Verification of the Validity of Depressive Symptom Scale Based on the Existing Health Questionnaire

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Abstract

This paper is the first one of a series of our epidemiological studies exploring the long-term relationship between depressive symptoms and developments of lifestyle-related diseases in middle-aged and older Japanese population. Our strategy for exploring the long-term relationship is to fully utilize the annual health checkup data in a Japanese manufacturer for 14 years from 1995. The health checkup data includes answers to the questions about subjective symptoms, but does not include any of the established and generally accepted set of depression scale questions. In order to confirm that the level of depressive symptoms can be estimated by the answers to the subjective symptom questions in the existing dataset, we selected 13 questions about subjective symptoms from the questionnaire for review and asked to fill in Zung Self-rating Depression Scale questions to the people randomly sampled from the checkup population in 2008. A positive correlative relationship between the result of the selected 13 questions and SDS is confirmed by simple linear regression with a positive coefficient (p<0.001). The internal consistency is also confirmed with Cronbach's alpha 0.8871. This strongly supports our further study design examining the long-term relationship with the existing checkup data for 14 years.

Key words: depressive symptoms, SDS, health checkup questionnaire, correlation, linear regression

❖ Introduction

There have been a lot of papers and reviews examining the link between chronic diseases and depressive disorders in the literature[1], [1]. However there is little for the Japanese working population. Therefore we planed a series of epidemiological studies exploring the long-term relationship between depressive symptoms and developments of lifestyle-related diseases in middle-aged and older Japanese population. This paper is the first one of the series of our studies.

The strategy we adopted for exploring the long-term relationship is to fully utilize the annual health checkup data in a Japanese manufacturer for 14 years from 1995. The health checkup data includes not only blood pressure and blood test results (triglyceride, cholesterol, blood sugar, etc.), but also answers to the questions about subjective symptoms. However it does not include any of the established and generally accepted set of depression scale questions. In order to fully utilize the existing health checkup data for the past 14 years, the first step to follow should be to confirm that the level of depressive symptoms can be estimated by utilizing several of the existing subjective symptom questions.

Of the questions in the annual checkup questionnaire, we selected 13 questions about subjective symptoms for review and asked to fill in Zung Self-rating Depression Scale[2] (hereinafter called "SDS") questions to the people randomly sampled from the checkup population in 2008. And we confirmed the concurrent validity between the result of these 13 questions and the result of SDS.

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[1] Chapman (2005) in the references is a good review summary of the related papers in the past.

Table 1   Selected 13 Questions for estimating the level of depressive symptoms

1	I have an unpleasant awakening due to feeling tired
2	I cannot work efficiently before lunch time
3	I feel tired and sluggish
4	I am very concerned about any changes in my physical condition
5	I easily get irritated
6	I get anxious for no particular reasons
7	I have difficulties feeling close to others and feel isolated
8	I do not feel refreshed and feel gloomy
9	I cannot think clearly and have trouble making a decision
10	I feel too lazy and am not interested in the things I used to like to do
11	I have trouble sleeping
12	I have no appetite
13	I have a bad headache or feel severely heavy-headed

❖ Method

1 Study field

The field of the study is one of the health care centers (hereinafter called "the facility") for Hitachi, Ltd., one of the largest manufacturers in Japan. The facility carries out the health checkup for the employees and families of the business group. Almost 50,000 people take health checkups at the facility annually in total.

The health checkup for the people who are 30 years old and over includes blood tests for triglyceride, cholesterol, blood sugar, etc. And at the beginning of each checkup, they are asked to fill in a well designed questionnaire, which includes the questions about subjective symptoms.

2 The scale for review in this study

Based on the advice of a psychiatrist who supports our study, we selected 13 questions from the questionnaire as a set of questions for estimating his/her level of depressive symptoms (see Table 1). It includes 12 questions (No. 1–12 in Table 1) of 13 psychological subjective symptoms in the section 6 of the questionnaire and one question (No. 13 in Table 1) of 18 somatic subjective symptoms in the section 7. The selected 13 questions cover almost all major depressive episode questions in M.I.N.I. (MINI INTERNATIONAL NEUROPSYCHIATRIC INTERVIEW Japanese version 5.0.0 (2003))[3] in a similar Japanese expression.

