (K6 score ≥ 5). Seeing a message only once
17 may be insufficient to induce help-seeking action. Although a number of interventions have
18 been conducted to promote access to mental health care, very little is known about what
19 interventions increase help-seeking action [9]. To our knowledge, there is no successful
20 precedent that proved the effect of public health messaging on help-seeking action. Further
21 studies are needed to find out effective strategies for maintaining help-seeking intention and
22 increasing help-seeking action.
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37 This study provides evidence for the effectiveness of depression help-seeking messages in
38 middle-aged Japanese people. On the contrary, it has a number of potential limitations. First,
39 the web-based survey was self-administered, so that the accuracy of responses would depend
40 on participants' understanding of the questions and their motivation to answer questions
41 accurately. The understandability of the wording of items was checked prior to the survey.
42 The use of the Internet and the provision of anonymity would be expected to elicit more
43 truthful responses, by minimizing social desirability pressures [33]. However, it is almost
44 impossible to eliminate the information bias completely. Second, the study participants were
45 selected from a nationwide panel of a research company. According to the national census
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3 [34], the percentage of the Japanese population aged 35-44 years with university degrees were
4 22.0% in 2010, considerably lower than that of this study (45.6%). The selection bias may
5 have influenced the results to some extent. Third, the study participants were limited to 35-45
6 years old. It is uncertain whether the messages will work equally well in other age groups.
7 Moreover, because of cultural differences, the findings from this study may not be applicable
8 to non-Japanese populations. Now we are planning to conduct a population-based
9 interventional study to assess the effectiveness of a public health communication program
10 using the depression help-seeking messages. We will discuss the channels and activities that
11 will be most likely to successfully reach target audience in the future study.
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24 5. Conclusion

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26 This study examined the effects of message framing and formatting on persuasive
27 message effectiveness in the context of developing depression help-seeking messages.
28 Compared with the neutral-framed, the loss- and gain-framed messages more strongly
29 influenced the recipients' emotions. The message formatting applied the CDC Clear
30 Communication Index increased the likelihood that the message will be read and enhanced
31 the recipients' emotional responses. Consequently, the loss-framed formatted message had
32 much effect on increasing help-seeking intention. According to these results, communicating
33 persuasive messages will change people's attitudes and intentions toward help-seeking for
34 depression if the messages are developed carefully and appropriately. Providers should
35 consider that message framing and formatting influence persuasive message effectiveness
36 when they design their messages. It would be recommendable to apply loss-framing and
37 formatting to depression help-seeking messages, to say the least, but further studies are
38 needed to find a way to sustain the effect of messaging for a long time.
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Contributors

MS was responsible for the design and conduct of the study, the collection, analysis, and interpretation of data, and the writing of the article. TY and HY contributed to the data interpretation and discussion of the implications of this work. All authors read and approved the final manuscript.

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Competing interest

The authors declare that they have no competing interest.

Ethics approval

The study protocol was approved by the ethics committees of the Jikei University School of Medicine and has been conducted in accordance with the Ethical Guidelines for Medical and Health Research Involving Human Subjects by the Japanese Government.

Data sharing statement

No additional data are available.

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Figure legend

Figure 1 Flow of participants through the study

For peer review only

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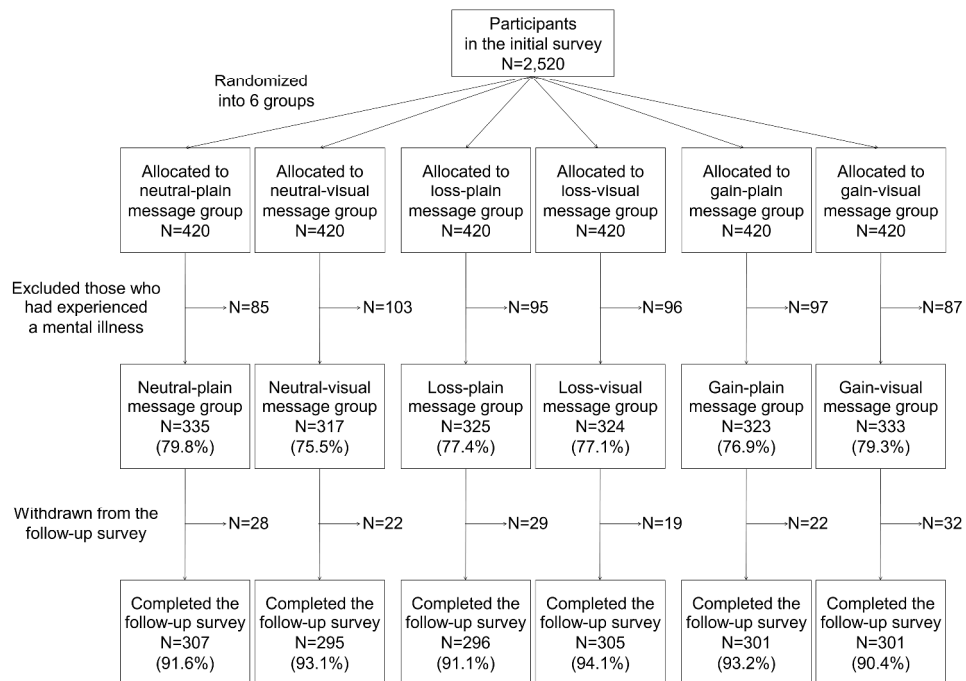


Figure 1 Flow of participants through the study


1200x900mm (96 x 96 DPI)

Appendix A. Depression help-seeking messages (formatted versions)

Neutral-framed message - “Depression can happen to anyone”

うつ病は、だれでもかかる可能性がある病気です。

つらい出来事やストレスなどをきっかけに、
およそ**15人にひとり**が生涯のうちうつ病を経験すると言われています。



うつ病になると、「ゆううつだ」「やる気が出ない」などの**“こころ”のサイン**と
「疲れているのに眠れない」「全身がだるい」などの**“からだ”のサイン**が表われます。

うつ病かも…と思ったら、ひとりで悩まず、
かかりつけの医師や最寄りの医療機関、相談窓口にご相談しましょう。

Main message

- Depression happens to one out of 15 people.


Information on early signs of depression

Call to action

Loss-framed message - “Depression needs treatment”

うつ病は、治療が必要な病気です。

放っておくと、**日常生活にも支障をきたす**ような、つらい状態が続きます。
適切な治療を受けなければ、**約80パーセントが以前の状態に回復しません**。



うつ病になると、「ゆううつだ」「やる気が出ない」などの**“こころ”のサイン**と
「疲れているのに眠れない」「全身がだるい」などの**“からだ”のサイン**が表われます。

うつ病かも…と思ったら、ひとりで悩まず、
かかりつけの医師や最寄りの医療機関、相談窓口にご相談しましょう。

Main message

- If not treated, 80% cannot recover from depression.


Information on early signs of depression

Call to action

Gain-framed message - “Depression improves with treatment”

うつ病は、早期に気づいて治療を始めれば良くなります。

放っておくと、**日常生活にも支障をきたす**ような、つらい状態が続きますが、
適切な治療を受ければ、**約80パーセントが以前の状態に回復します**。



うつ病になると、「ゆううつだ」「やる気が出ない」などの**“こころ”のサイン**と
「疲れているのに眠れない」「全身がだるい」などの**“からだ”のサイン**が表われます。

うつ病かも…と思ったら、ひとりで悩まず、
かかりつけの医師や最寄りの医療機関、相談窓口にご相談しましょう。

Main message

- If treated, 80% can recover from depression.

Information on early signs of depression

Call to action

BMJ Open

Effects of message framing and formatting on comprehensibility, persuasiveness, emotion, intention, and action in Japanese adults: a cross-sectional study with 2-month follow-up

| | |
|---------------------------------|---|
| Journal: | <i>BMJ Open</i> |
| Manuscript ID | bmjopen-2017-020823.R2 |
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| Primary Subject Heading: | Communication |
| Secondary Subject Heading: | Mental health, Public health |
| Keywords: | depression, help-seeking, persuasive message, questionnaire survey |
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3 Effects of message framing and formatting on comprehensibility, persuasiveness, emotion,
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5 intention, and action in Japanese adults: a cross-sectional study with 2-month follow-up.
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ABSTRACT

Objective: To examine the effects of message framing and formatting on persuasive message effectiveness in the context of developing depression help-seeking messages.

Design: Cross-sectional followed by 2-month follow-up study

Setting and participants: A web-based survey was conducted in July 2017 among Japanese adults aged 35-45 years. Of 1,957 eligible respondents without psychiatric history, 1,805 people (92.2%) completed the 2-month follow-up questionnaire.

Main outcome measures: Six depression help-seeking messages were prepared with 3 frames (neutral-, loss-, and gain-framed) \times 2 formats (formatted and unformatted). Participants were asked to rate the messages in terms of comprehensibility, persuasiveness, emotional responses, design quality, and intended future use. Help-seeking intention for depression was measured using vignette methodology before and after exposure to the messages. Subsequent 2-month help-seeking action for their own mental health (medical service use) was monitored by the follow-up survey.

Results: Compared with the neutral-framed, the loss- and gain-framed messages more strongly influenced emotions. The message formatting applied the CDC Clear

Communication Index increased the likelihood that the message will be read and enhanced the emotional responses. Multiple logistic regression analysis revealed that the loss-framed formatted message had much effect on increasing help-seeking intention for depression. All messages had little effect on maintaining help-seeking intention or increasing help-seeking action.

Conclusion: Communicating persuasive messages will change people's intentions toward help-seeking for depression if the messages are developed carefully and appropriately.

Providers should consider that message framing and formatting influence persuasive message effectiveness when they design their messages. It would be recommendable to apply

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loss-framing and formatting to depression help-seeking messages, to say the least, but further studies are needed to find a way to sustain the effect of messaging for a long time.

Key words: depression, help-seeking, persuasive message, questionnaire survey

For peer review only

STRENGTH AND LIMITATIONS

- This study represents the first attempt to examine the effects of message framing and formatting on persuasive message effectiveness in the context of developing depression help-seeking messages. The experimental comparison of 6 differently framed and formatted messages successfully revealed that message framing and formatting would play different roles in the persuasion process.
- This study relied on self-reported information. It is almost impossible to eliminate the information bias completely.
- The study participants were limited to 35-45 years old selected from a nationwide panel of a research company. It is uncertain whether the messages will work equally well in other age groups or in other settings.

Introduction

Mental disorders are the leading cause of disability worldwide, accounting for 21% of all non-fatal burden [1]. Failure and delay in initial treatment contact for mental disorders has been recognized as an important public health problem [2,3]. A systematic review and meta-analysis revealed that negative attitudes toward mental illness and help-seeking are associated with less active help-seeking in the general population [4]. There is a possibility that interventions for improving people's attitudes and intentions toward help-seeking could facilitate access to mental health care, in addition to those targeting people's behaviors toward mental illness itself.

A number of public health programs have been launched to eliminate negative attitudes toward mental illness and help-seeking to facilitate access to mental health care [5]. Communication is one of the components necessary for effective public health program implementation [6]. With better information, individuals and communities can make better decisions about their own health. Effective communication produce beneficial changes in people's behaviors toward health issues [7,8]. A systematic review revealed that communicating persuasive messages is effective in improving attitudes toward help-seeking for depression [9]. Meanwhile, previous studies have suggested that depression help-seeking messages have the potential to backfire; exposure to the messages may result in increased self-stigma and increased reluctance to help-seeking (i.e. boomerang effect) [10,11]. Further evidence is needed to identify strategies for successful public health messaging with the aim of promoting access to mental health care.

