

# Validity and Reliability of the Japanese Version of the 10-Item Perceived Efficacy in Patient-Physician Interactions (PEPPI-10) Scale in Breast Cancer Outpatients

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The 10-item Perceived Efficacy in Patient-Physician Interactions (PEPPI-10) questionnaire was used as an indirect measure of the patients' perception of the strength of their therapeutic connection with their physician. The English version of the PEPPI-10 could serve as a valuable research tool for analyzing the relationship between patient and physician. The incidence of breast cancer is amongst the highest in Japan, and Patient Reported Outcome is often used as an outcome measure for breast cancer. It is particularly important to establish a strong patient-physician interaction for patients with breast cancer, since these patients require long-term treatment. We designed the present study to assess the reliability and validity of the Japanese version of the PEPPI-10 in female Japanese breast cancer outpatients. A cross-sectional study was performed at the Saitama Cancer Center, Japan. From August 2014 to August 2015, the Japanese versions of the PEPPI-10 that measure patient-perceived self-efficacy and the Brief Illness Perception Questionnaire (BIPQ) that measure illness perception were used for 92 breast cancer patients who received outpatient chemotherapy (mean age: 52.9 years, Cancer Stage I or Stage II : 82.6%, receiving adjuvant chemotherapy: 69.6%). We found that the Japanese version of the PEPPI-10 scale had a high coefficient of internal consistency (Cronbach's  $\alpha$  coefficient, 0.83) for reliability, and concurrent validity analysis indicated that the utility of PEPPI-10 was moderately correlated with that of the BIPQ. In conclusion, the Japanese version of the PEPPI-10 is a useful tool that can empower breast cancer outpatients during the course of their treatment.

**Keywords:** assessment; breast cancer; communication; patient-physician; validation

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## Introduction

The incidence of breast cancer is amongst the highest in Japanese women (Hori et al. 2015). Patient Reported Outcome (PRO) is important for cancer patients as objective assessments (e.g., survival and response rates) (Matsuda et al. 2014), and PRO is often used as an outcome measure in clinical trials. It is particularly important to assess PRO in breast cancer patients, since individuals with this disease are treated over long periods of time.

Moreover, patients with this cancer require long-term treatment; therefore, a strong patient-physician interaction is crucial for this population as a whole, but particularly so for outpatients. Cancer diagnosis and treatment can affect PRO (Valderas et al. 2008). Information regarding quality of life (QOL), which is addressed in the PRO, is vital for understanding the full impact of treatment differences on patient outcomes (Hollen and Gralla 1996). Furthermore, an enhanced understanding of patient QOL can help improve clinical care (Mystakidou et al. 2005). However, medical

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staff may not sufficiently understand PRO. Effective interactions between the patient and the physician are associated with a reduced impact of disease on a patient's functional ability, and an increased active involvement in medical decision-making (Greenfield et al. 1985). Questionnaires assessing patient-physician interactions are used to collect PRO data. In a previous study, the 10-item Perceived Efficacy in Patient-Physician Interactions (PEPPI-10) questionnaire was used as an indirect measure of the patients' perception of the strength of their therapeutic connection with their physician (Fenton et al. 2018). The English version of the PEPPI-10 questionnaire could serve as a valuable research tool for analyzing the relationship between patient and physician (Maly et al. 1998). A validation of the Chinese version of this questionnaire has been reported (Zhao et al. 2016). The Dutch 5-item PEPPI demonstrated adequate validity and reliability in patients with osteoarthritis, and was an appropriate tool for measuring the self-efficacy of patients with osteoarthritis with regard to interactions with their physicians (ten Klooster et al. 2012).

To the best of our knowledge, no study has investigated the application of the PEPPI-10 scale in Japanese breast cancer outpatients. We designed the present study to assess the reliability and validity of the Japanese version of the PEPPI-10 in female Japanese breast cancer outpatients.