The answer for the question No. 1 to 12 is among 4 choices, "1 no", "2 sometimes", "3 often" and "4 always". The answer for the question No. 13 is among 3 choices, "1 no", "2 yes" and "3 severe". The scale for review in this study is the total sum of the answer scores of the selected 13 questions (hereinafter called "Qsum"). In order to assign an equal weight to all the questions, the score of the question No. 13 is converted into the 1–4 scale, i.e. the score 2 and 3 are converted to 2.5 and 4 respectively.

3 Standard scale of depressive symptom

We chose Zung Self-rating Depression Scale questions - Japanese version (see Table 2) as a standard scale of depressive symptom which is to be compared to Qsum. This is mainly because it is one of the widely accepted depression scales and its simple 20 questions need only a little time to be answered and very easy to handle.

4 Random sampling of the study population

The candidates to be asked to fill in SDS were randomly selected from the facility's checkup reservation list in 2008 based on the pickup rates according to age distribution in the previous year, 2007. The first recruitment was conducted for the period from September 4th to 30th in 2008. From the reservation list for the period (1,214 males and 212 females), we randomly sampled and prepared the candidate list (105 males and 104 females). At the beginning of the checkup the facility staff explained the study purpose to the candidates and asked them to fill in SDS. Out of the candidates for the period, 69 males and 90 females agreed to fill in SDS. In order to acquire sam-

Table 2   Zung Self-rating Depression Scale questions

1	I feel down-hearted and blue
2	Morning is when I feel the best
3	I have crying spells or feel like it
4	I have trouble sleeping at night
5	I eat as much as I used to
6	I still enjoy sex
7	I notice that I am losing weight
8	I have trouble with constipation
9	My heart beats faster than usual
10	I get tired for no reason
11	My mind is as clear as it used to
12	I find it easy to do the things I used to
13	I am restless and can't keep still
14	I feel hopeful about the future
15	I am more irritable than usual
16	I find it easy to make decisions
17	I feel that I am useful and needed
18	My life is pretty full
19	I feel that others would be better off if I were dead
20	I still enjoy the things I used to do

Note: Four choices for each statement are "a little of the time", "some of the time", "good part of the time" and "most of the time".
Adapted from Zung, A self-rating depression scale, Arch Gen Psychiatry, 1965; 12: 63–70.

Table 3   Summary of the Samples

	Male	Female	Total
N	142	153	295
Age 30–39	38 (26.8%)	31 (20.3%)	69 (23.4%)
40–49	62 (43.7%)	54 (35.3%)	116 (39.3%)
50–59	42 (29.6%)	68 (44.4%)	110 (37.3%)
Ave. Age	45.8	47.6	46.7
Ave. SDSsum	36.5	38.1	37.3
Ave. Qsum	18.4	20.5	19.5

ples over 100 each, we conducted the second recruitment for the period from October 27th to November 17th with the same procedure. The randomly sampled candidates from the reservation list for the second period (968 males and 140 females) are 90 males and 74 females, and out of them, 73 males and 63 females agreed to participate. In total 142 males and 153 females agreed to participate the study.

The software for statistical analysis is Stata/SE 10.1 for Windows. The ethical review board of the medical organization to which the facility belongs approved the protocol of this study.

❖ Results

1 Summary of the samples

The Summary of the samples is shown in Table 3. We have 142 male samples and 153 females. The average age for male is 45.8 years old, which is a little bit lower than 47.6 years old for female. The average of SDS score (hereinafter called "SDSsum") for male is 36.5, which is also a little bit lower than 38.1 for female. The average of the total score of the selected 13 questions from the facility's health checkup questionnaire (Qsum) is 18.4 for male, which is also a little bit lower than 20.5 for female.

2 Correlative Relationship between Qsum and SDSsum

The scatter plot with Qsum and SDSsum is shown in Figure 1. The correlation coefficient between Qsum and SDSsum is 0.752. The result of simple linear regression analysis is shown in Table 4. The coefficient for Qsum is positive. The adjusted R-squared is 0.5641 and the p-values of the coefficient for Qsum and the constant are less than 0.1%. A positive correlative relationship between Qsum and SDSsum is considered medium to strong.