Health communication research has revealed that the effect of persuasive messages can depend on message characteristics. Well known is the framing effect, that is, health messages framed to highlight either the benefits of performing a behavior (i.e. gain-framed) or the consequences of not performing a behavior (i.e. loss-framed) will lead to different decisions

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2
3 and different health behaviors [12]. A systematic review and meta-analysis revealed that
4 gain-framed messages are more likely than loss-framed messages to promote prevention
5 behaviors, particularly for skin cancer prevention, smoking cessation, and physical activity
6 [13]. Meanwhile, the Cochrane Review group reported that loss-framed messages led to more
7 positive perception of effectiveness than gain-framed messages for screening messages and
8 tended to be more persuasive for treatment messages [14]. These results do not unequivocally
9 support the framing effect of health message. There seems to be some contexts in which
10 loss-framed messages are equally or more effective than gain-framed messages. It is uncertain
11 which message frame will more satisfactorily motivate people to seek mental health care, loss
12 frame or gain frame.

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Reading a message is the first step of the persuasion process. If recipients find difficulty in reading and understanding the given message, it is unlikely to have any persuasive impact. The Centers for Disease Control and Prevention (CDC) proposed a set of evidence-based criteria to plan and assess public health communication materials for diverse audiences, namely the Clear Communication Index [15]. On the basis of existing research-based evidence, the Index represents the most important items that enhance clarity and aid understanding of public health messages and materials. The six core items applicable to all materials are: 1) include one main message statement, 2) put the main message first, 3) use visual cues to emphasize the main message, 4) include a visual that conveys the main message, 5) include one call to action, and 6) use active voice. Previous studies have demonstrated that the materials revised using the Index are rated more favorably than the originals by possible audience members. The application of the Index makes it more likely that audience can correctly identify the intended main message and understand the words in the materials [16,17]. However, to our knowledge, there have been no attempts to confirm whether health messages designed to conform to the Index items function better as a stimulus to change people's behaviors toward health issues. Moreover,

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3 little is known about the interaction between message frame and format. If message format
4 significantly influences the comprehensibility of health message, it is likely to modify the
5 framing effect of health message to some extent.
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9 The objective of this study was to examine the effects of message framing and formatting
10 on persuasive message effectiveness in the context of developing depression help-seeking
11 messages. Although the mechanism of persuasive message effectiveness has not been clearly
12 elucidated, a number of factors can serve to mediate or moderate the effect of persuasive
13 messages. Emotional responses to messages influence perceptions of effectiveness of
14 messages [18,19]. Perceived message effectiveness is strongly correlated with and may be
15 causally related to actual message effectiveness [19,20]. Intention is the best determinant of
16 behavior in a wide range of health domains [21], and it has been commonly used as an
17 outcome measure in health communication research [13]. We previously found that reading
18 comprehension of health information was significantly associated with recognition of health
19 risk and intention to perform health behaviors [22]. On the basis of these findings, the present
20 study compared audience's responses to 6 differently framed and formatted messages in terms
21 of comprehensibility, persuasiveness, emotion, intention, and action.
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40 1. Methods

41 We launched a research project to develop effective health communication interventions
42 for encouraging help-seeking in people at risk of suicide. As the first step in the research
43 project, we developed rating scales for measuring audience's perceptions of effectiveness of
44 health messages in Japanese people [23]. At the second step, we intended to develop effective
45 public health messages that increase people's help-seeking intentions for depression. We
46 created different kinds of depression help-seeking messages on the basis of our previous
47 findings [24] and conducted a web-based survey to rate them by possible audience members.
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3 Data from the survey were analyzed to achieve the two intended objectives. One was to
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5 examine the effects of message framing and formatting on the effectiveness of depression
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7 help-seeking messages, as reported in this paper. Another objective was to determine whether
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9 the effects of depression help-seeking messages are influenced by audience's depressive status,
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11 as reported elsewhere [25].
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14 The study protocol was approved by the ethics committees of the Jikei University School
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16 of Medicine and has been conducted in accordance with the Ethical Guidelines for Medical
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18 and Health Research Involving Human Subjects by the Japanese Government.
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21 22 2.1 Patient and public involvement 23

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25 There were no patients involved in the design of the study or the recruitment to and
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27 conduct of the study.
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30 31 2.2 Messages 32

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34 In order to examine the effects of message framing and formatting, six depression
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36 help-seeking messages were prepared with 3 frames (neutral-, loss-, and gain-framed) \times 2
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38 formats (formatted and unformatted). The aim of messaging was to increase people's
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40 help-seeking intentions for depression. The target audience were either depressed or
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42 non-depressed people. The messages were designed as print advertisements to be inserted in
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44 the form of web-based surveys.
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47 The formatted versions of depression help-seeking messages were shown in Appendix A.
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49 Each message consisted of three parts. The first part was the main message statement. The
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51 second part provided information on early signs of depression: depression can be recognized
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53 early by mental symptoms such as depressed mood, loss of interest, etc. and physical
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55 symptoms such as disturbed sleep, increased fatigue, etc. The last part was the call to action:
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3 if you suspect your depression, consult your family doctor.
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5 The 3 main message statements were selected from the text message list developed by
6 Bell and colleagues [26] so as to be matched against the beliefs related to the top 3 reasons for
7 having no help-seeking intention for depression, respectively [24]: 1) depression can happen
8 to anyone, 2) depression needs treatment, and 3) depression improves with treatment. The
9 first one was neutral-framed with additional information on incidence of depression: about
10 one out of 15 people experience depression during their lifetime. The second one was
11 loss-framed (threat appeal) with additional information on prognosis of untreated patients:
12 about 80% of untreated patients will not recover. The third one was gain-framed (benefit
13 appeal) with additional information on prognosis of treated patients: about 80% of treated
14 patients will recover.
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26 For each of the 3 differently framed messages, the formatted and unformatted versions
27 were prepared. The formatted (visual) messages were visually designed in accordance with
28 the CDC Clear Communication Index User Guide [15]. The unformatted (plain) messages
29 were in plain text without any colors or visuals.
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37 2.3 Participants

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39 A web-based survey was conducted in July 2017 among Japanese adults aged 35-45 years.
40 The Comprehensive Survey of Living Conditions revealed that people who were feeling
41 stressed or distressed were most frequently observed in the 40-49 age group (58.7% in men
42 and 48.6% in women) [27]. In addition, the World Mental Health Japan Survey revealed that
43 the 12-month prevalence of mental disorders was significantly higher in the younger age
44 groups [28]. Therefore, people aged 35-45 years seemed to be a suitable target for persuasive
45 messages encouraging help-seeking for depression.
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54 Participants in the survey were recruited from an online research panel of a leading
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3 research company in Japan (Cross Marketing Inc., Tokyo, Japan). Medical professionals were
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5 excluded through a prescreening process. Applicants for participation in the survey were
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7 accepted in the order of receipt until the number of participants reached the quotas for gender,
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9 area, and K6 score (1-4 and $5 \leq$ points). The Japanese version of the 6-item Kessler
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11 Psychological Distress Scale (K6) has been established as a screener for depression in Japan
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13 [29]. A validation study revealed that a K6 score ≥ 5 is a reasonable cutoff to distinguish
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15 between depressed and non-depressed people [30]. A total of 2,520 responses were obtained
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17 over two days of recruitment.
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20 A follow-up survey was conducted in September 2017 to monitor subsequent changes in
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22 help-seeking intention and action. Of the 2,520 participants in the initial survey, 2,315 people
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24 (91.9%) completed the follow-up questionnaire.
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27 All participants voluntarily agreed to participate in the survey after reading a description
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29 of the purpose and procedure of the survey. Consent to participate was implied by the
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31 completion and submission of the survey.
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34 35 2.4 Measures

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37 Participants in the initial survey were asked to rate one of the depression help-seeking
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39 messages after they read the message for at least 15 seconds, in terms of comprehensibility,
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41 persuasiveness, emotional responses, design quality, and intended future use. Help-seeking
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43 intention for depression was measured using vignette methodology before and after exposure
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45 to the messages. Moreover, participants in the follow-up survey were asked about
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47 help-seeking intention for depression and help-seeking action for their own mental health
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49 (medical service use) during the 2-month follow-up period.
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52 The web questionnaire forms presented the questions one by one through the operation of
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54 a 'Next' button. Respondents answered one question per page and could not go back to the
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3 previous page.
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7 2.4.1 Comprehensibility

9 Using the perceived effectiveness rating scales [23], the five items asked how easy or hard
10 the information is to: 1) read, 2) understand, 3) remember, 4) locate important information,
11 and 5) keep for future reference. All item scores (range 1-5 points) were averaged to produce
12 the comprehensibility score.
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18 2.4.2 Persuasiveness

20 Using the perceived effectiveness rating scales [23], the seven items asked to what extent
21 they agree or disagree that the information is: 1) believable, 2) convincing, 3) important to me,
22 4) help me feel confident about how best to do, 5) would help my family and friends, 6) put
23 thoughts in my mind about wanting to do, and 7) agreeable. All item scores (range 1-5 points)
24 were averaged to produce the persuasiveness score.
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35 2.4.3 Emotional responses

36 Participants were asked ‘when you read the message, to what extent you feel: 1) surprise,
37 2) anger, 3) fear, 4) sadness, 5) guilt, 6) anxiety, and 7) happiness?’ [18,19]. Response options
38 were from 1 (not at all) to 5 (extremely).
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46 2.4.4 Design quality

47 Six items for design quality were derived from the Consumer Information Rating Form
48 developed by Krass and colleagues [31]. Participants were asked to rate the message on a
49 5-point scale in terms of 1) organization, 2) attractiveness, 3) size, 4) tone, 5) helpfulness, and
50 6) spacing. Higher scores indicate higher quality.
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2.4.5 Intended future use

Three items for intended future use were derived from the Consumer Information Rating Form developed by Krass and colleagues [31]. Participants were asked 'If you saw the information in a newspaper or magazine, how likely would you [use, read, and keep] it?'. Response options were from 1(very unlikely) to 5 (very likely).

2.4.6 Help-seeking intention

Help-seeking intention for depression was measured using vignette methodology. Participants were presented with a vignette describing a man (or woman) with depression and were then asked 'If you had health problems right now like Mr. A (or Ms. A), would you see a doctor?' [23,24,25]. Participants answered the question on a four-point scale (certainly yes/probably yes/probably not/certainly not). Those who gave affirmative answers (certainly yes and probably yes) were counted as having a positive help-seeking intention.

Help-seeking intention for depression was measured at three time points: 1) before exposure to the messages in the initial survey, 2) after exposure to the messages in the initial survey, and 3) at the follow-up survey. Those who had a positive help-seeking intention at the second point but did not at the first point were counted as developing help-seeking intentions after exposure to the message. Those who had a positive help-seeking intention both at the second and third points were counted as maintaining help-seeking intention.

2.4.7 Help-seeking action

Help-seeking action for their own mental health was measured in the follow-up survey by asking participants whether they had seen a doctor for their mental health problem in the previous 2 months.