## Methods

### *Development of the PEPPI-10*

The original English questionnaire was translated into Japanese by Japanese researchers, and the translated Japanese questionnaire was back-translated by a Dutch researcher who had a good command of both Japanese and English. Both the English version and the Japanese version were compared, and were discussed among Japanese and Dutch researchers. This translation/back translation sequence was repeated twice.

### *Sample and protocol*

The Japanese version of the PEPPI-10 questionnaire was tested in an outpatient chemotherapy clinic. Breast cancer patients who used the outpatient chemotherapy clinic at the Saitama Cancer Center, Japan from August 2014 to August 2015 were included in this study. Eligibility criteria included patients aged 20 years or more who were in sufficiently good physical condition for participation in the investigation. The patients were provided with the PEPPI-10 and Brief Illness Perception Questionnaire (BIPQ) (Broadbent et al. 2006, 2015), and were required to answer them. The completed questionnaires were submitted without the participation of their physician. All procedures were followed in accordance with the Helsinki Declaration of the World Medical Association, and the protocol was approved by the Institutional Review Board of Saitama Cancer Center (CA014-14). Informed consent was obtained from the patients before the start of the study.

### *PEPPI-10*

The English version of the PEPPI-10 (Maly et al. 1998) was translated into Japanese. The subjects responded to each question on a scale of 1 to 5, with 5 representing "very confident," and 1 repre-

sented "not at all confident." The range of possible scores for the full PEPPI-10 scale was 10 to 50, with 50 representing the highest patient-perceived self-efficacy (Maly et al. 1998).

### *Other assessment tools*

The BIPQ is a validated instrument used to assess illness perceptions in various patient groups, including those with cancer (Broadbent et al. 2006, 2015). The BIPQ consists of eight questions that measure eight dimensions of illness perception. We used the "coherence (how well do you feel you understand your illness)" question in the BIPQ. In the current study, the word "illness" was replaced with "breast cancer". Answers were given on a scale ranging from 0 (not at all) to 10 (very much). The Japanese version of BIPQ is available from the Illness Perception Questionnaire Website (<http://ipq.h.uib.no//index.html>).

### *Sociodemographic and clinical characteristics*

Sociodemographic and clinical characteristics were obtained from the medical records of the patients, and included age, subtype, stage, and type of cancer, HER2-receptor sensitivity, timing (adjuvant or neo-adjuvant) of chemotherapy, and prior radiotherapy, employment, and partner status.

### *Statistical analysis*

Descriptive analyses were used to describe the sample characteristics and items using mean and standard deviation (SD) in the PEPPI-10. The data were used to test for reliability as follows: internal consistency of each scale was estimated with Cronbach's  $\alpha$ ; a value of 0.70 or greater was considered to indicate acceptable internal consistency (Cronbach 1951). The data were used to test for concurrent validity using the Pearson's correlation of an item with its own scale and those of other scales. Pearson's correlation coefficient was computed for correlations with scores on BIPQ coherence, age, and cancer stage. Construct validity was tested using factor analysis. Data analysis consisted of a two-step sequence that was comprised of exploratory and confirmatory factor analyses. The first step was performed using exploratory factor analysis with varimax rotation, and Bartlett's test and the Kaiser-Meyer-Olkin (KMO) index were implemented. The confirmatory factor analysis tested the fit of the one-factor and two-factor models as described previously (Zhao et al. 2016). The following fit statistics were used in the confirmatory factor analysis: satisfactory model fit (non-significant  $\chi^2$ ;  $p > 0.05$ ); normed-fit index (NFI,  $> 0.95$ ); comparative fit index (CFI,  $> 0.95$ ); root mean square error of approximation (RMSEA,  $< 0.08$  indicates good fit and  $> 0.1$  indicates poor fit), and goodness-of-fit statistic (GFI,  $> 0.90$ ) (Hooper et al. 2008).