3 Reliability of Qsum

In order to confirm the internal consistency of the scale Qsum, Cronbach's alpha was calculated. The result was 0.8871, which far exceeded 0.8.

As we did not try a retest of Qsum in this study, the stability, i.e. the reproducibility of the measure was not explicitly confirmed. However this self-report questionnaire has been used for over 10 years and in recent years administered by answering the questions on a computer screen without involving any other person. Therefore the measurement procedure is well expected to be stable.

4 Consistency of the Answers

The statements of the questions in Qsum and those in SDSsum are not exactly the same as shown in Table 1 and 2. But some are quit close. For example, Q11 in Qsum "I have trouble sleeping" and Q4 in SDSsum "I have trouble sleeping at night" are almost
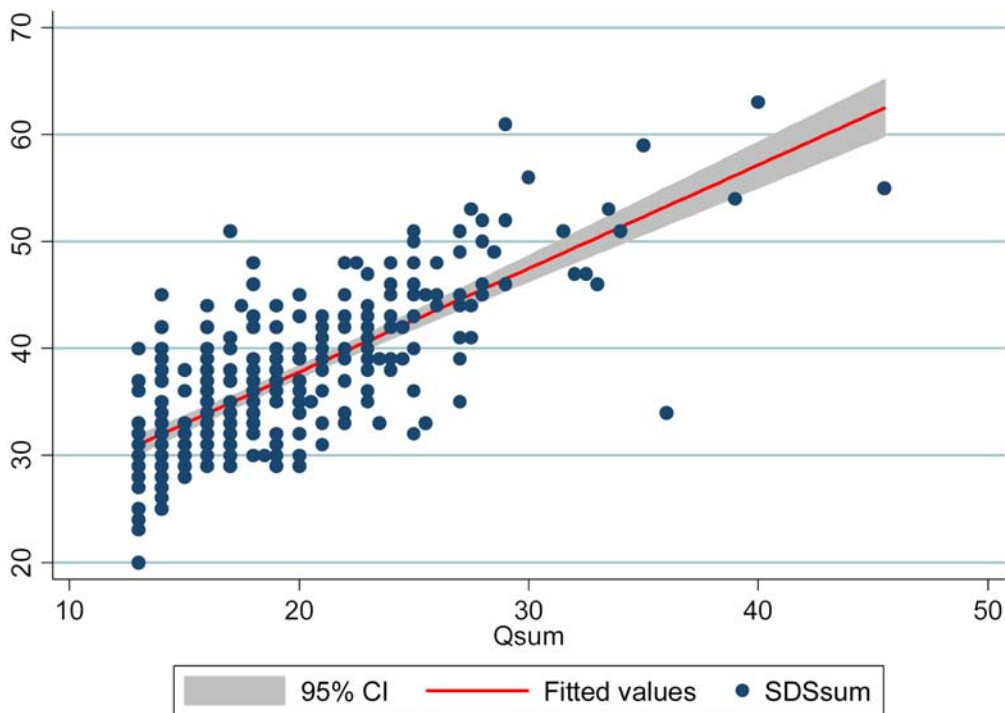
Figure 1.   Scatter plot of Qsum and SDSsum

Note: 95% CI is the 95% confidence interval of the mean.

Table 4   Regression analysis

SDSsum	Coef.	Std. Err.	t	p>|t|	[95% Conf. Interval]	
Qsum	0.96827	0.04958	19.53	0.000	0.87070	1.06584
_cons	18.43427	1.00485	18.35	0.000	16.45664	20.41190

Number of objects   =   295
R-squared   = 0.5656
Adj R-squered   = 0.5641

the same. The frequency of the answer combinations and the result of Kappa test for answer agreements are shown in Table 5. The result indicates that we can reject the null hypothesis that answers are made randomly. Also, Q12 in Qsum "I have no appetite" and Q5 in SDSsum "I eat as much as I used to" are rather opposite statements and Q5 in SDSsum is one of the reverse scaling questions. The frequency of the answer combinations after adjusting the reverse scaling in SDS and the Kappa test result are shown in Table 6. Again we can reject the null hypothesis. The answers are considered consistent enough.

