Original Article

Pre-testing and re-testing are preliminarily necessary before full questionnaire survey

Ishiguro Azusa[1~4)], Nakamukai Masako[1,2,5)], Ishida Naoko[1,2,5)], Uchiyama Naoko[1,6)], Sasaki Masako[7)], Matsuda Hiroko[1,3)], Arakawa Hirohisa[2)]

[1)]Kanagawa Dental Hygienists' Association

[2)] Department of Oral Health, Graduate School of Kanagawa Dental University

[3)] Department of Dental Hygiene, Tsurumi Junior College

[4)] Department of Dental Hygiene, The Nippon Dental University at College at Tokyo

[5)] School of Dental Hygiene, Kanagawa Dental University, Junior College

[6)]Health Promotion Division, Yokosuka Health Center

[7)]Yokosuka Health Center

Key words　questionnaire surveys, pre-testing, re-testing

受付日　2013 年 5 月 23 日　　受理　2013 年 12 月 12 日

日本歯科衛生学会雑誌，Vol.8，No.2，28－37，2014．より

Abstract

Objectives: Despite the fact that questionnaire surveys are frequently used in investigative research, few of them check whether the intent of the questions is correctly conveyed to the respondents or examine question reproducibility. We therefore planned to perform pre-testing and re-testing before full questionnaire survey.

Subjects and Methods: We conducted a pre-testing by questionnaire on 8 men and women with experience raising children, and conducted a retest 3 weeks later.

Results and Discussion: Based on the opinions of respondents during the pre-testing and re-testing, we revised the wording and word arrangement, and underlined some parts to add emphasis. Despite the fact that questionnaires are frequently used in survey investigations, few of them check whether the intent of the questions is correctly conveyed to the respondents or examine question reproducibility. The results of the current study revealed that answers to questions about generic characters or current habits were highly reproducible, while those that required judgment based on past memories or vague knowledge were not very reproducible. However, even if a question was poorly reproducible, it was sometimes necessary to carefully scrutinize whether changes were necessary. When conducting a questionnaire survey, it is preferable that the stability of responses be preserved.

Introduction

Questionnaire surveys are a very widely used technique, however the order and phrasing of questions may lead to their being interpreted by respondents in ways that differ from the questioner's intention. Before a survey is carried out, it is therefore necessary to perform a pre-testing and ask respondents their opinion in order to make

questions easier to read, change the emphasis, or rephrase them[1]. Previous studies have shown that when implementing surveys other than those for which the reproducibility of answers to questions has been confirmed, particularly when using original questionnaires, the re-testing must be used to confirm their reliability and validity and correct them if necessary[2~4]. However, it remains uncommon for questionnaire surveys to be performed after the content of questions has been scrutinized by re-testing.

On the other hand, through engaged in statistical analysis of the 2011 Study of the Dental Health of Prefectural Residents[5], we found and reported that the examples of "chewy foods" cited in response to the question "Do you include chewy foods in your child's meals?" revealed no consistent trend in the recognition of chewiness by guardians, indicating that food education is not producing effective results at present[6].

We therefore planned another questionnaire survey and perform pre-testing and re-testing this time. Despite the fact that questionnaire surveys are frequently used in investigative research, few of them check whether the intent of the questions is correctly conveyed to the respondents or examine question reproducibility. We therefore planned to perform pre-testing and re-testing before full questionnaire survey. We here report the findings we obtained from the pre-testing and re-testing.

Subjects and Methods

I. Survey subjects

Subjects were three men and five women (mean age, 39.3 years for men, 38.2 years for women) with experience of raising children who had provided informed consent for their participation in this study.

II. Survey period

The questionnaire was distributed and collected between mid-May and mid-June 2012.

III. Survey content and method

It is important to examine the validity and reliability of the question for questionnaire survey. Figures 1 and 2 show the original versions of the questionnaires about 3-year-olds and their guardians. These questionnaires are planned to promote food education and produce a guide to chewy foods can actually be used. Respondents were asked to complete these questionnaires, and were asked whether any of the questions were difficult to understand or answer (pre-testing) for the purpose of correction of validity. The views put forward during pre-testing were considered, and the questionnaire was amended where necessary. Three weeks after the pre-testing, the same survey subjects were retested. The results of the pre-testing and re-testing were compared, and further corrections were made where necessary. Figures 3 and 4 show the final versions after all corrections. We also examined the reliability concerning "the judgments of four categories of chewing evaluation about seven kinds of foods" that was the most important question. We performed a regression analysis to examine the reproducibility, and calculated Cronbach's alpha coefficient to examine the consistency.

IV. Ethical considerations

This study complied with the Helsinki Declaration, and was approved by the Ethics Committee of Kanagawa Dental College (June 11, 2012, no. 189).

Results

I. Pre-testing

1. Questionnaire for 3-year-olds

In the explanatory note requesting cooperation with the survey that was attached to

the original version of the questionnaire, I ordered the gender of guardian who answered it, to prevent the gender of the guardian answering the questionnaire being unduly skewed.With respect to Q2.1, “About when did you start to wean your child? (This refers to the time at which you started feeding solids such as rice water or rice gruel, not fruit juice or tea)” and Q2.2, “About when did you stop to suckle? (time when you stopped breastfeeding or other type of nipple feeding and move on to milk and baby food)” (Figure 1); however, one of male guardians stated that “I was not sufficiently involved in feeding my child to be able to answer this.” The explanatory note was therefore amended to read “We would like to ask male guardian to complete the questionnaire as far as possible. If there are questions they are unable to answer, female guardians are requested to assist” to make it clear that questions about 3-year-olds need not necessarily be answered by their male guardians. The same view was expressed concerning Q1.4 and Q1.5 in Figure 2. As the suggestion was also made that the words “weaning” and “nipple feeding” in Q2.2 in Figure 1 were difficult to understand, the wording was amended to “About when did you stop breastfeeding or feeding with infant formula, and move on to cow’s milk and baby food?” as shown in Q2.2 in Figure 3.