2.5 Statistical Analysis

All statistical analyses were performed using the SAS ver. 9.4 (SAS Institute, Cary, NC, USA). Main and interaction effects of frame and format were assessed using two-way analysis of variance. The proportions of people who reported a positive help-seeking intention for depression before and after exposure to the messages were compared using McNemar test. Multiple logistic regression analysis was further conducted to compare the effects of 6 differently framed and formatted messages on help-seeking intention for depression. Odds ratios with 95% confidence intervals for help-seeking intention for depression were calculated with adjustment for gender, depressive status, and help-seeking intention before exposure the messages. Significant levels were set at $p < 0.05$.

3. Results

Figure 1 shows the flow of participants through the study. In the initial survey, 2520 participants were randomly assigned to one of the 6 message groups. Excluding those who had an experience of receiving treatment for their mental illness, the remaining 1,957 participants were included in the study. Of these, 1,805 people (92.2%) who completed the follow-up questionnaire were included in the analysis of the follow-up data.

Table 1 shows the characteristics of the study participants. Of the 1,957 participants, 45.6% had a university degree, 56.3% were married, and 60.1% had a full-time job. As a result of the random assignment of participants to 6 message groups, no significant differences between the message groups were observed in sociodemographic characteristics.

Table 1 Characteristics of the study participants

| | | N | |
|------------------|----------------------------------|------|-------|
| Gender | Male | 980 | 50.1% |
| | Female | 977 | 49.9% |
| Age | Mean (SD) | 40.9 | (3.0) |
| Education | Compulsory education/high school | 540 | 27.6% |
| | Junior college/vocational school | 524 | 26.8% |
| | University or higher | 893 | 45.6% |
| Marital status | Married | 1101 | 56.3% |
| | Unmarried | 767 | 39.2% |
| | Divorced/widowed | 89 | 4.5% |
| Occupation | Full-time job | 1176 | 60.1% |
| | Temporary or part-time job | 329 | 16.8% |
| | No occupation | 452 | 23.1% |
| Household income | <2.0 million yen † | 230 | 11.8% |
| | 2.0–3.9 million | 394 | 20.1% |
| | 4.0–5.9 million | 552 | 28.2% |
| | 6.0–7.9 million | 400 | 20.4% |
| | 8.0–9.9 million | 205 | 10.5% |
| | 10.0+ million | 161 | 8.2% |
| | Missing | 15 | 0.8% |

†1 million yen was about 10,000 U.S. dollars at the time of the survey.

Table 2 Assessment of the depression help-seeking messages

| | | Message | | | | | | p | | A × B |
|---------------------|------|--------------------|---------------------|----------------|-----------------|----------------|-----------------|--------------|---------------|-------|
| | | Neutral - plain | Neutral - visual | Loss -plain | Loss -visual | Gain -plain | Gain -visual | Frame (A) | Format (B) | |
| Comprehensibility | | | | | | | | | | |
| | Mean | 3.74 | 3.81 | 3.79 | 3.80 | 3.82 | 3.82 | 0.554 | 0.472 | 0.757 |
| | SD | 0.79 | 0.78 | 0.87 | 0.83 | 0.83 | 0.78 | | | |
| Persuasiveness | | | | | | | | | | |
| | Mean | 3.15 | 3.13 | 3.20 | 3.18 | 3.10 | 3.17 | 0.168 | 0.732 | 0.352 |
| | SD | 0.59 | 0.63 | 0.66 | 0.62 | 0.67 | 0.64 | | | |
| Emotional responses | | | | | | | | | | |
| 1) surprise | Mean | 2.47 | 2.57 | 2.60 | 2.81 | 2.49 | 2.63 | 0.005 | 0.002 | 0.636 |
| | SD | 1.03 | 1.10 | 1.06 | 1.01 | 1.10 | 1.02 | | | |
| 2) anger | Mean | 1.91 | 1.91 | 1.94 | 2.01 | 1.90 | 1.99 | 0.411 | 0.202 | 0.596 |
| | SD | 0.95 | 0.92 | 0.92 | 0.96 | 0.92 | 0.93 | | | |
| 3) fear | Mean | 2.51 | 2.43 | 2.55 | 2.64 | 2.22 | 2.41 | <0.001 | 0.163 | 0.061 |
| | SD | 1.03 | 1.05 | 1.06 | 1.07 | 1.01 | 0.98 | | | |
| 4) sadness | Mean | 2.44 | 2.43 | 2.53 | 2.61 | 2.24 | 2.38 | <0.001 | 0.124 | 0.413 |
| | SD | 1.03 | 1.10 | 1.05 | 1.04 | 1.01 | 0.95 | | | |
| 5) guilt | Mean | 2.09 | 2.07 | 2.08 | 2.18 | 2.02 | 2.09 | 0.326 | 0.247 | 0.440 |
| | SD | 0.91 | 0.96 | 0.93 | 0.94 | 0.92 | 0.86 | | | |
| 6) anxiety | Mean | 2.63 | 2.50 | 2.59 | 2.74 | 2.34 | 2.45 | <0.001 | 0.370 | 0.035 |
| | SD | 1.04 | 1.12 | 1.06 | 1.08 | 1.02 | 1.03 | | | |
| 7) happy | Mean | 1.93 | 1.83 | 1.99 | 1.98 | 2.17 | 2.35 | <0.001 | 0.657 | 0.024 |
| | SD | 0.96 | 0.92 | 0.98 | 0.98 | 0.98 | 0.95 | | | |
| Design quality | | | | | | | | | | |
| 1) organization | Mean | 3.67 | 3.65 | 3.72 | 3.80 | 3.64 | 3.71 | 0.113 | 0.258 | 0.557 |
| | SD | 0.87 | 0.90 | 0.91 | 0.84 | 0.88 | 0.87 | | | |
| 2) attractiveness | Mean | 3.10 | 3.22 | 3.18 | 3.37 | 3.08 | 3.26 | 0.029 | <0.001 | 0.749 |
| | SD | 0.84 | 0.89 | 0.86 | 0.84 | 0.91 | 0.90 | | | |
| 3) size | Mean | 3.38 | 3.38 | 3.37 | 3.52 | 3.32 | 3.41 | 0.177 | 0.037 | 0.296 |
| | SD | 0.81 | 0.88 | 0.91 | 0.86 | 0.79 | 0.86 | | | |
| 4) tone | Mean | 3.16 | 3.11 | 3.20 | 3.13 | 3.22 | 3.33 | 0.004 | 0.966 | 0.084 |
| | SD | 0.72 | 0.79 | 0.82 | 0.83 | 0.77 | 0.83 | | | |
| 5) helpfulness | Mean | 3.38 | 3.36 | 3.39 | 3.57 | 3.37 | 3.48 | 0.048 | 0.019 | 0.109 |
| | SD | 0.82 | 0.84 | 0.90 | 0.80 | 0.87 | 0.87 | | | |
| 6) spacing | Mean | 3.35 | 3.50 | 3.26 | 3.56 | 3.24 | 3.52 | 0.633 | <0.001 | 0.220 |
| | SD | 0.77 | 0.80 | 0.91 | 0.78 | 0.85 | 0.80 | | | |
| Intended future use | | | | | | | | | | |
| 1) read | Mean | 3.17 | 3.23 | 3.28 | 3.28 | 3.12 | 3.36 | 0.286 | 0.016 | 0.052 |
| | SD | 0.90 | 0.91 | 0.92 | 0.95 | 0.95 | 0.87 | | | |
| 2) use | Mean | 2.77 | 2.71 | 2.87 | 2.83 | 2.72 | 2.86 | 0.063 | 0.666 | 0.065 |
| | SD | 0.84 | 0.86 | 0.84 | 0.85 | 0.82 | 0.79 | | | |
| 3) keep | Mean | 2.36 | 2.34 | 2.38 | 2.48 | 2.34 | 2.46 | 0.332 | 0.142 | 0.332 |
| | SD | 0.98 | 0.95 | 0.97 | 0.98 | 0.91 | 0.90 | | | |

All items were scored on a 1-to-5 point scale. Two-way analysis of variance was used to assess main and interaction effects of frame and format.

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3 Table 2 shows the assessment of the depression help-seeking messages. The
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5 comprehensibility and persuasiveness scores showed no significant differences between the
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7 frames or between the formats. For the emotional responses, significant main effects of frame
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9 were observed in 5 out of 7 items (surprise, fear, sadness, anxiety, and happiness). There were
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11 a significant effect of format on 'surprise' and significant frame×format interaction effects on
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13 'anxiety' and 'happiness'. Compared with the neutral-framed, the loss- and gain-framed
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15 messages showed significant enhancements of emotional responses to the formatted messages.
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17 For the design quality, significant main effects of format were observed in 4 out of 6 items
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19 (attractiveness, size, helpfulness, and spacing). There were significant main effects of frame
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21 on 3 items (attractiveness, tone, and helpfulness) but no significant frame×format interaction.
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23 For the intended future use, a significant main effect of format was observed in 1 out of 3
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25 items (read). There were no significant main effects of frame and no significant frame×format
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27 interaction.
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31 Table 3 shows the changes in help-seeking intention for depression before and after
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33 exposure to the messages. All messages except the neutral-plain message produced significant
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35 increase in help-seeking intention. Similar results were obtained when only those who were
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37 depressed (K6 score ≥ 5) were analyzed.
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40 Multiple logistic regression analysis was further conducted to compare the effects of 6
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42 differently framed and formatted messages on help-seeking intention for depression.
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44 Compared with the neutral-plain message as a reference group, the loss-visual message had a
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46 significantly greater effect, but the others did not: the adjusted odds ratios (95% confidence
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48 intervals) of the neutral-visual, loss-plain, loss-visual, gain-plain, and gain-visual messages
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50 were 1.31 (0.89-1.92), 1.29 (0.88-1.89), 1.57 (1.07-2.29), 1.39 (0.95-2.04) and 1.41
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52 (0.97-2.06), respectively.
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Table 3 Changes in help-seeking intention for depression

| Message | All | | | | Depressed (K6 score ≥ 5) | | | | | |
|---------|-----|--------------------|-------|--------|--------------------------------|-----|--------------------|-------|--------|--------|
| | N | Positive intention | | | p | N | Positive intention | | | p |
| | | Before | After | Change | | | Before | After | Change | |
| Neutral | 335 | 115 | 128 | | 0.128 | 142 | 40 | 48 | | 0.131 |
| -plain | | 34.3% | 38.2% | +11.3% | | | 28.2% | 33.8% | +20.0% | |
| Neutral | 317 | 116 | 139 | | 0.003 | 128 | 34 | 52 | | <0.001 |
| -visual | | 36.6% | 43.8% | +19.8% | | | 26.6% | 40.6% | +52.9% | |
| Loss | 325 | 126 | 146 | | 0.017 | 130 | 41 | 51 | | 0.033 |
| -plain | | 38.8% | 44.9% | +15.9% | | | 31.5% | 39.2% | +24.4% | |
| Loss | 324 | 117 | 151 | | <0.001 | 137 | 40 | 56 | | 0.003 |
| -visual | | 36.1% | 46.6% | +29.1% | | | 29.2% | 40.9% | +40.0% | |
| Gain | 323 | 117 | 144 | | 0.001 | 137 | 36 | 48 | | 0.011 |
| -plain | | 36.2% | 44.6% | +23.1% | | | 26.3% | 35.0% | +33.3% | |
| Gain | 333 | 135 | 158 | | 0.003 | 150 | 58 | 72 | | 0.004 |
| -visual | | 40.5% | 47.4% | +17.0% | | | 38.7% | 48.0% | +24.1% | |

Help-seeking intention for depression was assessed before and after exposure to the messages. McNemar test was used to assess changes in help-seeking intention.

