



## Factor structure of the Zung Self-rating Depression Scale in first-year university students in Japan

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### Abstract

The Zung-Self-rating Depression Scale (SDS) was distributed to 28,588 first-year university students. Factor analysis using PROMAX rotation revealed three factors interpretable as affective, cognitive, and somatic symptoms. The confirmatory factor analysis showed a goodness-of-fit index of 0.976 and an adjusted goodness-of-fit index of 0.967. The two sexes exhibited virtually the same factor structure. The result suggests that studies with this scale should use these three subscales rather than a total score.

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### 1. Introduction

Studying depression among adolescents is important because of its continuity from the early to later stages of life (Feehan et al., 1993). Depression in the early stage of life can predict not only depression (Harrington et al., 1990; Kovacs et al., 1984) but also other types of mental disorders (Kashani et al., 1987) in the future. Depression in adolescence has also been reported to be linked to future adjustment problems such as problems in marriage, employment status, involvement with drugs, delinquent behaviour, being arrested, being convicted of a crime, being in a car

accident, and being a school dropout (Carlson and Strober, 1978; Chiles et al., 1980; Kandel and Davies, 1986; Newcomb and Bentler, 1988; Paton et al., 1977; Weinberg and Emslie, 1988).

Instruments developed thus far to measure symptoms of depression usually consist of multiple items covering different domains of depressive symptomatology. Most investigators, however, use the total score of a measure as an index of depression severity. This seems to be only an approximate estimation of depressive symptomatology because many studies indicate that depression is a multifaceted phenomenon. For example, three- (Fleck et al., 1995; Marcos and Salamero, 1990; Ramos-Brieva and Cordero-Villafafila, 1988), four- (Basoglu, 1984; Hammond, 1998; O'Brien and Glaudin, 1988; Onega and Abraham, 1997), five- (Gibbons et al., 1993), and six-factor (Hamdi et al., 1997) solutions were

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reported for the Hamilton Depression Rating Scale (Hamilton, 1960), the most widely used observer-based measure of clinical depression. Similar findings of multiple-factor solutions were reported for other rating scales of depression and depression-related symptoms (e.g., Addington et al., 1990; Craighead and Evans, 1996; Freeman et al., 1996; Giambra, 1997; Gullion and Rush, 1998; Hare and Davis, 1996; Lotrakul and Sukanich, 1999; Meins, 1996; Mook et al., 1991; Mueller et al., 1999; Prigerson et al., 1995; Reynolds and Baker, 1988; Rush et al., 1996; Salamero and Marcos, 1992; Serretti et al., 1999; Suzuki et al., 1995), while studies reporting a single-dimension solution are exceptional (e.g., Addington et al., 1992, 1994; Bech, 1991; Ivarsson and Gillberg, 1997). If depressive symptomatology consists of different domains, it may be plausible to use subscales rather than a total score to measure clinical pictures of individuals with affective symptoms (Tennen et al., 1995). Among the many self-report measures of depression developed thus far, the Zung Self-rating Depression Scale (SDS; Zung, 1965) has been one of the most popular and widely used since its publication in 1965 (Kitamura, 1999; Zung, 1986). The SDS consists of 20 items. Originally, Zung (1965) divided them on a conceptual basis into three domains: pervasive affect (e.g., crying spells), physiological equivalents (e.g., insomnia), and psychological equivalents (e.g., hopelessness). This classification of symptoms was refuted by Zung (1967) himself through a factor structure of the SDS items based on a population of 169 elderly persons. This yielded four factors, but their clinical interpretation was difficult. This result is difficult to generalise because Zung's (1967) sample was limited to an elderly population with a small number of subjects.

Since Zung (1965) reported the SDS, several studies on its factor structure have been carried out. In a review of the literature, we identified 30 references with the key words of the SDS and factor structure, out of which 10 articles showed the matrix of the SDS factor analysis. They were mainly from the U.S. (Barefoot et al., 2000; Passik et al., 2000; Steuer et al., 1980) and Japan (Kawada and Suzuki, 1992, 1993; Sakamoto et al., 1998; Sugawara et al., 1999) and few from European countries (Sirkka-liisa and Pakkala, 1986; Schotte et al., 1996).