As it was pointed out that the questions and answers for the items in Q5 in Figure 1 used a complicated format, this was changed to “For the following list of foods, please mark those that you often give your child to eat with a circle, and those that you do not with a cross, within the brackets. Also, please evaluate the “chewiness” of all of these foods for your child on a scale from 1 to 4, irrespective of whether you marked them with a circle or a cross, by circling the number that applies,” as shown in Q4 in Figure 3. As well as adding underlining for emphasis, the four categories of chewiness evaluation were also shifted from the body of the question to above the numbers for evaluation in

the response column.

2. Questionnaire for guardians

As it was suggested that guardians may include grandmothers and grandfathers, age groups were added to Q2.2 in Figure 4. With respect to Q1.1 in Figure 2, it was noted that it would be difficult to indicate that meals were eaten at 6:30, and the question was therefore amended to allow times to be indicated in hours and minutes, as shown in Q1.1 in Figure 4. It was also pointed out that it was difficult to know whether Q1.2 in Figure 2 was asking about guardians or 3-year-olds, and it was therefore amended by adding underlining and parentheses to read “These questions ask about the current dietary habits of your child (child who received health checkup for 3-year-old).” in order to avoid the possibility of misunderstanding. The same point was also raised concerning Q1.4 and Q1.5 in Figure 2, and these were therefore amended by moving them to Q3.5 and Q3.6 in the questionnaire about 3-year-olds in Figure 3 to avoid the possibility of misunderstanding.

Q3 in Figure 2 was also moved to Q4 in Figure 4 for the same reason as for Q5 in Figure 1.

II. Re-testing

Table 1 shows the results of questionnaires about 3-year-olds and their guardians. There was a high degree of consistency between basic attributes and current dietary habits, as well as with parents’ attitudes to their children’s eating, for questions of each nature, but a low degree for judgements based on past memories and knowledge. The results for questions with a low degree of consistency are given below.

1. Questionnaire for 3-year-olds

Errors for Q2.1 in Figure 3 were of one-scale difference within four scales and as this was regarded as tolerable, this question was not amended. For Q2.2, errors were of one-scale difference within four scales for three respondents and of two-scale differences within four scales for one respondent. Asking the respondent who made the two-scale difference within four scales error confirmed that the reason was simple recall bias, and this question was therefore not amended. Errors evident in answers to Q3.1 and Q3.3 were also of one-scale difference within four scales, and as this was regarded as tolerable, these questions were not amended. With respect to Q3.5 and Q3.6, asking respondents confirmed that errors were the result either of misreading the question or of changing from a male to a female respondent for retesting, and these questions were therefore not amended. Errors in responses using the evaluation scale for "chewiness" in Q4 were only of one-scale difference within four scales and this was not regarded as a problem. For the item "Lotus root" in Q4.2-2, there were errors of two-scale differences within four scales for one respondent and of three-scale differences within four scales for another, and for "Konjac" in Q4.5-2, the error was of two-scale differences within four scales for two respondents. Asking these respondents confirmed that the errors occurred due to a lack of confidence in their judgment of chewiness, and this question was therefore not amended.

2. Questionnaire for guardians

Asking respondents about Q1.2 in Figure 4 confirmed that the reason was simple recall bias, and this question was therefore not amended. Errors for Q2.3 and Q2.4 were of one-scale difference within four scales, and as this was regarded as tolerable these questions were not amended. For Q4.4-1 and Q4.7-1, asking the respondent confirmed that the differences between the circles and crosses were the result of simple recall bias,

and these questions were therefore not amended. Errors in responses using the evaluation scale for “chewiness” in Q4 were only of one-scale difference within four scales, and this was not regarded as a problem. For the items “Lotus root” in Q4.2-2 and “Konjac” in Q4.5-2, the error was of two-scale differences within four scales for one respondent. Asking the respondents confirmed that the errors occurred due to a lack of confidence in their judgment of chewiness, and this question was therefore not amended.

3. The reliability of questionnaire

The coefficient of correlation between pretest and re-test of four categories of chewing evaluation phases of was 0.63 ($P < 0.001$), and Cronbach’s alpha coefficient was 0.62.

Discussion

I. Examination for the validity of questionnaire

1. Pre-testing

Pre-testing may be performed to determine the amount of data required for the sample survey when carrying out questionnaire surveys using sample statistics[7]. Akizuki *et al.*[8] reported or described that they carried out pretesting to confirm the face validity, factorial structure, response distribution, and reliability of questions. Small-scale pre-testing can also be used to identify and correct problems in the content of questions[9]. The effect of question order may also vary depending on their content and the situation concerned, and it is important to investigate individual differences through previous similar surveys and pre-testing[10]. In the present study, we carried out pre-testing to identify problems in the original version of the questionnaire by asking respondents for their opinions. One issue that emerged was the difficulty of

understanding the terms “weaning” and “lactation” in the questionnaire for 3-year-olds. This was solved by either adding an explanation of the term or changing the wording. It was also noted that, in some cases, it was difficult to understand whether a question referred to 3-year-olds or to guardians, and whether the responses required a written answer or the use of the scale from 1 to 4. These issues were resolved by adding underlining and other means of emphasis. The difficulty of answering questions that included the evaluation scale was addressed by correcting the format, so the four categories were indicated above the four-grade scale using a tabular format. When there is an odd number of possible responses, answers tend to cluster around the median value[11], and the four-grade scale with an even number of responses was therefore regarded as valid.