Table 4 Help-seeking action during the follow-up period

| Message | All | | Depressed (K6 score ≥ 5) | |
|---------|---------|--------|--------------------------------|--------|
| | N | Action | N | Action |
| Neutral | 307 | 12 | 132 | 8 |
| -plain | | 3.9% | | 6.1% |
| Neutral | 295 | 12 | 121 | 5 |
| -visual | | 4.1% | | 4.1% |
| Loss | 296 | 8 | 120 | 4 |
| -plain | | 2.7% | | 3.3% |
| Loss | 305 | 9 | 128 | 6 |
| -visual | | 3.0% | | 4.7% |
| Gain | 301 | 14 | 127 | 11 |
| -plain | | 4.7% | | 8.7% |
| Gain | 301 | 11 | 141 | 8 |
| -visual | | 3.7% | | 5.7% |
| | p=0.815 | | p=0.516 | |

Help-seeking action for their own mental health in the previous 2 months was measured in the follow-up survey.

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4 Of the 1,805 participants in the follow-up survey, 1,141 people had not possessed
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6 help-seeking intention before exposure to the messages, and 249 people (21.8%) developed
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8 their help-seeking intentions after exposure to the messages. Of these, 143 people (57.4%)
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10 maintained their help-seeking intentions up to the follow-up survey. The proportion of
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12 participants who maintain their help-seeking intentions was not significantly different across
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14 the given messages: the percentages for the neutral-visual, loss-plain, loss-visual, gain-plain,
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16 and gain-visual messages were 65.7% (23/35), 57.9% (22/38), 48.0% (25/50), 23/44 (52.3%)
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18 and 67.5% (27/40), respectively ($p=0.423$).
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21 Table 4 shows the help-seeking action during the follow-up period. There were 66 people
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23 (3.7%) who had seen a doctor for their mental health problem during the follow-up period.
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25 The proportion of participants with help-seeking action was not significantly different across
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27 the given messages. Similar results were obtained when only those who were depressed (K6
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29 score ≥ 5) were analyzed.
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32 33 34 4. Discussion 35

36 This study examined audience's responses to 6 differently framed and formatted messages
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38 that were developed with the aim of increasing people's help-seeking intentions for
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40 depression. Although depression help-seeking messages have the potential to backfire [10,11],
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42 such boomerang effect was not evident in this study. All messages except the neutral-plain
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44 message produced significant increase in help-seeking intention after exposure to the
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46 messages. This result supports the effectiveness of communicating persuasive messages for
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48 increasing people's help-seeking intentions for depression. Moreover, multiple logistic
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50 regression analysis indicated that the loss-visual message worked better than the other
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52 messages. Despite the potential limitations of this study, it would be recommendable to apply
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54 loss-framing and formatting to depression help-seeking messages.
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3 The differently framed messages brought different emotional responses in a predictable
4 way. Compared with the neutral-framed, the loss- and gain-framed messages more strongly
5 influenced the recipients' emotions. The loss-framed messages more strongly induced
6 negative emotions (surprise, fear, sadness, and anxiety), while the gain-framed messages more
7 strongly induced a positive emotion (happiness). Previous studies have suggested that
8 emotional responses play a significant role in the persuasion process [18,19]. There was no
9 significant difference in persuasiveness, however, the loss- and gain-framed messages seemed
10 more likely to bring out the recipients' help-seeking intentions by inducing emotional
11 responses than the neutral-framed messages.
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22 The formatted messages were judged superior to the unformatted messages in design
23 quality. The formatted messages consequently succeeded in increasing the likelihood that the
24 message will be read. These results support the effectiveness of the CDC Clear
25 Communication Index which helps provide easily understandable health messages and materials
26 [16,17]. The significant frame×format interaction effects on 'anxiety' and 'happiness'
27 indicated that the message formatting enhanced the recipients' emotional responses, both
28 negative and positive. There was no significant difference in persuasiveness, however, the
29 formatted messages seemed more likely to be perceived as attractive and helpful by audience
30 than the unformatted messages.
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41 As for the percentage changes in help-seeking intention for depression by message group
42 (Table 3), it is hard to say that the loss-framed messages were more effective than the
43 gain-framed messages or vice versa. The loss-plain message showed a smaller percentage
44 increase than the gain-plain message (15.9% vs. 23.1%), and the proportions of participants
45 who reported a positive help-seeking intention after exposure these messages were equivalent
46 (44.9% vs. 44.6%). Meanwhile, the loss-visual message showed a greater percentage increase
47 than the gain-visual message (29.1% vs. 17.0%), and the proportions of participants who
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3 reported a positive help-seeking intention after exposure these messages were equivalent
4 (46.6% vs. 47.4%). The respective effects of loss-framing and formatting on help-seeking
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7 intention were not preeminent, but multiple logistic regression analysis revealed that the
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9 loss-visual message had much effect on increasing help-seeking intention. Previous studies
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11 have not provided a conclusive answer as to which message frame will more satisfactorily
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13 motivate people to seek mental health care, loss frame or gain frame [13,14]. A literature
14
15 review suggested that adding pictures to written text will increase the likelihood that the text
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17 will be read, however, the effects of pictures on comprehension, recall, and adherence have
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19 not yet been established [32]. The results of this study are insufficient to conclude, but it is
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21 likely that loss-framing and formatting act synergistically to increase help-seeking intention
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23 for depression. It would be recommendable to apply loss-framing and formatting to
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25 depression help-seeking messages, to say the least.
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29 Of those who developed their help-seeking intention after exposure to the messages,
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31 43.6% did not maintain their help-seeking intentions up to the 2-month follow-up survey. The
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33 depression help-seeking messages succeeded in possessing help-seeking intention for a short
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35 time after exposure, but the effect could not be sustained over time. Moreover, those who had
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37 taken help-seeking action during the 2-month follow-up period accounted for 3.7% of the
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39 total and for 5.5% of those who were depressed (K6 score ≥ 5). Seeing a message only once
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41 may be insufficient to induce help-seeking action. Although a number of interventions have
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43 been conducted to promote access to mental health care, very little is known about what
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45 interventions increase help-seeking action [9]. To our knowledge, there is no successful
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47 precedent that proved the effect of public health messaging on help-seeking action. Further
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49 studies are needed to find out effective strategies for maintaining help-seeking intention and
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51 increasing help-seeking action.
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55 This study provides evidence for the effectiveness of depression help-seeking messages in
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3 middle-aged Japanese people. On the contrary, it has a number of potential limitations. First,
4 the web-based survey was self-administered, so that the accuracy of responses would depend
5 on participants' understanding of the questions and their motivation to answer questions
6 accurately. The understandability of the wording of items was checked prior to the survey.
7
8 The use of the Internet and the provision of anonymity would be expected to elicit more
9 truthful responses, by minimizing social desirability pressures [33]. However, it is almost
10 impossible to eliminate the information bias completely. Second, the study participants were
11 selected from a nationwide panel of a research company. According to the national census
12 [34], the percentage of the Japanese population aged 35-44 years with university degrees were
13 22.0% in 2010, considerably lower than that of this study (45.6%). The selection bias may
14 have influenced the results to some extent. Third, the study participants were limited to 35-45
15 years old. It is uncertain whether the messages will work equally well in other age groups.
16
17 Moreover, because of cultural differences, the findings from this study may not be applicable
18 to non-Japanese populations. Now we are planning to conduct a population-based
19 interventional study to assess the effectiveness of a public health communication program
20 using the depression help-seeking messages. We will discuss the channels and activities that
21 will be most likely to successfully reach target audience in the future study.
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41 5. Conclusion

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43 This study examined the effects of message framing and formatting on persuasive
44 message effectiveness in the context of developing depression help-seeking messages.
45 Compared with the neutral-framed, the loss- and gain-framed messages more strongly
46 influenced the recipients' emotions. The message formatting applied the CDC Clear
47 Communication Index increased the likelihood that the message will be read and enhanced
48 the recipients' emotional responses. Consequently, the loss-framed formatted message had
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3 much effect on increasing help-seeking intention. According to these results, communicating
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5 persuasive messages will change people's attitudes and intentions toward help-seeking for
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7 depression if the messages are developed carefully and appropriately. Providers should
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9 consider that message framing and formatting influence persuasive message effectiveness
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11 when they design their messages. It would be recommendable to apply loss-framing and
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13 formatting to depression help-seeking messages, to say the least, but further studies are
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15 needed to find a way to sustain the effect of messaging for a long time.
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20 Contributors

21
22 MS was responsible for the design and conduct of the study, the collection, analysis, and
23
24 interpretation of data, and the writing of the article. TY and HY contributed to the data
25
26 interpretation and discussion of the implications of this work. All authors read and approved
27
28 the final manuscript.
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36
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42 Competing interest

43
44 The authors declare that they have no competing interest.
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48 Ethics approval

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50 The study protocol was approved by the ethics committees of the Jikei University School
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52 of Medicine and has been conducted in accordance with the Ethical Guidelines for Medical
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54 and Health Research Involving Human Subjects by the Japanese Government.
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5 Data sharing statement
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7 No additional data are available.
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Figure legend

Figure 1 Flow of participants through the study

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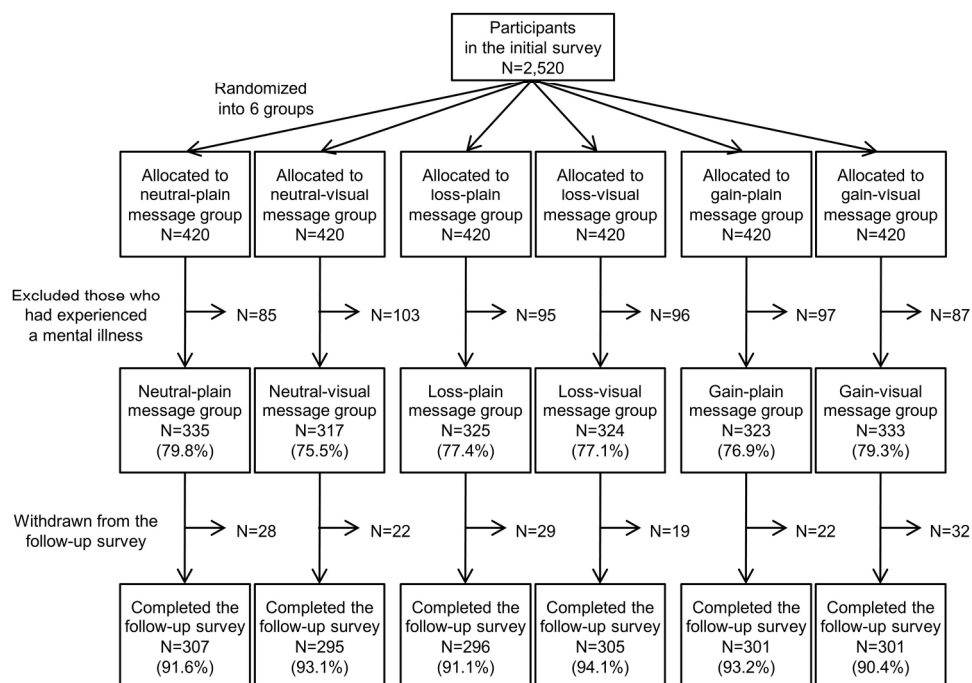