Different factor structures emerged from those reports. However, the population sizes ranged from 60 (Steuer et al., 1980) to 3178 (Kawada and Suzuki, 1993); the characteristics of the populations were also varied, including coronary, renal, or cancer patients, elderly people, patients with affective disorders, employees, and students; the rotation of factors was diagonal or orthogonal; and the procedures of determining the number of factors differed (e.g., Kaiser criteria, scree test, and eigenvalue > 2). Two articles reported two-factor structure, four articles three-factor structure, and six articles, two-factor structure. All the factor analyses we reviewed were exploratory ones except for Sakamoto et al. (1998). Thus, we thought it worthwhile to carry out a confirmatory factor analysis on the SDS.

Because depression is prevalent among adolescents and young adults and it is, as stated, linked to concurrent and future maladjustment in wider domains, the factor structure of the depression symptomatology among this population deserves research attention. We will report here the factor structure of the SDS among a large number of first-year university students in Japan. In addition, we were interested in confirmation of the factor structure extracted from an exploratory factor analysis.

## 2. Methods

### 2.1. Participants

From 1981 to 1999, Yamaguchi University enrolled 34,656 new students. They had medical check-ups in April as legislated by School Health Law. This procedure included the distribution of the SDS in Yamaguchi University. A total of 28,588 (82%) students returned a usable questionnaire. Of these students, 70% were male and 30% female. Their mean age (S.D.) was 18.4 (1.1) years.

### 2.2. Measures

*Self-rating Depression Scale (SDS)*: The Japanese version of the SDS (Fukuda and Kobayashi, 1973) is a self-report measure of depression consisting of 20 items, with a four-point scale ranging from a little of the time (1) to most of the time (4). Of the 20 items,

10 are worded positively and 10 are worded negatively. The former 10 items are reversed items. The validity and the reliability of the SDS have been reported (for review, see Zung, 1986).

### 3. Results

The means and SDs of the SDS items are described in Table 1. A factor analysis was performed for all the SDS items with PROMAX rotation. Based on the scree test (Cattell, 1966; Zwick and Velicer, 1982), three factors were extracted (Table 1). Their eigenvalues were 3.8, 1.8, and 1.3. The SDS items with high factor loadings on the first factor include irritability, depressed affect, fatigue, and crying spells. This factor was interpreted as reflecting the affective symptoms. The items with high factor loadings on the second factor include personal devaluation, emptiness, hopelessness, and indecisiveness. Thus, the second factor was interpreted as reflecting the cognitive symptoms. The items with high factor loadings on the third factor include decreased appetite, decreased libido, and psychomo-

tor retardation. This factor was thus interpreted as reflecting the somatic symptoms. When the same analyses were conducted for the two sexes separately, virtually the same results were observed.

### 4. Discussion

We have reported here that the SDS items can be divided clearly into three clinically interpretable domains— affective, cognitive, and somatic. These divisions correspond to psychopathological consideration as well as Zung's (1965) original proposal of the three domains.

Of the 10 articles on the factor matrix of the SDS cited earlier, item 1 “I feel downhearted”, item 3 “Crying spells”, item 13 “Restless”, item 15 “More irritable than usual”, and item 19 “Others would be better off if I were dead” loaded on the same factor in almost all the reports. Exceptional was Sirkka-liisa and Pakkala's (1986) report. This study used only an elderly population. These items correspond to our affective domain. The two other items that were categorised as affective in our factor analysis (item 9 “Heart beats faster” and item 10 “Tired for no reason”) had high factor loadings on the same factor as the above items when the number of factors was two.

The four items belonging to the somatic domain in our study (item 14 “I feel hopeful”, item 16 “Easy to make decisions”, item 17 “I am useful”, and item 18 “My life is full”) also loaded on the same factor across almost all the studies. The three somatic items (item 5 “I eat as much”, item 6 “I enjoy sex”, and item 12 “I find it easy to do things”) were the most variable in their place in the factor matrix. They loaded on the same factor, loaded on different factors, or had only negligible loadings (Table 2).