2. Re-testing

The re-testing involves administering the same questionnaire to the same subjects after a period of time has elapsed, and comparing the reproducibility of the answers between the first and second times. If the results are consistent, the respondents’ interpretations of the questions can also be regarded as consistent, and their responses to the questions as highly stable. If the in-between period is too short, however, respondents may remember the answers they gave the first time. Conversely, if this period is too long, their lifestyles and other factors may change, potentially also changing their answers[12]. According to Akizuki *et al.*[8], retesting to check the stability of questions should be performed after around 1 month, while according to Kawamura *et al.*[13], in general the reliability of repeated testing should be investigated by measurements 2 weeks to 1 month apart. Yamazaki *et al*[14]., however, reported that, in general, the repeated testing method should be used over a period of several months, and that a period of around 3

months is often used, although there is no firm evidence for this. In light of these reports, as the present study included many questions about diet, which is affected by seasonal variations, re-testing was performed after a period of around three weeks. Reproducibility was high for both the questionnaires for 3-year-olds and those for guardians, as described below, and question content was also regarded as almost entirely appropriate. Questions with low reproducibility of responses were amended.

1） Questionnaire for 3-year-olds

Gender and birth order exhibited 100% consistency. This was probably because the nature of the questions concerned generic character. According to Saitoh *et al.*[15], when high school students were retested after an interval of 1 year, the rates of discrepancy for parent age were 8% for fathers and 6% for mothers, with responses to questions about generic character having a high degree of reproducibility. It can be envisaged, however, that errors may arise in responses to the questions “About when did you start weaning your child?” and “About when did you stop breastfeeding or feeding with infant formula, and move on to milk and baby food?”, as these are dependent on past memories. The questions “About how many times do they chew a mouthful of rice before swallowing?” and “Do they drink tea, water, or other liquids during meals?” concerned children’s current dietary habits, and therefore exhibited a high degree of consistency at 87.5%. Similarly, the questions “Is your child a good eater?” and “How long do they take to eat the evening meal (from start to finish of eating?)” are also concerned children’s current dietary habits, and there were only one-grade difference within three categories from two respondents. The reproducibility of questionnaire surveys is reportedly lowest for family medical histories and higher for individual medical histories, with drinking and smoking exhibiting the highest levels of

reproducibility[16]. In light of this, reproducibility is low with respect to memories of others and highest for current individual habits, with individual memories of the past being of somewhat lower reproducibility than current habits. Despite this, although the questions “Do you choose what to give your child to eat in consideration of the fact that your child will chew it thoroughly?” and “Do you encourage your child to chew thoroughly during meals?” concern individuals’ actions with respect to manner of guardians to the diet of their child, completely opposite responses were given in 25% and 37.5% of cases, respectively. However, this error arose because the respondent changed from the male to the female guardians, and it was therefore not regarded as a problem.

We also found that some questions were difficult to answer because of the way in which they were arranged on the page. The question “Do you give these to your child frequently or infrequently?” in Q4 in the revised version, “For the following list of foods, please mark those that you often give your child to eat with a circle, and those that you do not with a cross, within the brackets. In addition, please evaluate the “chewiness” of all of these foods for your child on a scale from 1 to 4, irrespective of whether you marked them with a circle or a cross, by circling the number that applies,” concerns individuals’ current actions, and responses therefore exhibited a high degree of consistency, despite the presence of a few mistakes. The evaluation of “chewiness” according to a four-grade scale, however, was based on knowledge, and reproducibility was therefore low when respondents’ knowledge was vague.

2） Questionnaire for guardians

In the revised version, Q1.1, “Does your child eat his/her evening meal at a set time?” Q1.3, “About how often does your child eat out?”, Q2.5, “Do you drink tea, water, or

other liquids during meals?" and Q2.6, "Are there foods you particularly like or dislike?" concerned individuals' current actions, and therefore exhibited a high degree of consistency. Q2.1 in the revised version, "What is your gender?" concerned a generic character, and the degree of consistency was therefore 100%. However, despite the fact that Q1.2 in the revised version, "Who do they eat their evening meal with? (Multiple answers permitted)" concerned children's current dietary habits, the degree of consistency was low at 62.5%. However, asking respondents confirmed that the reason was simple recall bias. In the revised version, Q2.3, "About how many times do you chew a mouthful of rice before swallowing?" and Q2.4, "How long do you take to eat your evening meal (from start to finish of eating?)" concern the current dietary habits of guardians themselves, and errors were therefore only of one-scale difference within four scales, which was not regarded as a problem. Despite the fact that responses to Q3, "Which of the following do you think are reasons it is believed that "chewing" thoroughly is good for health? (Multiple answers permitted)," were knowledge-based judgments, reproducibility was still high. This was probably because the respondents were well-informed. The question "Do you eat these frequently or infrequently?" in Q4, "For the following list of foods, please mark those that you often eat yourself with a circle, and those that you do not with a cross, within the brackets. In addition, please evaluate the "chewiness" of all of these foods for you on a scale from 1 to 4, irrespective of whether you marked them with a circle or a cross, by circling the number that applies," concerns individuals' current actions, and responses therefore exhibited a high degree of consistency, despite the presence of a few mistakes. The evaluation of "chewiness" according to a four-grade scale, however, was based on knowledge, and reproducibility was therefore low when respondents' knowledge was vague, similarly to

that of the questionnaire about 3-year-olds. This question is the key point of the main survey, and as some of the four-grade scales changed from right to left whereas others changed from left to right, these cancelled out and it was considered that no amendment was necessary.