Figure 1 Flow of participants through the study


190x142mm (300 x 300 DPI)

Appendix A. Depression help-seeking messages (formatted versions)

Neutral-framed message - “Depression can happen to anyone”

うつ病は、だれでもかかる可能性がある病気です。

つらい出来事やストレスなどをきっかけに、
およそ**15人にひとり**が生涯のうちうつ病を経験すると言われています。



うつ病になると、「ゆううつだ」「やる気が出ない」などの**“こころ”のサイン**と
「疲れているのに眠れない」「全身がだるい」などの**“からだ”のサイン**が表われます。


うつ病かも…と思ったら、ひとりで悩まず、
かかりつけの医師や最寄りの医療機関、相談窓口にご相談しましょう。

- Main message
- Depression happens to one out of 15 people.
- Information on early signs of depression
- Call to action

Loss-framed message - “Depression needs treatment”

うつ病は、治療が必要な病気です。

放っておくと、**日常生活にも支障をきたす**ような、つらい状態が続きます。
適切な治療を受けなければ、**約80パーセントが以前の状態に回復しません**。



うつ病になると、「ゆううつだ」「やる気が出ない」などの**“こころ”のサイン**と
「疲れているのに眠れない」「全身がだるい」などの**“からだ”のサイン**が表われます。


うつ病かも…と思ったら、ひとりで悩まず、
かかりつけの医師や最寄りの医療機関、相談窓口にご相談しましょう。

- Main message
- If not treated, 80% cannot recover from depression.
- Information on early signs of depression
- Call to action

Gain-framed message - “Depression improves with treatment”

うつ病は、早期に気づいて治療を始めれば良くなります。

放っておくと、**日常生活にも支障をきたす**ような、つらい状態が続きますが、
適切な治療を受ければ、**約80パーセントが以前の状態に回復します**。



うつ病になると、「ゆううつだ」「やる気が出ない」などの**“こころ”のサイン**と
「疲れているのに眠れない」「全身がだるい」などの**“からだ”のサイン**が表われます。

うつ病かも…と思ったら、ひとりで悩まず、
かかりつけの医師や最寄りの医療機関、相談窓口にご相談しましょう。

- Main message
- If treated, 80% can recover from depression.
- Information on early signs of depression
- Call to action

BMJ Open

Comparing responses to differently framed and formatted persuasive messages to encourage help-seeking for depression in Japanese adults: a cross-sectional study with 2-month follow-up

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| Primary Subject Heading: | Communication |
| Secondary Subject Heading: | Mental health, Public health |
| Keywords: | depression, help-seeking, persuasive message, questionnaire survey |
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3 Comparing responses to differently framed and formatted persuasive messages to encourage
4 help-seeking for depression in Japanese adults: a cross-sectional study with 2-month
5 follow-up.
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ABSTRACT

Objective: To examine audience's responses to differently framed and formatted persuasive messages in the context of developing depression help-seeking messages.

Design: Cross-sectional followed by 2-month follow-up study

Setting and participants: A web-based survey was conducted in July 2017 among Japanese adults aged 35-45 years. There were 1,957 eligible respondents without psychiatric history. Of these, 1,805 people (92.2%) completed the 2-month follow-up questionnaire.

Main outcome measures: Six depression help-seeking messages were prepared with 3 frames (neutral-, loss-, and gain-framed) × 2 formats (formatted and unformatted). Participants were asked to rate one of the messages in terms of comprehensibility, persuasiveness, emotional responses, design quality, and intended future use. Help-seeking intention for depression was measured using vignette methodology before and after exposure to the messages. Subsequent 2-month help-seeking action for their own mental health (medical service use) was monitored by the follow-up survey.

Results: The loss-framed messages more strongly induced negative emotions (surprise, fear, sadness, and anxiety), while the gain-framed messages more strongly induced a positive emotion (happiness). The message formatting applied the CDC Clear Communication Index enhanced the emotional responses and increased the likelihood that the message will be read. The loss-framed formatted message alone had a significantly greater odds ratio of having help-seeking intention for depression compared with the neutral-framed unformatted message as a reference group. All messages had little impact on maintaining help-seeking intention or increasing help-seeking action.

Conclusion: Message framing and formatting may influence emotional responses to the depression help-seeking message, willingness to read the message, and intention to seek help for depression. It would be recommendable to apply loss-framing and formatting to

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depression help-seeking messages, to say the least, but further studies are needed to find a way to sustain the effect of messaging for a long time.

Key words: depression, help-seeking, persuasive message, questionnaire survey

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STRENGTH AND LIMITATIONS

- This study represents the first attempt to compare audience's responses to 6 depression help-seeking messages with 3 frames (neutral-, loss-, and gain-framed) × 2 formats (formatted and unformatted).
- The 2-month follow-up survey was conducted to monitor changes in help-seeking intention and action after exposure to the messages.
- This study relied on self-reported information. It is almost impossible to eliminate the information bias completely.
- The study participants were limited to 35-45 years old selected from a nationwide panel of a research company. It is uncertain whether the messages will work equally well in other age groups or in other settings.

Introduction

Mental disorders are the leading cause of disability worldwide, accounting for 21% of all non-fatal burden [1]. Failure and delay in initial treatment contact for mental disorders has been recognized as an important public health problem [2,3]. A systematic review and meta-analysis revealed that negative attitudes toward mental illness and help-seeking are associated with less active help-seeking in the general population [4]. There is a possibility that interventions for improving people's attitudes and intentions toward help-seeking could facilitate access to mental health care, in addition to those targeting people's behaviors itself.

A number of public health programs have been launched to eliminate negative attitudes toward mental illness and help-seeking to facilitate access to mental health care [5]. Communication is one of the components necessary for effective public health program implementation [6]. With better information, individuals and communities can make better decisions about their own health. Effective communication produce beneficial changes in people's behaviors toward health issues [7,8]. A systematic review revealed that communicating persuasive messages is effective in improving attitudes toward help-seeking for depression [9]. Meanwhile, previous studies have suggested that depression help-seeking messages have the potential to backfire; exposure to the messages may result in increased self-stigma and increased reluctance to help-seeking (i.e. boomerang effect) [10,11]. Further evidence is needed to identify strategies for successful public health messaging with the aim of promoting access to mental health care.

Health communication research has revealed that the effect of persuasive messages can depend on message characteristics. Well known is the framing effect, that is, health messages framed to highlight either the benefits of performing a behavior (i.e. gain-framed) or the consequences of not performing a behavior (i.e. loss-framed) will lead to different decisions and different health behaviors [12]. A systematic review and meta-analysis revealed that

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3 gain-framed messages are more likely than loss-framed messages to promote prevention
4 behaviors, particularly for skin cancer prevention, smoking cessation, and physical activity
5 [13]. Meanwhile, the Cochrane Review group reported that loss-framed messages led to more
6 positive perception of effectiveness than gain-framed messages for screening messages and
7 tended to be more persuasive for treatment messages [14]. These results do not unequivocally
8 support the framing effect of health message. There seems to be some contexts in which
9 loss-framed messages are equally or more effective than gain-framed messages. It is uncertain
10 which message frame will more satisfactorily motivate people to seek mental health care, loss
11 frame or gain frame.

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22 Reading a message is the first step of the persuasion process. If recipients find difficulty in
23 reading and understanding the given message, it is unlikely to have any persuasive impact.
24 The Centers for Disease Control and Prevention (CDC) proposed a set of evidence-based
25 criteria to plan and assess public health communication materials for diverse audiences, namely
26 the Clear Communication Index [15]. On the basis of existing research-based evidence, the
27 Index represents the most important items that enhance clarity and aid understanding of public
28 health messages and materials. The six core items applicable to all materials are: 1) include one
29 main message statement, 2) put the main message first, 3) use visual cues to emphasize the main
30 message, 4) include a visual that conveys the main message, 5) include one call to action, and 6)
31 use active voice. Previous studies have demonstrated that the materials revised using the Index
32 are rated more favorably than the originals by possible audience members. The application of
33 the Index makes it more likely that audience can correctly identify the intended main message
34 and understand the words in the materials [16,17]. However, to our knowledge, there have been
35 no attempts to confirm whether health messages designed to conform to the Index items
36 function better as a stimulus to change people's behaviors toward health issues. Moreover,
37 little is known about the interaction between message frame and format. If message format

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2 significantly influences the comprehensibility of health message, it is likely to modify the
3 framing effect of health message to some extent.
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7 The objective of this study was to examine whether message framing and formatting are
8 related to persuasive message effectiveness in the context of developing depression
9 help-seeking messages. Although the mechanism of persuasive message effectiveness has not
10 been clearly elucidated, a number of factors can serve to mediate or moderate the effect of
11 persuasive messages. Emotional responses to messages influence perceptions of effectiveness
12 of messages [18,19]. Perceived message effectiveness is strongly correlated with and may be
13 causally related to actual message effectiveness [19,20]. Intention is the best determinant of
14 behavior in a wide range of health domains [21], and it has been commonly used as an
15 outcome measure in health communication research [13]. We previously found that reading
16 comprehension of health information was significantly associated with recognition of health
17 risk and intention to perform health behaviors [22]. On the basis of these findings, the present
18 study compared audience's responses to six depression help-seeking messages with 3 frames
19 (neutral-, loss-, and gain-framed) × 2 formats (formatted and unformatted) in terms of
20 comprehensibility, persuasiveness, emotion, intention, and action.
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41 1. Methods

42 We launched a research project to develop effective health communication interventions
43 for encouraging help-seeking in people at risk of suicide. As the first step in the research
44 project, we developed rating scales for measuring audience's perceptions of effectiveness of
45 health messages in Japanese people [23]. At the second step, we intended to develop effective
46 public health messages that increase people's help-seeking intentions for depression. We
47 created different kinds of depression help-seeking messages on the basis of our previous
48 findings [24] and conducted a web-based survey to rate them by possible audience members.
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3 Data from the survey were analyzed to achieve the two intended objectives. One was to
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5 examine whether message framing and formatting are related to the effectiveness of
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7 depression help-seeking messages, as reported in this paper. Another objective was to
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9 determine whether the effectiveness of depression help-seeking messages are influenced by
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11 audience's depressive status, as reported elsewhere [25].
12

13 The study protocol was approved by the ethics committees of the Jikei University School
14
15 of Medicine and has been conducted in accordance with the Ethical Guidelines for Medical
16
17 and Health Research Involving Human Subjects by the Japanese Government.
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22 2.1 Patient and public involvement

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24 There were no patients involved in the design of the study or the recruitment to and
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26 conduct of the study.
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30 2.2 Messages