All calculations were performed using the SPSS statistical package, version 24 and Amos, version 25 for Windows.

## Results

### *Patients*

Descriptive analyses of the data were performed with the variables of sociodemographic and clinical characteristics. Of the 92 breast cancer patients who used the outpatient chemotherapy clinic, there were no missing data. Characteristics of the patients in this study are presented in Table 1. The mean age of the patients was 52.9 years. Most of them had stage I or II (82.6%) invasive ductal

Table 1. Sample characteristics (n = 92).

| Characteristics   | Number (%)       |         |
|---|------------------|---------|
| Age, mean (SD)  | 52.9             | (10.3)  |
| Eastern Co-operative Oncology Group performance status, n (%) |                  |         |
|   | 0                | (100.0) |
| Stage   |                  |         |
|   | I                | (22.8)  |
|   | II               | (59.8)  |
|   | III              | (17.4)  |
| Type  |                  |         |
|   | Invasive ductal  | (93.5)  |
|   | Invasive lobular | (3.3)   |
|   | Other            | (3.3)   |
| HER2  |                  |         |
|   | Negative         | (73.9)  |
|   | Positive         | (26.1)  |
| Chemotherapy Timing   |                  |         |
|   | Neo-adjuvant     | (30.4)  |
|   | Adjuvant         | (69.6)  |
| Previous radiotherapy   |                  |         |
|   | No               | (91.3)  |
|   | Yes              | (8.7)   |
| Employment  |                  |         |
|   | Job at present   | (55.4)  |
|   | No               | (44.6)  |
| Partner   |                  |         |
|   | No               | (6.5)   |
|   | Yes              | (93.5)  |

SD, standard deviation.

(93.5%) cancer that was HER2-negative (73.9%). The majority of the patients received adjuvant chemotherapy (69.6%) and no prior radiotherapy. About half of the patients were employed (55.4%) and 93.5% of all patients had a partner.

#### Reliability

The mean scores and standard deviations (SD) for the items in the PEPPI-10 scale are displayed in Table 2.

#### Internal consistency

The Cronbach's  $\alpha$  coefficient for the full PEPPI-10 was 0.83, and showed satisfactory internal consistency (Table 2).

#### Concurrent validity

The score of the full PEPPI-10 was modestly correlated with coherence in the BIPQ (Pearson's correlation, 0.315;  $P = 0.002$ ), and negatively correlated with age

(Pearson's correlation,  $-0.094$ ;  $P = 0.374$ ) and stage (Pearson correlation,  $-0.099$ ;  $P = 0.347$ ), although these correlations did not meet the threshold for statistical significance (Table 3).

#### Construct validity

The KMO index was 0.916 with a  $\chi^2$  value of 725.85 ( $P < 0.01$ ). The exploratory factor analysis of the PEPPI-10 confirmed the presence of one distinct domain. Only one factor was retained with an eigenvalue greater than 1, and the cumulative contribution rate was 66.8%. The factor loadings for each of the 10 items (Q1 through Q10) were 0.86, 0.79, 0.85, 0.83, 0.80, 0.78, 0.59, 0.84, 0.79, and 0.80, respectively.

For confirmatory factor analysis, we hypothesized both one- and two-factor models. These models did not show a good fit (one-factor model:  $\chi^2 = 91.3$ ,  $P < 0.001$ ; two-factor model:  $\chi^2 = 82.1$ ,  $P < 0.001$ ). Additional indices are presented in Table 4.