❖ Discussions

SDS itself is not a tool for the definite diagnosis of depression, but is expected that primary care physicians can use SDS for finding hidden depressive conditions and also psychiatrists can supplementarily use SDS for judging the degree of improvement of depressive conditions. And a early SDS study for a Japanese patients with depression reported that the average and the standard deviation of SDSsum are 60 and 7 respectively[4].

Based on the result of the regression analysis shown in Table 4, we can get the regression equation "SDSsum estimate = 0.96827 * Qsum + 18.43427", and a simple algebra can give us the Qsum value

Table 5   Answer consistency between Q11 in Qsum and Q4 in SDSsum

| | Q4 (SDSsum) | | | | |
	1	2	3	4	Total
Q11 (Qsum)					
1	186	21	1	0	208
	89.42%	10.10%	0.48%	0.00%	100.00%
2	13	58	1	0	72
	18.06%	80.56%	1.39%	0.00%	100.00%
3	1	2	2	4	9
	11.11%	22.22%	22.22%	44.44%	100.00%
4	1	0	1	4	6
	16.67%	0.00%	16.67%	66.67%	100.00%
Total	201	81	5	8	295
	68.14%	27.46%	1.69%	2.71%	100.00%

Agreement	Expected Agreement	Kappa	Std. Err.	Z	Prob > z
84.75%	54.85%	0.6621	0.0497	13.33	0.0000

Table 6   Answer consistency between Q12 in Qsum and Q5 in SDSsum

| | Q5 (SDSsum) | | | | |
	1	2	3	4	Total
Q12 (Qsum)					
1	210	49	1	0	260
	80.77%	18.85%	0.38%	0.00%	100.00%
2	4	23	4	0	31
	12.90%	74.19%	12.90%	0.00%	100.00%
3	0	0	3	0	3
	0.00%	0.00%	100.00%	0.00%	100.00%
4	0	0	0	1	1
	0.00%	0.00%	0.00%	100.00%	100.00%
Total	214	72	8	1	295
	72.54%	24.41%	2.71%	0.34%	100.00%

Agreement	Expected Agreement	Kappa	Std. Err.	Z	Prob > z
80.34%	66.53%	0.4126	0.0466	8.86	0.0000

which is equivalent to SDSsum estimate 60. But it is considered to be inappropriate to make analyses based on this kind of extrapolated value since we have only 2 samples whose SDSsums are equal to or larger than 60 in our study population.

In a usual range of values, the positive correlative relationship of SDSsum and Qsum is confirmed as stated above and it is considered that the depressive symptoms become severer when SDSsum is getting larger. Therefore it can be well expected that the depressive symptoms become severer when Qsum is getting larger.

❖ Conclusions

A positive correlative relationship between the result of the selected 13 questions from the facility's questionnaire and SDS is confirmed. This strongly

supports our further study design that will examine the long-term relationship between depressive symptoms and developments of lifestyle-related diseases in middle-aged and older Japanese population with the existing checkup data of the facility for 14 years. The results of the further studies will be presented in our future publications.

❖ Acknowledgements

❖ References

1) Chapman D, et al.: The Vital Link Between Chronic Diseases and Depressive Disorders: Prev Chronic Dis [Serial online] 2005 http://www.cdc.gov/pcd issues/2005/jan/04_0066.htm (access 23 February 2009).

2) Zung WWK: A self-rating depression scale. Arch Gen Psychiatry 12, 63–70 (1965).

3) Sheehan D, et al.: MINI INTERNATIONAL NEU-ROPSYCHIATRIC INTERVIEW Japanese version 5.0.0 (2003). Tokyo: Seiwa Shoten, 2003 (in Japanese).

4) Fukuda K, et al.: SDS Shiyo Tebiki (A user's instruction of Self-rating Depression Scale Japanese Version). Kyoto: Sankyodo, 1983 (in Japanese).