Reviewing the literature suggests that affective and cognitive symptoms are fairly consistent constellations across studies. Somatic symptoms are less consistent but have a potential to constitute an independent constellation. No substantial differences in the factor structure of the SDS were found between studies in the U.S. and Japan, suggesting little cultural influence on it despite possible trans-cultural differences in the total score of the SDS (Zung, 1969; Naughton and Wiklund, 1993). Saka-

Table 1  
Factor loadings of the SDS items

SDS items	Mean	S.D.	Factors		
			I	II	III
15 Irritability	1.4	0.7	<b>0.65</b>	0.05	−0.03
1 Depressed affect	1.4	0.6	<b>0.64</b>	0.16	−0.06
10 Fatigue	1.3	0.6	<b>0.58</b>	0.01	−0.06
3 Crying spells	1.4	0.6	<b>0.58</b>	0.01	−0.18
13 Psychomotor agitation	1.4	0.7	<b>0.58</b>	−0.06	0.16
9 Tachycardia	1.2	0.4	<b>0.57</b>	−0.02	0.02
19 Suicidal ideation	1.1	0.4	<b>0.53</b>	−0.14	0.09
4 Sleep disturbance	1.5	0.7	0.38	0.18	−0.09
8 Constipation	1.4	0.7	0.37	−0.04	0.18
17 Personal devaluation	2.7	0.9	−0.05	<b>0.78</b>	−0.07
18 Emptiness	2.6	0.9	0.06	<b>0.75</b>	−0.02
14 Hopelessness	2.1	0.9	0.01	<b>0.68</b>	0.09
16 Indecisiveness	2.8	0.9	0.11	<b>0.56</b>	−0.05
20 Dissatisfaction	2.1	0.9	0.01	0.38	0.24
2 Worse in the morning	2.9	0.9	−0.08	0.31	0.17
5 Decreased appetite	1.4	0.7	0.01	−0.07	<b>0.73</b>
6 Decreased libido	2.0	0.9	−0.20	0.07	<b>0.56</b>
12 Psychomotor retardation	1.5	0.7	−0.04	0.25	<b>0.54</b>
11 Confusion	1.7	1.0	0.22	−0.25	0.31
7 Weight loss	1.2	0.6	0.24	−0.24	0.25

Factor loadings of 0.4 or more are in boldface.

Table 2  
Factor matrixes of the Zung Self-rating Depression Scale (SDS) items in previous investigations