Table 2. Reliability (n = 92).

| Item                 | Mean  | (SD)   | Cronbach's alpha |
|----------------------|-------|--------|------------------|
| Q1 (range, 1-5)      | 3.20  | (0.88) |                  |
| Q2 (range, 1-5)      | 3.23  | (0.90) |                  |
| Q3 (range, 1-5)      | 3.27  | (0.92) |                  |
| Q4 (range, 1-5)      | 3.55  | (0.88) |                  |
| Q5 (range, 1-5)      | 3.28  | (0.82) |                  |
| Q6 (range, 1-5)      | 3.30  | (0.95) |                  |
| Q7 (range, 1-5)      | 3.68  | (0.77) |                  |
| Q8 (range, 1-5)      | 3.45  | (0.89) |                  |
| Q9 (range, 1-5)      | 3.66  | (0.89) |                  |
| Q10 (range, 1-5)     | 3.30  | (0.92) |                  |
| Total (range, 10-50) | 33.93 | (7.21) | 0.83             |

“Q1. How confident are you in your ability to get a doctor to pay attention to what you have to say?”

“Q2. How confident are you in your ability to know what questions to ask a doctor?”

“Q3. How confident are you in your ability to get a doctor to answer all of your questions?”

“Q4. How confident are you in your ability to ask a doctor questions about your chief health concern?”

“Q5. How confident are you in your ability to make the most of your visit with a doctor?”

“Q6. How confident are you in your ability to get a doctor to take your chief health concern seriously?”

“Q7. How confident are you in your ability to understand what a doctor tells you?”

“Q8. How confident are you in your ability to get a doctor to do something about your chief health concern?”

“Q9. How confident are you in your ability to explain your chief health concern to a doctor? ”

“Q10. How confident are you in your ability to ask a doctor for more information if you don't understand what he or she said?”

SD, standard deviation.

Table 3. Concurrent validity : Pearson correlations between the PEPPI and other measures (n = 92).

|                      | BIPQ Coherence | Age    | Stage  |
|----------------------|----------------|--------|--------|
| PEPPI Total          |                |        |        |
| Pearson correlations | 0.315          | -0.094 | -0.099 |
| <i>P</i> value       | 0.002          | 0.374  | 0.347  |

BIPQ, brief illness perception questionnaire.

## Discussion

In the present study, the reliability and validity of the Japanese version of PEPPI-10 were evaluated in breast cancer outpatients.

The mean score of each item in the current study was slightly lower than those reported in the study by Maly et al. (1998). With regard to the characteristics of participating patients, most were Stage I (22.8%) or Stage II breast cancer (59.8%) and the majority of patients were receiving adjuvant chemotherapy (69.6%). We infer that the charac-

teristics of participating patients did not bias the data or our analysis.

Our current study demonstrated that the use of the questionnaires provided highly reliable data, as evidenced by the excellent internal consistency (Cronbach's  $\alpha$  coefficient, 0.83). We also demonstrated that PEPPI-10 exhibited concurrent validity when compared with BIPQ, although the association was weak. In a previous study (Zhao et al. 2016), the Chinese version of PEPPI-10 was not strongly correlated with other self-efficacy scales. In line with previous studies (Maly et al. 1998; Zhao et al. 2016), PEPPI-

Table 4. Confirmatory factor analysis of the Japanese version of PEPPI-10.

|                         |                            | Model1          |         | Model2          |         |
|-------------------------|----------------------------|-----------------|---------|-----------------|---------|
|                         |                            | Factor1         | Factor1 | Factor1         | Factor2 |
| Standardised loadings   | Q1                         | 0.86            |         |                 | 0.88    |
|                         | Q2                         | 0.79            | 0.79    |                 |         |
|                         | Q3                         | 0.85            | 0.86    |                 |         |
|                         | Q4                         | 0.83            | 0.85    |                 |         |
|                         | Q5                         | 0.80            | 0.81    |                 |         |
|                         | Q6                         | 0.78            | 0.78    |                 |         |
|                         | Q7                         | 0.59            | 0.60    |                 |         |
|                         | Q8                         | 0.84            |         |                 | 0.84    |
|                         | Q9                         | 0.79            |         |                 | 0.82    |
|                         | Q10                        | 0.80            |         |                 | 0.82    |
| Goodness-of fit indices | $\chi^2$ ( <i>P</i> value) | 91.32 (< 0.001) |         | 82.12 (< 0.001) |         |
|                         | NFI                        | 0.88            |         | 0.89            |         |
|                         | CFI                        | 0.92            |         | 0.93            |         |
|                         | RMSEA                      | 0.13            |         | 0.13            |         |
|                         | GFI                        | 0.83            |         | 0.84            |         |
|                         |                            |                 |         |                 |         |