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32 In order to examine the effects of message framing and formatting, six depression
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34 help-seeking messages were prepared with 3 frames (neutral-, loss-, and gain-framed) \times 2
35
36 formats (formatted and unformatted). The aim of messaging was to increase people's
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38 help-seeking intentions for depression. The target audience were either depressed or
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40 non-depressed people. The messages were designed as print advertisements to be inserted in
41
42 the form of web-based surveys.
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46 The formatted versions of depression help-seeking messages were shown in Appendix A.
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48 Each message consisted of three parts. The first part was the main message statement. The
49
50 second part provided information on early signs of depression: depression can be recognized
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52 early by mental symptoms such as depressed mood, loss of interest, etc. and physical
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54 symptoms such as disturbed sleep, increased fatigue, etc. The last part was the call to action:
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3 if you suspect your depression, consult your familiar primary care doctor.
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5 The 3 main message statements were selected from the text message list developed by
6 Bell and colleagues [26] so as to be matched against the beliefs related to the top 3 reasons for
7 having no help-seeking intention for depression, respectively [24]: 1) depression can happen
8 to anyone, 2) depression needs treatment, and 3) depression improves with treatment. The
9 first one was neutral-framed with additional information on incidence of depression: about
10 one out of 15 people experience depression during their lifetime. The second one was
11 loss-framed (threat appeal) with additional information on prognosis of untreated patients:
12 about 80% of untreated patients will not recover. The third one was gain-framed (benefit
13 appeal) with additional information on prognosis of treated patients: about 80% of treated
14 patients will recover.
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26 For each of the 3 differently framed messages, the formatted and unformatted versions
27 were prepared. The formatted (visual) messages were visually designed in accordance with
28 the CDC Clear Communication Index User Guide [15]. The unformatted (plain) messages
29 were in plain text without any colors or visuals.
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37 2.3 Participants

38 A web-based survey was conducted in July 2017 among Japanese adults aged 35-45 years.
39 The Comprehensive Survey of Living Conditions revealed that people who were feeling
40 stressed or distressed were most frequently observed in the 40-49 age group (58.7% in men
41 and 48.6% in women) [27]. In addition, the World Mental Health Japan Survey revealed that
42 the 12-month prevalence of mental disorders was significantly higher in the younger age
43 groups [28]. Therefore, people aged 35-45 years seemed to be a suitable target for persuasive
44 messages encouraging help-seeking for depression.
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54 Participants in the survey were recruited from an online research panel of a leading
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3 research company in Japan (Cross Marketing Inc., Tokyo, Japan). Medical professionals were
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5 excluded through a prescreening process. Applicants for participation in the survey were
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7 accepted in the order of receipt until the number of participants reached the quotas for gender,
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9 area, and K6 score (1-4 and $5 \leq$ points). The Japanese version of the 6-item Kessler
10
11 Psychological Distress Scale (K6) has been established as a screener for depression in Japan
12
13 [29]. A validation study revealed that a K6 score ≥ 5 is a reasonable cutoff to distinguish
14
15 between depressed and non-depressed people [30]. A total of 2,520 responses were obtained
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17 over two days of recruitment.
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20 A follow-up survey was conducted in September 2017 to monitor subsequent changes in
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22 help-seeking intention and action. Of the 2,520 participants in the initial survey, 2,315 people
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24 (91.9%) completed the follow-up questionnaire.
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27 All participants voluntarily agreed to participate in the survey after reading a description
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29 of the purpose and procedure of the survey. Consent to participate was implied by the
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31 completion and submission of the survey.
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35 2.4 Measures

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37 Participants in the initial survey were randomly assigned to one of the six depression
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39 help-seeking messages. After they read the message for at least 15 seconds, they were asked
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41 to rate it in terms of comprehensibility, persuasiveness, emotional responses, design quality,
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43 and intended future use. Help-seeking intention for depression was measured using vignette
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45 methodology before and after exposure to the messages. Moreover, participants in the
46
47 follow-up survey were asked about help-seeking intention for depression and help-seeking
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49 action for their own mental health (medical service use) during the 2-month follow-up period.
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52 The web questionnaire forms presented the questions one by one through the operation of
53
54 a 'Next' button. Respondents answered one question per page and could not go back to the
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3 previous page.
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7 2.4.1 Comprehensibility

9 Using the perceived effectiveness rating scales [23], the five items asked how easy or hard
10 the information is to: 1) read, 2) understand, 3) remember, 4) locate important information,
11 and 5) keep for future reference. All item scores (range 1-5 points) were averaged to produce
12 the comprehensibility score.
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18 2.4.2 Persuasiveness

20 Using the perceived effectiveness rating scales [23], the seven items asked to what extent
21 they agree or disagree that the information is: 1) believable, 2) convincing, 3) important to me,
22 4) help me feel confident about how best to do, 5) would help my family and friends, 6) put
23 thoughts in my mind about wanting to do, and 7) agreeable. All item scores (range 1-5 points)
24 were averaged to produce the persuasiveness score.
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35 2.4.3 Emotional responses

36 Participants were asked 'when you read the message, to what extent you feel: 1) surprise,
37 2) anger, 3) fear, 4) sadness, 5) guilt, 6) anxiety, and 7) happiness?' [18,19]. Response options
38 were from 1 (not at all) to 5 (extremely).
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46 2.4.4 Design quality

47 Six items for design quality were derived from the Consumer Information Rating Form
48 developed by Krass and colleagues [31]. Participants were asked to rate the message on a
49 5-point scale in terms of 1) organization, 2) attractiveness, 3) size, 4) tone, 5) helpfulness, and
50 6) spacing. Higher scores indicate higher quality.
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2.4.5 Intended future use

Three items for intended future use were derived from the Consumer Information Rating Form developed by Krass and colleagues [31]. Participants were asked ‘If you saw the information in a newspaper or magazine, how likely would you [use, read, and keep] it?’. Response options were from 1(very unlikely) to 5 (very likely).

2.4.6 Help-seeking intention

Help-seeking intention for depression was measured using vignette methodology. Participants were presented with a vignette describing a man (or woman) with depression and were then asked ‘If you had health problems right now like Mr. A (or Ms. A), would you see a doctor?’ [23,24,25]. Participants answered the question on a four-point scale (certainly yes/probably yes/probably not/certainly not). Those who gave affirmative answers (certainly yes and probably yes) were counted as having a positive help-seeking intention.

Help-seeking intention for depression was measured at three time points: 1) before exposure to the messages in the initial survey, 2) after exposure to the messages in the initial survey, and 3) at the follow-up survey. Those who had a positive help-seeking intention at the second point but did not at the first point were counted as developing help-seeking intentions after exposure to the message. Those who had a positive help-seeking intention both at the second and third points were counted as maintaining help-seeking intention.

2.4.7 Help-seeking action

Help-seeking action for their own mental health was measured in the follow-up survey by asking participants whether they had seen a doctor for their mental health problem in the previous 2 months.

2.5 Statistical Analysis

All statistical analyses were performed using the SAS ver. 9.4 (SAS Institute, Cary, NC, USA). Main and interaction effects of frame and format were assessed using two-way analysis of variance. The proportions of people who reported a positive help-seeking intention for depression before and after exposure to the messages were compared using McNemar test. Multiple logistic regression analysis was further conducted to compare the likelihood of having help-seeking intention for depression across the differently framed and formatted messages. Odds ratios with 95% confidence intervals for help-seeking intention for depression were calculated with adjustment for gender, depressive status, and help-seeking intention before exposure the messages. Significant levels were set at $p < 0.05$.

A statistical power analysis was carried out using Cohen's tables [32], because there was no existing research to indicate a likely effect size. To detect a small-sized difference between independent means ($d=0.20$), 393 samples in each group give an alpha of 0.05 with a power of 0.80; the necessary sample size was 310 at an alpha of 0.10 and 586 at an alpha of 0.01 with the same power. The number of participants in each group ranged between 267 and 382, which were adequate to detect small effects at an alpha of 0.05.

3. Results

Figure 1 shows the flow of participants through the study. In the initial survey, 2520 participants were randomly assigned to one of the 6 message groups. Excluding those who had an experience of receiving treatment for their mental illness, the remaining 1,957 participants were included in the study. Of these, 1,805 people (92.2%) who completed the follow-up questionnaire were included in the analysis of the follow-up data.

Table 1 shows the characteristics of the study participants. Of the 1,957 participants,

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2
3 45.6% had a university degree, 56.3% were married, and 60.1% had a full-time job. As a
4
5 result of the random assignment of participants to 6 message groups, no significant
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7 differences between the message groups were observed in sociodemographic characteristics.
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9
10 Table 2 shows the assessment of the depression help-seeking messages. The
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12 comprehensibility and persuasiveness scores showed no significant differences between the
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14 frames or between the formats. For the emotional responses, significant main effects of frame
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16 were observed in 5 out of 7 items (surprise, fear, sadness, anxiety, and happiness). There were
17
18 a significant effect of format on 'surprise' and significant frame×format interaction effects on
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20 'anxiety' and 'happiness'. Compared with the neutral-framed, the loss- and gain-framed
21
22 messages showed significant enhancements of emotional responses to the formatted messages.
23
24 For the design quality, significant main effects of format were observed in 4 out of 6 items
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26 (attractiveness, size, helpfulness, and spacing). There were significant main effects of frame
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28 on 3 items (attractiveness, tone, and helpfulness) but no significant frame×format interaction.
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30 For the intended future use, a significant main effect of format was observed in 1 out of 3
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32 items (read). There were no significant main effects of frame and no significant frame×format
33
34 interaction.
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37
38 Table 3 shows the changes in help-seeking intention for depression before and after
39
40 exposure to the messages. All messages except the neutral-plain message produced significant
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42 increase in help-seeking intention. Similar results were obtained when only those who were
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44 depressed (K6 score ≥ 5) were analyzed.
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Table 1 Characteristics of the study participants

| | | N | |
|------------------|----------------------------------|------|-------|
| Gender | Male | 980 | 50.1% |
| | Female | 977 | 49.9% |
| Age | Mean (SD) | 40.9 | (3.0) |
| Education | Compulsory education/high school | 540 | 27.6% |
| | Junior college/vocational school | 524 | 26.8% |
| | University or higher | 893 | 45.6% |
| Marital status | Married | 1101 | 56.3% |
| | Unmarried | 767 | 39.2% |
| | Divorced/widowed | 89 | 4.5% |
| Occupation | Full-time job | 1176 | 60.1% |
| | Temporary or part-time job | 329 | 16.8% |
| | No occupation | 452 | 23.1% |
| Household income | <2.0 million yen † | 230 | 11.8% |
| | 2.0–3.9 million | 394 | 20.1% |
| | 4.0–5.9 million | 552 | 28.2% |
| | 6.0–7.9 million | 400 | 20.4% |
| | 8.0–9.9 million | 205 | 10.5% |
| | 10.0+ million | 161 | 8.2% |
| | Missing | 15 | 0.8% |

†1 million yen was about 10,000 U.S. dollars at the time of the survey.