II. Examination for the reliability of questionnaire

The correlation of pretest and re-test was high and significant. Therefore, it was shown that the result of the re-test conducted three weeks after the pretest was high in reproducibility. In addition, Cronbach's alpha coefficient was 0.63. From this figure the reliability was considered as to be slightly high[17]. Because four categories of chewing evaluation do not have much individual difference, this is caused by the variance of the total point became small and is not lowering the reliability. In consideration of the results mentioned above, it was judged that we could use these four categories of evaluations for a full-scale investigation.

Conclusions

In repeat testing, we found that errors were small with respect to generic character and current habits, and that reproducibility was high for memories of the past and judgements based on vague knowledge. Even for questions with low reproducibility, however, careful consideration should be given as to whether they should be amended, and it may be decided that corrections are unnecessary in some cases. When carrying out questionnaire surveys, both a pre-testing and re-testing should be performed in order to verify the stability of responses before the main survey is implemented.

Acknowledgment

This study was supported by Kanagawa Public Health Research Grant (2012). We would like to thank all the related for their cooperation.

References

1） Statistical Information Division,Planning Promotion Section,Aomori Prefecture Government:Manual of Statistic Investigation concerning Social Investigation -The Basics and Utilization of Statistics- in Series of Statistic Literacy concerning Report on Utilization of Statistics Information.2002. http://www.pref.aomori.lg.jp/soshiki/kikaku/tokei/files/report14-05.pdf (Jun. 7, 2012 accessed)

2） Kaneko M: Development of cancer patient’s suffering scale-A study of reliability and validity-, Journal of St.Luke's society for nursing research, 3(1): 25-32, 1999. (In Japanese)

3） Asakawa K, Morii Y, Kogawa M, Uechi Y: A study of students adjustment to their high school-development of the index of students adjustment to high school life-, Hyogo University of Teacher Education journal, 22: 37-40, 2002. (In Japanese)

4） Kakudate N, Morita M, Fujisawa M, Nagayama M, Kawanami M: Development of a Self-Efficacy Scale for Self-care (SESS) among periodontal disease patients -Reliabillity and validity examination-, Journal of the Japanese Association of Periodontology, 49(4): 285-295, 2007. (In Japanese)

5） Health Promotion Division, Health Care and Medical Services Department, Public Health and Welfare Bureau, Kanagawa Prefectural Government: The 2011 Study of the Dental Health of Prefectural Residents, 2012.

http://www.pref.kanagawa.jp/uploaded/attachment/427962.pdf (Oct. 12, 2012 accessed)

6） Ishiguro A, Ishida N, Nakamukai M, Arakawa H: Recognition of chewy foods among the guardians of three-year-old children, The Journal of the Japan Dental Hygienists' Association, 8(1): 52-56,2013. (In Japanese)

7） Toyoda H: Lecture of Survey Method, Series <Science of Investigation> 1, Asakura Publishing, Tokyo, First edition, 2005, 41-42. (In Japanese)

8） Akituki Y: Source-specific effects of positive and negative social interactions on depressive symptoms among Japanese women with fertility problems, Grant-in-Aid for Scientific Research, 2011.
http://kaken.nii.ac.jp/pdf/2010/seika/mext/32501/20791744seika.pdf (Jan. 10, 2013 accessed)

9） Setting and enforcement of the questionnaire, 2003.
http://www11.ocn.ne.jp/~yoshiok/new_page_31.pdf (May. 28, 2012 accessed)

10） Hayashi F, Yamaoka K: Practice of the Investigation -What do you read from incomplete data?- Series <Science of Investigation> 2, Asakura Publishing, Tokyo, First edition, 2002, 43.

11） Sutudy on the reproducubitity and reliability of the current and family medical history obtained from the re-testing of questionnaire survey.
http://kaken.nii.ac.jp/d/p/10770167 (Jan. 10, 2013 accessed)

12） The plausibleand and the reliability.
http://school.athuman.com/273010/seminar/material05.html (May. 28, 2012 accessed)

13） Kawamura M, Okada M, Sasahara H: Development of an Oral Self-Care

Appraisal (OSCA) Questionnaire for Youth and Test-Retest Reliability of Its Items. The Journal of Hiroshima University Dental Society, 37(1): 72-81, 2005. (In Japanese)

14） Yamazaki K, Uchida K: Problems of the development and administration of questionnaires in psychological survey studies. Reserch bulletin of Nsruto University of Education (Edited by Education Sciences), 20: 1-10, 2005. (In Japanese)

15） Saitoh Y, Minamisato S, Saitoh I: Reproducibility of the questionnaire survey on the geriatric disease, study on establishment of a healthy lifestyle from the infant. Study Report for the 1995 fiscal year, Ministry of Hearth snd Welfare, Lapan, 1996. (In Japanese)

16） Study Group on Medical Evaluation by the Patient: NDP Allotment study, Patient experience investigation in the medical quality improvement -Proof study on the usefulness-. http://tqmh.jp/0406kanjakeikenchousahoukokusho.pdf#search (Jan.11, 2013 accessed)

17） Shojima K, Toyoda H: Estimation of Cronbach's alpha coefficient in the context of item response theory. The Japanese Jounal of Psychology, 73(3): 227-233, 2002. (In Japanese)

著者へ連絡先
石黒　梓
〒 238-8580
神奈川県横須賀市稲岡町 82
神奈川歯科大学大学院歯学研究科口腔衛生学講座
TEL:046-822-8862
FAX:046-822-8862
E-mail:ishiguro@kdu.ac.jp