Model1, one-factor model; Model2, two-factor model; NFI, normed-fit index (good fit > 0.95); CFI, comparative fit index (good fit > 0.95); RMSEA, root mean square error of approximation (acceptable fit < 0.08); GFI, goodness-of-fit statistic (good fit > 0.90).

10 was not significantly correlated with age in the present study. Exploratory factor analysis for construct validity showed only one factor, and the one-factor model did not show a good model fit in the confirmatory factor analysis. However, this is similar to the study by Maly et al. (1998), where only one factor was retained with an eigenvalue greater than 1.00.

PEPPI-10 is a questionnaire used to measure patient's perceived self-efficacy in interacting with physicians, and the impact of empowerment interventions (Maly et al. 1998). Recently, study protocols for investigating physician communication behaviors (Hagiwara et al. 2018) and behavioral markers of patient and physician race-related attitudes (Hamel et al. 2018) have been published. The doctor-patient relationship is a key component in patient health outcomes (Whittal and Lippke 2016); yet, little is known about perceived self-efficacy in doctor-patient interactions (Raymond et al. 2011). Patient-centered communication and perceived self-efficacy in patient-physician interactions may be significantly associated with patient adherence, and interventions in patient-provider communication may offer opportunities to improve patient outcomes (Liu et al. 2013). Greater patient-perceived self-efficacy in patient-physician interactions has been associated with participation (Maly et al. 2004). In the Netherlands, the 5-item PEPPI was used to assess health literacy and various aspects of self-management (Heijmans et al. 2015). Information about patient-perceived self-efficacy in interacting with physicians may prove useful for improving the QOL of patients in Japan, and PEPPI-10 might be an important tool for this purpose. In future, the Japanese version of PEPPI-10 could be used to enhance the quality of treatment

decision-making and patient adherence to the therapy.

There are some limitations in the current study. The Japanese version of PEPPI-10 did not indicate sufficient validity in this study. However, the only two published studies in this area are related to the validation of the original English version of PEPPI-10 (Maly et al. 1998) and the Chinese version (Zhao et al. 2016), and sufficient validity was not observed in either study as described above. Although our results did not reveal strong concurrent validity, they were generally similar to those reported in the above studies. With regard to concurrent validity, the coherence in the BIPQ questionnaire might be too broad to be related to self-efficacy. We suggest that the concurrent validity should be further examined using more comparable, domain-specific measures of doctor-patient communication. However, we do not believe that a relevant questionnaire to address this is currently available. With regard to construct validity, we think that PEPPI is questionnaire that has been structured one factor. For this reason, we consider Japanese version PEPPI-10 fit for purpose.

In conclusion, the Japanese version of the PEPPI-10 demonstrated adequate reliability and moderate concurrent validity for outpatients with breast cancer. We believe that this questionnaire will prove useful to assess the patient-physician interaction and provide information about the patients' perception of their therapeutic connection with their physician, especially for Japanese breast cancer outpatients.

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### Author Contributions

A.M. conceived the study. A.M., K.K., M.J.F., J.R.K., S. R.S.R., A.A.K. and K.Y. participated the development of the protocol. K.I. and M.M. were involved in trial design, intervention development and ethics application. A.M. and K.Y. were responsible for statistical analyses. A.M. and K.Y. wrote the first draft of this paper. All authors contributed to preparing and revising the manuscript, including relevant scientific content. All authors approved the final version of the manuscript.

### Conflict of Interest

The authors declare no conflict of interest.

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