Table 2 Assessment of the depression help-seeking messages

| | | Message | | | | | | p | | A × B | |
|---------------------|------|--------------------|---------------------|----------------|-----------------|----------------|-----------------|--------------|---------------|-------|-------|
| | | Neutral - plain | Neutral - visual | Loss -plain | Loss -visual | Gain -plain | Gain -visual | Frame (A) | Format (B) | | |
| Comprehensibility | | Mean | 3.74 | 3.81 | 3.79 | 3.80 | 3.82 | 3.82 | 0.554 | 0.472 | 0.757 |
| | | SD | 0.79 | 0.78 | 0.87 | 0.83 | 0.83 | 0.78 | | | |
| Persuasiveness | | Mean | 3.15 | 3.13 | 3.20 | 3.18 | 3.10 | 3.17 | 0.168 | 0.732 | 0.352 |
| | | SD | 0.59 | 0.63 | 0.66 | 0.62 | 0.67 | 0.64 | | | |
| Emotional responses | | | | | | | | | | | |
| 1) surprise | Mean | 2.47 | 2.57 | 2.60 | 2.81 | 2.49 | 2.63 | 0.005 | 0.002 | 0.636 | |
| | SD | 1.03 | 1.10 | 1.06 | 1.01 | 1.10 | 1.02 | | | | |
| 2) anger | Mean | 1.91 | 1.91 | 1.94 | 2.01 | 1.90 | 1.99 | 0.411 | 0.202 | 0.596 | |
| | SD | 0.95 | 0.92 | 0.92 | 0.96 | 0.92 | 0.93 | | | | |
| 3) fear | Mean | 2.51 | 2.43 | 2.55 | 2.64 | 2.22 | 2.41 | <0.001 | 0.163 | 0.061 | |
| | SD | 1.03 | 1.05 | 1.06 | 1.07 | 1.01 | 0.98 | | | | |
| 4) sadness | Mean | 2.44 | 2.43 | 2.53 | 2.61 | 2.24 | 2.38 | <0.001 | 0.124 | 0.413 | |
| | SD | 1.03 | 1.10 | 1.05 | 1.04 | 1.01 | 0.95 | | | | |
| 5) guilt | Mean | 2.09 | 2.07 | 2.08 | 2.18 | 2.02 | 2.09 | 0.326 | 0.247 | 0.440 | |
| | SD | 0.91 | 0.96 | 0.93 | 0.94 | 0.92 | 0.86 | | | | |
| 6) anxiety | Mean | 2.63 | 2.50 | 2.59 | 2.74 | 2.34 | 2.45 | <0.001 | 0.370 | 0.035 | |
| | SD | 1.04 | 1.12 | 1.06 | 1.08 | 1.02 | 1.03 | | | | |
| 7) happy | Mean | 1.93 | 1.83 | 1.99 | 1.98 | 2.17 | 2.35 | <0.001 | 0.657 | 0.024 | |
| | SD | 0.96 | 0.92 | 0.98 | 0.98 | 0.98 | 0.95 | | | | |
| Design quality | | | | | | | | | | | |
| 1) organization | Mean | 3.67 | 3.65 | 3.72 | 3.80 | 3.64 | 3.71 | 0.113 | 0.258 | 0.557 | |
| | SD | 0.87 | 0.90 | 0.91 | 0.84 | 0.88 | 0.87 | | | | |
| 2) attractiveness | Mean | 3.10 | 3.22 | 3.18 | 3.37 | 3.08 | 3.26 | 0.029 | <0.001 | 0.749 | |
| | SD | 0.84 | 0.89 | 0.86 | 0.84 | 0.91 | 0.90 | | | | |
| 3) size | Mean | 3.38 | 3.38 | 3.37 | 3.52 | 3.32 | 3.41 | 0.177 | 0.037 | 0.296 | |
| | SD | 0.81 | 0.88 | 0.91 | 0.86 | 0.79 | 0.86 | | | | |
| 4) tone | Mean | 3.16 | 3.11 | 3.20 | 3.13 | 3.22 | 3.33 | 0.004 | 0.966 | 0.084 | |
| | SD | 0.72 | 0.79 | 0.82 | 0.83 | 0.77 | 0.83 | | | | |
| 5) helpfulness | Mean | 3.38 | 3.36 | 3.39 | 3.57 | 3.37 | 3.48 | 0.048 | 0.019 | 0.109 | |
| | SD | 0.82 | 0.84 | 0.90 | 0.80 | 0.87 | 0.87 | | | | |
| 6) spacing | Mean | 3.35 | 3.50 | 3.26 | 3.56 | 3.24 | 3.52 | 0.633 | <0.001 | 0.220 | |
| | SD | 0.77 | 0.80 | 0.91 | 0.78 | 0.85 | 0.80 | | | | |
| Intended future use | | | | | | | | | | | |
| 1) read | Mean | 3.17 | 3.23 | 3.28 | 3.28 | 3.12 | 3.36 | 0.286 | 0.016 | 0.052 | |
| | SD | 0.90 | 0.91 | 0.92 | 0.95 | 0.95 | 0.87 | | | | |
| 2) use | Mean | 2.77 | 2.71 | 2.87 | 2.83 | 2.72 | 2.86 | 0.063 | 0.666 | 0.065 | |
| | SD | 0.84 | 0.86 | 0.84 | 0.85 | 0.82 | 0.79 | | | | |
| 3) keep | Mean | 2.36 | 2.34 | 2.38 | 2.48 | 2.34 | 2.46 | 0.332 | 0.142 | 0.332 | |
| | SD | 0.98 | 0.95 | 0.97 | 0.98 | 0.91 | 0.90 | | | | |

All items were scored on a 1-to-5 point scale. Two-way analysis of variance was used to assess main and interaction effects of frame and format.

Table 3 Changes in help-seeking intention for depression

| Message | All | | | | p | Depressed (K6 score ≥ 5) | | | | p |
|---------|-----|--------------------|-------|--------|--------|--------------------------------|--------------------|-------|--------|--------|
| | N | Positive intention | | Change | | N | Positive intention | | Change | |
| | | Before | After | | | | Before | After | | |
| Neutral | 335 | 115 | 128 | | 0.128 | 142 | 40 | 48 | | 0.131 |
| -plain | | 34.3% | 38.2% | +11.3% | | | 28.2% | 33.8% | +20.0% | |
| Neutral | 317 | 116 | 139 | | 0.003 | 128 | 34 | 52 | | <0.001 |
| -visual | | 36.6% | 43.8% | +19.8% | | | 26.6% | 40.6% | +52.9% | |
| Loss | 325 | 126 | 146 | | 0.017 | 130 | 41 | 51 | | 0.033 |
| -plain | | 38.8% | 44.9% | +15.9% | | | 31.5% | 39.2% | +24.4% | |
| Loss | 324 | 117 | 151 | | <0.001 | 137 | 40 | 56 | | 0.003 |
| -visual | | 36.1% | 46.6% | +29.1% | | | 29.2% | 40.9% | +40.0% | |
| Gain | 323 | 117 | 144 | | 0.001 | 137 | 36 | 48 | | 0.011 |
| -plain | | 36.2% | 44.6% | +23.1% | | | 26.3% | 35.0% | +33.3% | |
| Gain | 333 | 135 | 158 | | 0.003 | 150 | 58 | 72 | | 0.004 |
| -visual | | 40.5% | 47.4% | +17.0% | | | 38.7% | 48.0% | +24.1% | |

Help-seeking intention for depression was assessed before and after exposure to the messages. McNemar test was used to assess changes in help-seeking intention.

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3 Multiple logistic regression analysis was further conducted to compare the likelihood of
4 having help-seeking intention for depression across the differently framed and formatted
5 messages. The loss-visual message alone had a significantly greater odds ratio of having
6 help-seeking intention for depression compared with the neutral-plain message as a reference
7 group: the adjusted odds ratios (95% confidence intervals) of the neutral-visual, loss-plain,
8 loss-visual, gain-plain, and gain-visual messages were 1.31 (0.89-1.92), 1.29 (0.88-1.89), 1.57
9 (1.07-2.29), 1.39 (0.95-2.04) and 1.41 (0.97-2.06), respectively.
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18 Of the 1,805 participants in the follow-up survey, 1,141 people had not possessed
19 help-seeking intention before exposure to the messages, and 249 people (21.8%) developed
20 their help-seeking intentions after exposure to the messages. Of these, 143 people (57.4%)
21 maintained their help-seeking intentions up to the follow-up survey. The proportion of
22 participants who maintain their help-seeking intentions was not significantly different across
23 the given messages: the percentages for the neutral-visual, loss-plain, loss-visual, gain-plain,
24 and gain-visual messages were 65.7% (23/35), 57.9% (22/38), 48.0% (25/50), 23/44 (52.3%)
25 and 67.5% (27/40), respectively ($p=0.423$).
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35 Table 4 shows the help-seeking action during the follow-up period. There were 66 people
36 (3.7%) who had seen a doctor for their mental health problem during the follow-up period.
37 The proportion of participants with help-seeking action was not significantly different across
38 the given messages. Similar results were obtained when only those who were depressed (K6
39 score ≥ 5) were analyzed.
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Table 4 Help-seeking action during the follow-up period

| Message | All | | Depressed (K6 score ≥ 5) | |
|---------|---------|--------|--------------------------------|--------|
| | N | Action | N | Action |
| Neutral | 307 | 12 | 132 | 8 |
| -plain | | 3.9% | | 6.1% |
| Neutral | 295 | 12 | 121 | 5 |
| -visual | | 4.1% | | 4.1% |
| Loss | 296 | 8 | 120 | 4 |
| -plain | | 2.7% | | 3.3% |
| Loss | 305 | 9 | 128 | 6 |
| -visual | | 3.0% | | 4.7% |
| Gain | 301 | 14 | 127 | 11 |
| -plain | | 4.7% | | 8.7% |
| Gain | 301 | 11 | 141 | 8 |
| -visual | | 3.7% | | 5.7% |
| | p=0.815 | | p=0.516 | |

Help-seeking action for their own mental health in the previous 2 months was measured in the follow-up survey.

4. Discussion

This study examined audience's responses to differently framed and formatted persuasive messages in the context of developing depression help-seeking messages. Although depression help-seeking messages have the potential to backfire [10,11], such boomerang effect was not evident in this study. All messages except the neutral-plain message produced significant increase in help-seeking intention after exposure to the messages. This result supports the effectiveness of communicating persuasive messages for increasing people's help-seeking intentions for depression. Moreover, multiple logistic regression analysis indicated that the loss-visual message worked better than the other messages. Despite the potential limitations of this study, it would be recommendable to apply loss-framing and formatting to depression help-seeking messages.

The three message frames elicited different patterns of emotional responses. The loss-framed messages more strongly induced negative emotions (surprise, fear, sadness, and anxiety), while the gain-framed messages more strongly induced a positive emotion (happiness). Previous studies have suggested that emotional responses play a significant role in the persuasion process [18,19]. There was no significant difference in persuasiveness, however, the loss- and gain-framed messages seemed more likely to bring out the recipients' help-seeking intentions by inducing emotional responses than the neutral-framed messages.