和文抄録

本格的な質問紙調査の前に予備的にプレテストと再テストが必要である

石黒　梓[1~4], 中向井政子[1,2,5], 石田直子[1,2,5], 内山直子[1,6], 佐々木雅子[7], 松田裕子[1,3], 荒川浩久[2]

[1] 神奈川県歯科衛生士会

[2] 神奈川歯科大学大学院歯学研究科口腔衛生学講座

[3] 鶴見大学短期大学部歯科衛生科

[4] 日本歯科大学東京短期大学歯科衛生学科

[5]神奈川歯科大学短期大学部歯科衛生学科

[6]横須賀市保健所健康づくり課

[7]横須賀市保健所

目的：調査研究に質問紙調査法が多く用いられているが，回答者に質問紙の意図が正確に伝わっているかを確認したり，質問の再現性を試験したものはほとんど見当たらない。そこで，われわれは質問紙調査実施前にプレテストと再テストを行うことを企画した。

対象および方法：子育て経験のある男女 8 名を対象に，質問紙にてプレテストを行い，その 3 週間後に再テストを行った。

結果と考察：プレテストと再テスト時に得られた回答者の意見から，質問の配

列や文言などを修正したり，アンダーラインで強調したりした。調査研究に質問紙調査が利用されることが多いが，質問の意図が回答者に正確に伝わっているかを確認したり質問の再現性を吟味したりして実施されたものは少ない。基本属性や現在の習慣に関する質問に対する回答の再現性は高く，過去の記憶やあやふやな知識に基づく判断の再現性は低いことが明らかとなった。しかしながら，再現性の低い質問であっても，修正を加えるか否かを慎重に判断する必要があるものもある。質問紙調査を行う際には，回答の安定性が保証されたうえで実施することが望まれる。

Survey of Chewy Foods (3-Year-Old Children)

●Please either fill in the blank_____ or circle the number that applies.

Q1. This question asks about children who received the health checkup for 3-year-olds.

1) What is your child gender? (1) Boy (2) Girl

2) What is his or her birth order? _____-born child (out of a total of _____ children)

Q2. This question asks about how and when your child was weaned.

1) About when did you start weaning your child? (This refers to the time at which you started feeding solids such as rice water or rice gruel, not fruit juice or tea)

(1) Age 4–5 months (2) Age 6–7 months (3) Age 8–9 months (4) Other: Age ____ months

2) About when did you stop weaning? (Time when you stopped breastfeeding or other nipple feeding, and moved on to milk and baby food)

(1) Before age 12 months (2) Age 12–16 months (3) Age 17–21 months

(4) Age 22–26 months (5) Later than this (6) Still using nipple feeding

Q3. This question asks about your child's current eating habits.

1) Is your child a good eater?

(1) Eats a lot (2) Eats somewhat more than average (3) Average (4) Eats somewhat less than average (5) Eats a little

2) About how many times do they chew a mouthful of rice before swallowing?

(1) Less than 10 (2) 10–19 (3) 20–29 (4) 30 or more

3) How long do they take to eat their evening meal (from start to finish of eating)?

(1) Less than 15 minutes (2) 15–30 minutes (3) 30–45 minutes (4) 45–60 minutes (5) 1 hour or more

4) Do they drink tea, water, or other liquids during meals?

(1) Not at all (2) A little (3) A lot (4) Drink in order to swallow

5) How many times a day do you give snacks?

(1) Once (2) Twice (3) Three times or more

Q4. Which of the following do you think are reasons it is believed that chewing thoroughly is good for health? (Multiple answers permitted)

(1) Preventing cancer (2) Increasing brain activity (3) Supporting lung function

(4) Preventing obesity (5) Alleviating allergic symptoms

Q5. For the following list of foods, please mark those that you often give your child to eat with a circle, and those that you do not with a cross, within the brackets. Also, please evaluate the chewiness of all of these foods for your child on a scale from 1 to 4, irrespective of whether you marked them with a circle or a cross, by circling the number that applies (1 indicates "very," 2 "somewhat," 3 "a little," and 4 "hardly at all" chewy).

1) Broccoli (_____, 1 2 3 4)

2) Lotus root (_____, 1 2 3 4)

3) Rice (_____, 1 2 3 4)

4) Boiled egg (_____, 1 2 3 4)

5) Konjac (_____, 1 2 3 4)

6) Raw cucumber (_____, 1 2 3 4)

7) Raw carrot (_____, 1 2 3 4)

This concludes the questionnaire. Thank you for your cooperation.

Figure 1. Original version of the questionnaire for 3-year-old

Survey of Chewy Foods (Guardians of 3 Year-Old Children, Preferably Female)

●Please either fill in the blank_____ or circle the number that applies.

Q1. These questions ask about the current dietary habits of your child.

1) Does your child eat his/her evening meal at a set time?

(1) Yes (around_____ o'clock) (2) No

2) Who does your child eat his/her meal with? (Multiple answers permitted)

(1) Father (2) Mother (3) Grandfather (4) Grandmother (5) Sibling(s) (6) Eats alone (7) Other (_____)

3) About how often does your child eat out?

(1) More than three times a week (2) Once or twice a week (3) More than once a month (4) Hardly ever

4) Do you choose what to give your child to eat in consideration of the fact that your child will chew it thoroughly?

(1) Yes (2) No

5) Do you encourage your child to chew thoroughly during meals?

(1) Yes (2) No

Q2. These questions ask about you yourself.

1) What is your gender? (1) Male (2) Female

2) About how many times do you chew a mouthful of rice before swallowing?

(1) Less than 10 (2) 10-19 (3) 20-29 (4) 30 or more

3) How long do you take to eat your evening meal (from start to finish of eating)?

(1) Less than 15 minutes (2) 15-30 minutes (3) 30-45 minutes (4) 45-60 minutes (5) 1 hour or more

4) Do you drink tea, water, or other liquids during meals?

(1) Not at all (2) A little (3) A lot (4) Drink in order to swallow

5) Are there foods you particularly like or dislike?

(1) No (2) Yes Examples of foods you dislike (_____)

Q3. For the following list of foods, please mark those that you often eat yourself with a circle, and those that you do not with a cross, within the brackets. Also, please evaluate the chewiness of all of these foods for you on a scale from 1 to 4, irrespective of whether you marked them with a circle or a cross, by circling the number that applies. (1 indicates "very," 2 "somewhat," 3 "a little," and 4 "hardly at all" chewy.)

1) Broccoli (_____, 1 2 3 4)

2) Lotus root (_____, 1 2 3 4)

3) Rice (_____, 1 2 3 4)

4) Boiled egg (_____, 1 2 3 4)

5) Konjac (_____, 1 2 3 4)

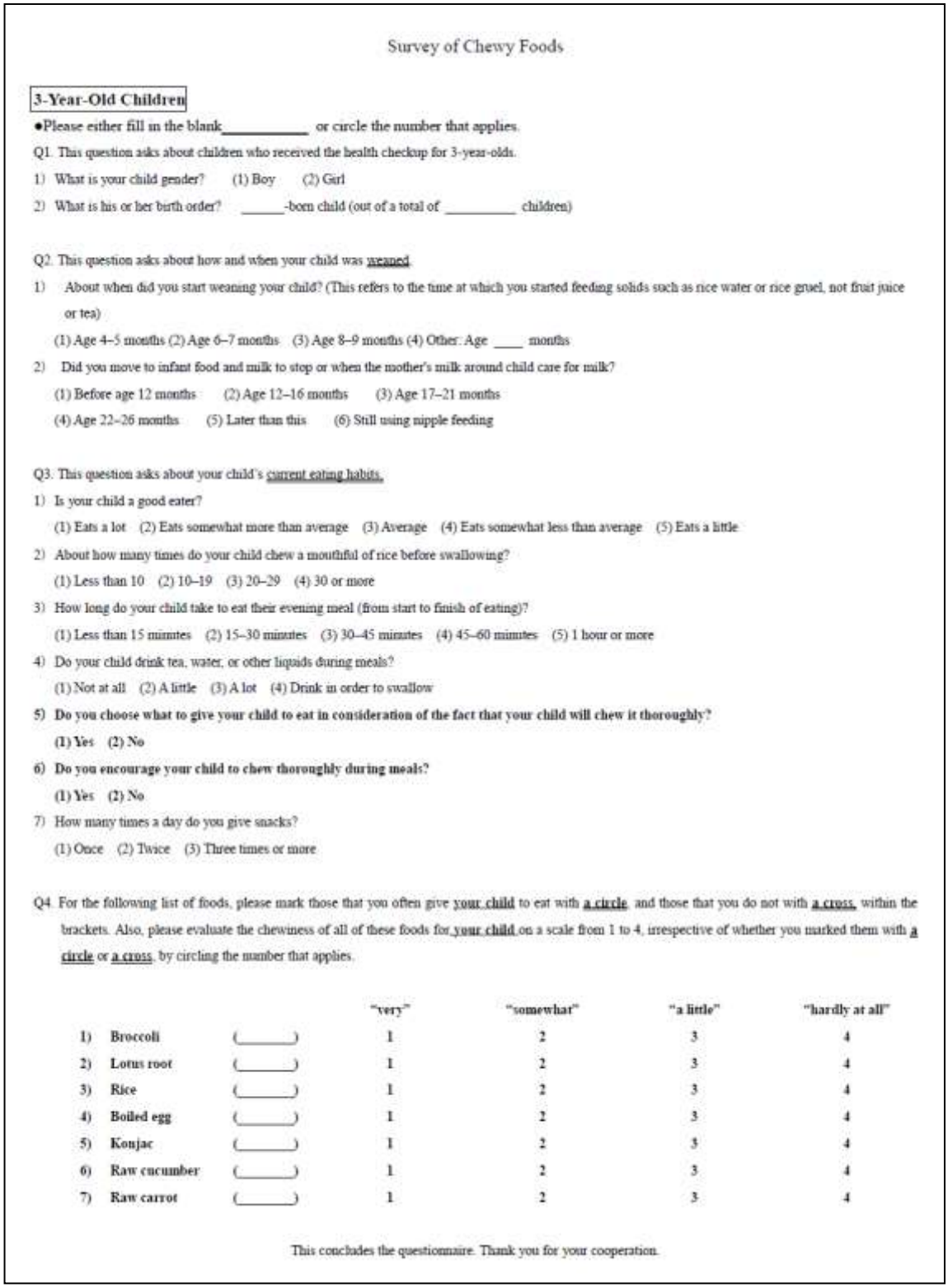
6) Raw cucumber (_____, 1 2 3 4)

7) Raw carrot (_____, 1 2 3 4)

This concludes the questionnaire. Thank you for your cooperation.

Figure 2. Original version of the questionnaire for guardians

＊This questionnaire was for use by female guardians. This wording was changed to "Preferably Male" in the version for use by male guardians.



Survey of Chewy Foods

3-Year-Old Children

●Please either fill in the blank_____ or circle the number that applies.

Q1. This question asks about children who received the health checkup for 3-year-olds.