The formatted messages were judged superior to the unformatted messages in design quality. The formatted messages consequently succeeded in increasing the likelihood that the message will be read. These results support the effectiveness of the CDC Clear Communication Index which helps provide easily understandable health messages and materials [16,17]. The significant frame×format interaction effects on 'anxiety' and 'happiness' indicated that the message formatting enhanced the recipients' emotional responses, both negative and positive. There was no significant difference in persuasiveness,

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3 however, the formatted messages seemed more likely to be perceived as attractive and helpful
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5 by audience and more likely to increase the recipients' willingness to read than the
6
7 unformatted messages.
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10 As for the percentage changes in help-seeking intention for depression by message group
11 (Table 3), it is hard to say that the loss-framed messages were more effective than the
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13 gain-framed messages or vice versa. The loss-plain message showed a smaller percentage
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15 increase than the gain-plain message (15.9% vs. 23.1%), and the proportions of participants
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17 who reported a positive help-seeking intention after exposure these messages were equivalent
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19 (44.9% vs. 44.6%). Meanwhile, the loss-visual message showed a greater percentage increase
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21 than the gain-visual message (29.1% vs. 17.0%), and the proportions of participants who
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23 reported a positive help-seeking intention after exposure these messages were equivalent
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25 (46.6% vs. 47.4%). The respective effects of loss-framing and formatting on help-seeking
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27 intention were not preeminent, but multiple logistic regression analysis revealed that the
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29 loss-visual message alone had a significantly greater odds ratio of having help-seeking
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31 intention for depression compared with the neutral-plain message as a reference group.
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34 Previous studies have not provided a conclusive answer as to which message frame will more
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36 satisfactorily motivate people to seek mental health care, loss frame or gain frame [13,14]. A
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38 literature review suggested that adding pictures to written text will increase the likelihood that
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40 the text will be read, however, the effects of pictures on comprehension, recall, and adherence
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42 have not yet been established [33]. The results of this study are insufficient to conclude, but it
43
44 is likely that loss-framing and formatting act synergistically to increase help-seeking intention
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46 for depression. It would be recommendable to apply loss-framing and formatting to
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48 depression help-seeking messages, to say the least.
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53 Of those who developed their help-seeking intention after exposure to the messages,
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55 43.6% did not maintain their help-seeking intentions up to the 2-month follow-up survey. The
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3 depression help-seeking messages succeeded in possessing help-seeking intention for a short
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5 time after exposure, but the effect could not be sustained over time. Moreover, those who had
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7 taken help-seeking action during the 2-month follow-up period accounted for 3.7% of the
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9 total and for 5.5% of those who were depressed (K6 score ≥ 5). Seeing a message only once
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11 may be insufficient to induce help-seeking action. Although a number of interventions have
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13 been conducted to promote access to mental health care, very little is known about what
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15 interventions increase help-seeking action [9]. To our knowledge, there is no successful
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17 precedent that proved the effect of public health messaging on help-seeking action. Further
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19 studies are needed to find out effective strategies for maintaining help-seeking intention and
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21 increasing help-seeking action.
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24 This study provides evidence for the effectiveness of depression help-seeking messages in
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26 middle-aged Japanese people. On the contrary, it has a number of potential limitations. First,
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28 the web-based survey was self-administered, so that the accuracy of responses would depend
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30 on participants' understanding of the questions and their motivation to answer questions
31
32 accurately. The understandability of the wording of items was checked prior to the survey.
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34 The use of the Internet and the provision of anonymity would be expected to elicit more
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36 truthful responses, by minimizing social desirability pressures [34]. However, it is almost
37
38 impossible to eliminate the information bias completely. Second, the study participants were
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40 selected from a nationwide panel of a research company. According to the national census
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42 [35], the percentage of the Japanese population aged 35-44 years with university degrees were
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44 22.0% in 2010, considerably lower than that of this study (45.6%). The selection bias may
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46 have influenced the results to some extent. Third, the study participants were limited to 35-45
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48 years old. It is uncertain whether the messages will work equally well in other age groups.
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50 Moreover, because of cultural differences, the findings from this study may not be applicable
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52 to non-Japanese populations. Now we are planning to conduct a population-based
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3 interventional study to assess the effectiveness of a public health communication program
4 using the depression help-seeking messages. We will discuss the channels and activities that
5 will be most likely to successfully reach target audience in the future study.
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10 11 5. Conclusion

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13 This study compared audience's responses to six depression help-seeking messages with 3
14 frames (neutral-, loss-, and gain-framed) × 2 formats (formatted and unformatted). The
15 message formatting applied the CDC Clear Communication Index enhanced the recipients'
16 emotional responses and increased the likelihood that the message will be read. Multiple
17 logistic regression analysis indicated that the loss-framed formatted message worked better
18 than the other messages. According to these results, message framing and formatting may
19 influence emotional responses to the depression help-seeking message, willingness to read the
20 message, and intention to seek help for depression. It would be recommendable to apply
21 loss-framing and formatting to depression help-seeking messages, to say the least, but further
22 studies are needed to find a way to sustain the effect of messaging for a long time.
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37 Contributors

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39 MS was responsible for the design and conduct of the study, the collection, analysis, and
40 interpretation of data, and the writing of the article. TY and HY contributed to the data
41 interpretation and discussion of the implications of this work. All authors read and approved
42 the final manuscript.
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53 Uehara Memorial Foundation Research Grant.
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5 Competing interest
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7 The authors declare that they have no competing interest.
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11 Ethics approval
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13 The study protocol was approved by the ethics committees of the Jikei University School
14 of Medicine and has been conducted in accordance with the Ethical Guidelines for Medical
15 and Health Research Involving Human Subjects by the Japanese Government.
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22 Data sharing statement
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24 No additional data are available.
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Figure legend

Figure 1 Flow of participants through the study

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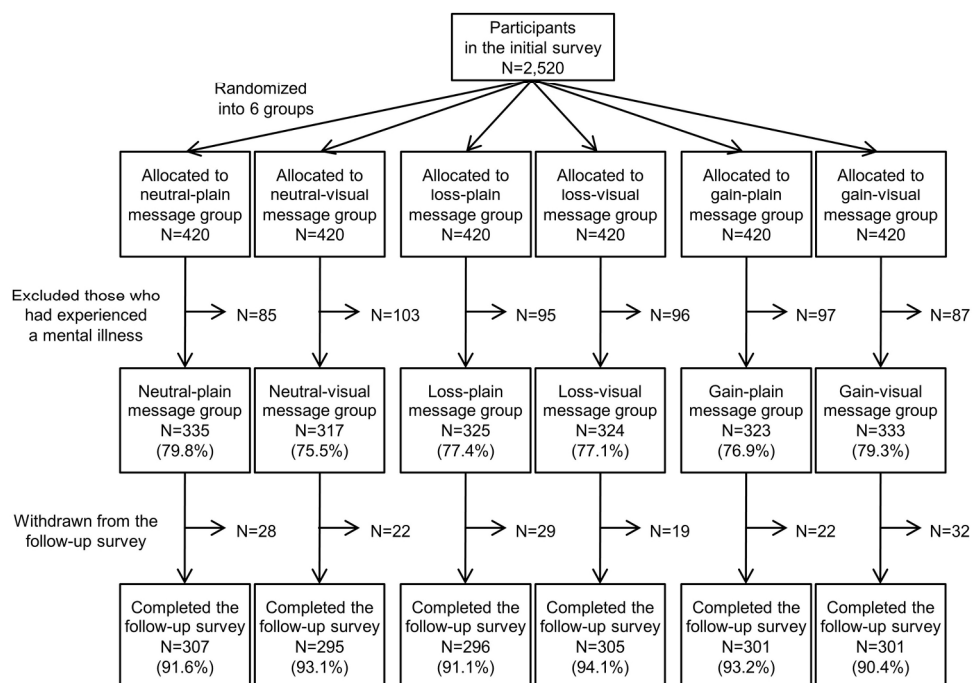


Figure 1 Flow of participants through the study


190x142mm (300 x 300 DPI)

Appendix A. Depression help-seeking messages (formatted versions)

Neutral-framed message - “Depression can happen to anyone”

うつ病は、だれでもかかる可能性がある病気です。

つらい出来事やストレスなどをきっかけに、
およそ**15人にひとり**が生涯のうちうつ病を経験すると言われています。



うつ病になると、「ゆううつだ」「やる気が出ない」などの**“こころ”のサイン**と
「疲れているのに眠れない」「全身がだるい」などの**“からだ”のサイン**が表われます。

うつ病かも…と思ったら、ひとりで悩まず、
かかりつけの医師や最寄りの医療機関、相談窓口にご相談しましょう。

Main message

- Depression happens to one out of 15 people.


Information on early signs of depression

Call to action

Loss-framed message - “Depression needs treatment”

うつ病は、治療が必要な病気です。

放っておくと、**日常生活にも支障をきたす**ような、つらい状態が続きます。
適切な治療を受けなければ、**約80パーセントが以前の状態に回復しません**。



うつ病になると、「ゆううつだ」「やる気が出ない」などの**“こころ”のサイン**と
「疲れているのに眠れない」「全身がだるい」などの**“からだ”のサイン**が表われます。

うつ病かも…と思ったら、ひとりで悩まず、
かかりつけの医師や最寄りの医療機関、相談窓口にご相談しましょう。

Main message

- If not treated, 80% cannot recover from depression.


Information on early signs of depression

Call to action

Gain-framed message - “Depression improves with treatment”

うつ病は、早期に気づいて治療を始めれば良くなります。

放っておくと、**日常生活にも支障をきたす**ような、つらい状態が続きますが、
適切な治療を受ければ、**約80パーセントが以前の状態に回復します**。



うつ病になると、「ゆううつだ」「やる気が出ない」などの**“こころ”のサイン**と
「疲れているのに眠れない」「全身がだるい」などの**“からだ”のサイン**が表われます。

うつ病かも…と思ったら、ひとりで悩まず、
かかりつけの医師や最寄りの医療機関、相談窓口にご相談しましょう。

Main message

- If treated, 80% can recover from depression.

Information on early signs of depression

Call to action

STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology*
Checklist for cohort, case-control, and cross-sectional studies (combined)

| Section/Topic | Item # | Recommendation | Reported on page # |
|---------------------------|--------|--|--------------------|
| Title and abstract | 1 | (a) Indicate the study's design with a commonly used term in the title or the abstract | 1 |
| | | (b) Provide in the abstract an informative and balanced summary of what was done and what was found | 2 |
| Introduction | | | |
| Background/rationale | 2 | Explain the scientific background and rationale for the investigation being reported | 5-6 |
| Objectives | 3 | State specific objectives, including any pre-specified hypotheses | 7 |
| Methods | | | |
| Study design | 4 | Present key elements of study design early in the paper | 7 |
| Setting | 5 | Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection | 9-10 |
| Participants | 6 | (a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants | 9-10 |
| | | (b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case | NA |
| Variables | 7 | Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable | 10-12 |
| Data sources/ measurement | 8* | For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group | 10-12 |
| Bias | 9 | Describe any efforts to address potential sources of bias | 10 |
| Study size | 10 | Explain how the study size was arrived at | 13 |
| Quantitative variables | 11 | Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why | 13 |
| Statistical methods | 12 | (a) Describe all statistical methods, including those used to control for confounding | 13 |
| | | (b) Describe any methods used to examine subgroups and interactions | 13 |
| | | (c) Explain how missing data were addressed | NA |
| | | (d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed | NA |

| | | | |
|--------------------------|-----|---|---------------|
| | | <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy | |
| | | (e) Describe any sensitivity analyses | NA |
| Results | | | |
| Participants | 13* | (a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed | 13 |
| | | (b) Give reasons for non-participation at each stage | 13 |
| | | (c) Consider use of a flow diagram | Fig.1 |
| Descriptive data | 14* | (a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders | 13-14, Table1 |
| | | (b) Indicate number of participants with missing data for each variable of interest | NA |
| | | (c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount) | NA |
| Outcome data | 15* | <i>Cohort study</i> —Report numbers of outcome events or summary measures over time <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures | 14, Table2 |
| Main results | 16 | (a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included | 14, Table3 |
| | | (b) Report category boundaries when continuous variables were categorized | NA |
| | | (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period | NA |
| Other analyses | 17 | Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses | NA |
| Discussion | | | |
| Key results | 18 | Summarise key results with reference to study objectives | 20 |
| Limitations | 19 | Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias | 22 |
| Interpretation | 20 | Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence | 22 |
| Generalisability | 21 | Discuss the generalisability (external validity) of the study results | 22 |
| Other information | | | |
| Funding | 22 | Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based | 23 |

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.