1) What is your child gender? (1) Boy (2) Girl

2) What is his or her birth order? _____-born child (out of a total of _____ children)

Q2. This question asks about how and when your child was weaned.

1) About when did you start weaning your child? (This refers to the time at which you started feeding solids such as rice water or rice gruel, not fruit juice or tea)

(1) Age 4–5 months (2) Age 6–7 months (3) Age 8–9 months (4) Other: Age ____ months

2) Did you move to infant food and milk to stop or when the mother's milk around child care for milk?

(1) Before age 12 months (2) Age 12–16 months (3) Age 17–21 months

(4) Age 22–26 months (5) Later than this (6) Still using nipple feeding

Q3. This question asks about your child's current eating habits.

1) Is your child a good eater?

(1) Eats a lot (2) Eats somewhat more than average (3) Average (4) Eats somewhat less than average (5) Eats a little

2) About how many times do your child chew a mouthful of rice before swallowing?

(1) Less than 10 (2) 10–19 (3) 20–29 (4) 30 or more

3) How long do your child take to eat their evening meal (from start to finish of eating)?

(1) Less than 15 minutes (2) 15–30 minutes (3) 30–45 minutes (4) 45–60 minutes (5) 1 hour or more

4) Do your child drink tea, water, or other liquids during meals?

(1) Not at all (2) A little (3) A lot (4) Drink in order to swallow

5) Do you choose what to give your child to eat in consideration of the fact that your child will chew it thoroughly?

(1) Yes (2) No

6) Do you encourage your child to chew thoroughly during meals?

(1) Yes (2) No

7) How many times a day do you give snacks?

(1) Once (2) Twice (3) Three times or more

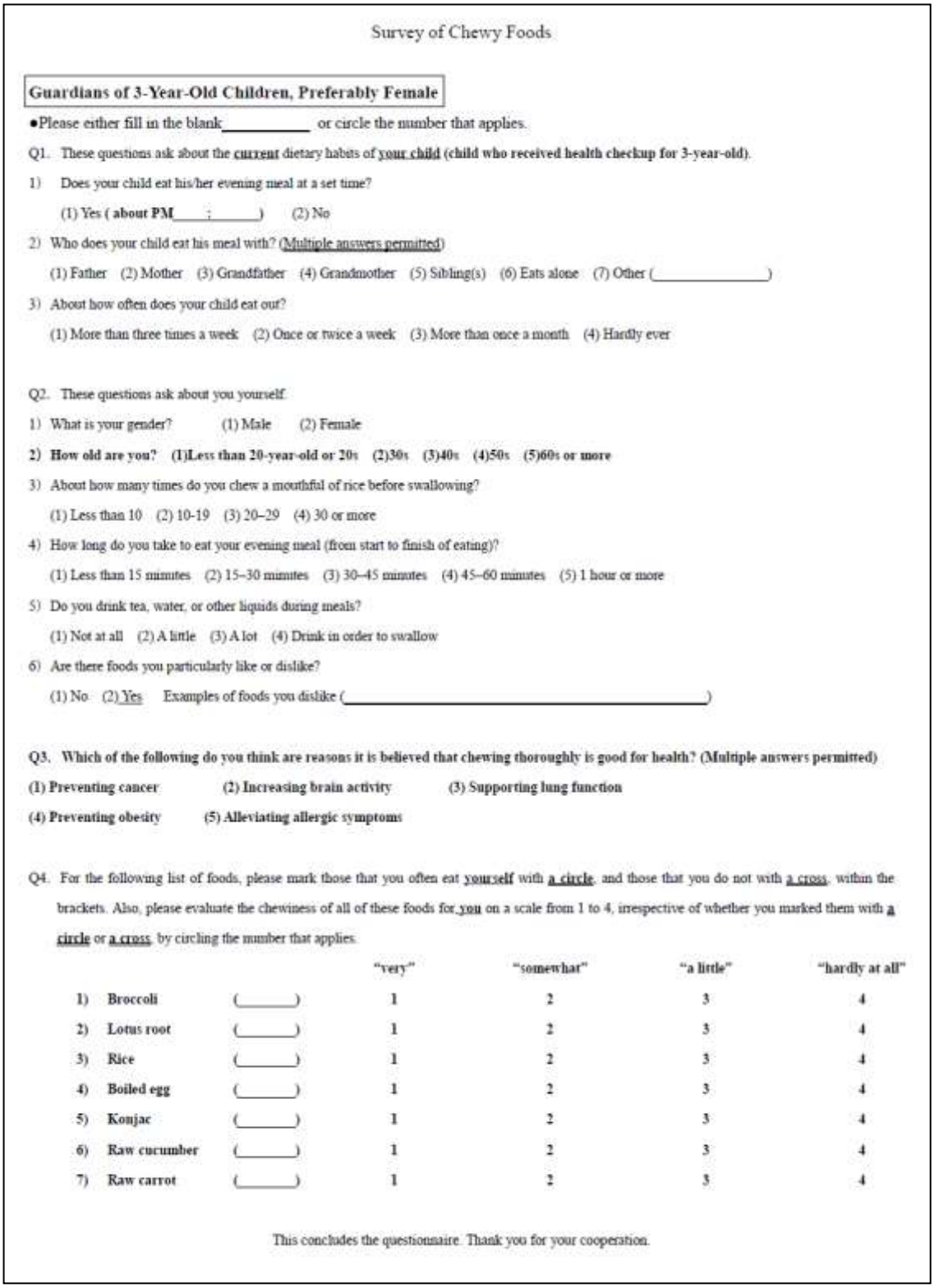
Q4. For the following list of foods, please mark those that you often give your child to eat with a circle, and those that you do not with a cross, within the brackets. Also, please evaluate the chewiness of all of these foods for your child on a scale from 1 to 4, irrespective of whether you marked them with a circle or a cross, by circling the number that applies.

			"very"	"somewhat"	"a little"	"hardly at all"
1)	**Broccoli**	(_____)	1	2	3	4
2)	**Lotus root**	(_____)	1	2	3	4
3)	**Rice**	(_____)	1	2	3	4
4)	**Boiled egg**	(_____)	1	2	3	4
5)	**Konjac**	(_____)	1	2	3	4
6)	**Raw cucumber**	(_____)	1	2	3	4
7)	**Raw carrot**	(_____)	1	2	3	4

This concludes the questionnaire. Thank you for your cooperation.

Figure 3. Revised version of the questionnaire for 3-year-old

＊The part which was changed from the original version is shown by a bold and different letters.



Survey of Chewy Foods

Guardians of 3-Year-Old Children, Preferably Female

●Please either fill in the blank_____ or circle the number that applies.

Q1. These questions ask about the current dietary habits of your child (child who received health checkup for 3-year-old).

1) Does your child eat his/her evening meal at a set time?

(1) Yes (about PM____:_____) (2) No

2) Who does your child eat his meal with? (Multiple answers permitted)

(1) Father (2) Mother (3) Grandfather (4) Grandmother (5) Sibling(s) (6) Eats alone (7) Other (_____)

3) About how often does your child eat out?

(1) More than three times a week (2) Once or twice a week (3) More than once a month (4) Hardly ever

Q2. These questions ask about you yourself.

1) What is your gender? (1) Male (2) Female

2) How old are you? (1)Less than 20-year-old or 20s (2)30s (3)40s (4)50s (5)60s or more

3) About how many times do you chew a mouthful of rice before swallowing?

(1) Less than 10 (2) 10-19 (3) 20–29 (4) 30 or more

4) How long do you take to eat your evening meal (from start to finish of eating)?

(1) Less than 15 minutes (2) 15–30 minutes (3) 30–45 minutes (4) 45–60 minutes (5) 1 hour or more

5) Do you drink tea, water, or other liquids during meals?

(1) Not at all (2) A little (3) A lot (4) Drink in order to swallow

6) Are there foods you particularly like or dislike?

(1) No (2) Yes Examples of foods you dislike (_____)

Q3. Which of the following do you think are reasons it is believed that chewing thoroughly is good for health? (Multiple answers permitted)

(1) Preventing cancer (2) Increasing brain activity (3) Supporting lung function

(4) Preventing obesity (5) Alleviating allergic symptoms

Q4. For the following list of foods, please mark those that you often eat yourself with a circle, and those that you do not with a cross, within the brackets. Also, please evaluate the chewiness of all of these foods for you on a scale from 1 to 4, irrespective of whether you marked them with a circle or a cross, by circling the number that applies.

		"very"	"somewhat"	"a little"	"hardly at all"
1) Broccoli	(_____)	1	2	3	4
2) Lotus root	(_____)	1	2	3	4
3) Rice	(_____)	1	2	3	4
4) Boiled egg	(_____)	1	2	3	4
5) Konjac	(_____)	1	2	3	4
6) Raw cucumber	(_____)	1	2	3	4
7) Raw carrot	(_____)	1	2	3	4

This concludes the questionnaire. Thank you for your cooperation.

Figure 4. Revised version of the questionnaire for guardians.
＊This questionnaire was for use by female guardians. This wording was changed to "Preferably Male" in the version for use by male guardians.
＊The part which was changed from the original version is shown by bold and different letters.

Table1. Results of pre-testing and re-testing on the questionnaire survey
Items in this table are based on the questionnaire of the modified version

3-year-old children				Guardians of 3-year-old children			
Item		Degree of accordance	The characteristic of question	Item		Degree of accordance	The characteristic of question
Q1.	1)	8/8	Generic character	Q1.	1)	7/8	Current dietary habits of the child
	2)	8/8			2)	5/8	
Q2.	1)	4/8	Memory of childcare		3)	7/8	
	2)	4/8		Q2.	1)	8/8	Generic character
Q3.	1)	6/8	Current dietary habits of the child		2) *2		
	2)	7/8			3)	6/8	Current dietary habits of the guardians
	3)	5/8			4)	4/8	
	4)	7/8			5)	7/8	
	5)	6/8	Manner of Guardians to the diet of their child		6)	8/8	
	6)	5/8		Q3.		8/8	Knowledge about the effect to chewing
	7)	6/8		Q4.	*1 1) −1	8/8	Current dietary habits of the guardians
Q4.	*1 1) −1	7/8			2) −1	8/8	
	2) −1	8/8			3) −1	8/8	
	3) −1	8/8			4) −1	6/8	
	4) −1	6/8			5) −1	7/8	
	5) −1	7/8			6) −1	8/8	
	6) −1	8/8			7) −1	7/8	
	7) −1	7/8			1) −2	4/8	Self-judgments based on guardians, knowledge
	1) −2	6/8	Self-judgments based on guardians, knowledge		2) −2	1/8	
	2) −2	3/8			3) −2	6/8	
	3) −2	5/9			4) −2	6/8	
	4) −2	5/8			5) −2	2/8	
	5) −2	1/8			6) −2	4/8	
	6) −2	3/8			7) −2	5/8	
	7) −2	3/8					

＊1　Q4.1) -1 ~ 7) -1 are the answers of a circle or a cross, Q4.1) -2 ~ 7) -2 are the answer of "chewiness".

＊2　The degree of accordance was not shown because this item was added from the re-testing.