	Morris et al. (1975)		Steuer et al. (1980)			Sirikka-liisa and Pahkala (1986)			Kawada and Suzuki (1992): night shift workers		Kawada and Suzuki (1992): daytime workers		Kawada and Suzuki (1993): night shift workers		Kawada and Suzuki (1993): daytime workers		Schotte et al. (1996)		Sakamoto et al. (1998)			Sugawara et al. (1999)			Passik et al. (2000)			Barefoot et al. (2000)				
	F1	F2	F1	F2	F3	F1	F2	F3	F1	F2	F1	F2	F1	F2	F1	F2	F1	F2	F3	F1	F2	F3	F1	F2	F3	F4	F1	F2	F3	F4		
1. I feel downhearted	0.68	–	–	0.77	–	–	0.60	–	0.59	0.60	–	–	–0.64	–	0.63	–	–	–	0.76	–	0.58	–	–	–	–	0.69	–	–	–	0.71	–	–
2. Morning is when I feel best	–	–	–	–	0.70	0.40	–	–	0.48	–	–	0.44	0.49	–	0.49	–	–	0.55	–	–	–	–	–	–	–	–	–	–	–	0.32	–	–
3. Crying spells	0.74	–	–	0.53	–	–	–	0.61	–	0.45	0.64	–	–	–0.56	–	–	–	0.45	–	0.49	–	0.61	–	–	–	0.70	–	–	–	0.59	–	–
4. I have trouble sleeping	0.60	–	–	0.49	–	–	0.63	–	–	0.50	0.46	–	–	–0.50	–	0.42	–	–	–	–	–	0.44	0.59	–	–	–	–	–	–	–	0.52	–
5. I eat as much	–	0.43	–	–	0.82	–	–	–	–	–	–	–	–	–	–	–	0.43	–	–	–	0.43	–	–	–	–	–	–	0.71	–	–	–	0.78
6. I enjoy sex	–	–	0.42	–	–	–	–	–	–	–	–	–	–	–	–	–	0.50	–	–	–	–	–	–	–	0.49	–	–	–	–	–	–	
7. I am losing weight	–	–	–	–	0.43	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.35	–	–	–	–	–	–	0.79	–	–	–	0.80
8. I have trouble with constipation	0.67	–	–	0.54	–	–	–	–	–	–	–	–	–	–	–	–	–	0.64	–	–	–	–	–	–	–	–	0.67	–	–	–	0.47	–
9. Heart beats faster	0.51	–	–	0.40	–	–	0.63	–	–	0.45	0.54	–	–	–0.55	–	0.51	–	0.55	–	–	0.46	–	–	–	–	–	0.61	–	–	–	0.60	–
10. Tired for no reason	0.70	–	–	0.59	–	–	0.54	–	–	0.56	0.59	–	–	–0.55	–	0.53	0.71	–	–	0.61	–	–	–	–	–	–	0.58	–	–	–	0.69	–
11. My mind is as clear	–	0.57	–	–	0.43	0.65	–	–	0.53	–	–	0.59	0.61	–	0.60	–	0.70	–	0.72	–	–	–	–	–	–0.78	0.63	–	–	–	0.57	–	–
12. I find it easy to do things	–	0.73	0.43	–	0.43	0.68	–	–	0.46	–	0.47	0.46	0.50	–	0.55	–	–	0.72	0.73	–	–	–	–	–	–0.85	0.53	–	–	–	–	0.55	–
13. Restless	0.71	–	–	0.69	–	–	0.48	–	–	0.72	0.64	–	–	–0.69	–	0.68	0.66	–	–	0.41	–	0.62	–	–	–	0.58	–	–	–	0.57	–	–
14. I feel hopeful	–	0.71	0.55	–	–	0.64	–	–	0.61	–	–	0.66	0.66	–	0.65	–	–	0.49	0.58	–	–	–	–	–	–0.78	–	0.66	–	–	–	0.65	–
15. More irritable than usual	0.68	–	–	0.51	–	0.58	–	–	–	0.72	0.71	–	–	–0.74	–	0.73	0.60	–	–	0.65	–	0.67	–	–	–	–	0.65	–	–	–	0.58	–
16. Easy to make decisions	–	0.64	–	–	0.54	–	0.56	–	0.62	–	–	0.67	0.66	–	0.62	–	0.74	–	0.51	–	–	–	–	–	–	–0.69	0.72	–	–	–	0.65	–
17. I am useful	–	0.70	0.84	–	–	0.66	–	–	0.62	–	–	0.63	0.65	–	0.64	–	0.72	–	0.50	–	–	–	–	–	–0.72	–	0.76	–	–	–	0.78	–
18. My life is full	–	0.71	0.80	–	–	0.66	–	–	0.80	–	–	0.84	0.78	–	0.79	–	0.48	0.44	0.63	–	–	–	–	–	–0.84	–	0.78	–	–	–	0.74	–
19. Others would be better off if I were dead	0.62	–	0.44	–	–	–	–	0.71	–	0.49	0.61	–	–	–0.57	–	0.45	0.71	–	–	–	–	–	–	–	–	–	0.49	–	–	–	0.58	–
20. I still enjoy the things I used to	–	0.74	0.72	–	–	0.60	–	–	0.74	–	–	0.78	0.70	–	0.73	–	–	–	–	–	–	–	–	–	–	–	0.72	–	–	–	0.62	–

Factor loadings of more than 0.4 were described.

moto et al. (1998) administered the SDS to a total of 2258 university students in Japan and found three factors that they interpreted in the same way as we did. They also reported virtually the same factor structure in male and female students. Sakamoto et al. (1998) carried out a confirmatory factor analysis. Thus, we consider that depression symptomatology can be thought of as consisting of three discrete domains at least among a Japanese adolescent population.

The present findings may be used in a clinical setting in many ways. For example, clinicians can use the subscales of the SDS to identify the course of different symptom domains throughout the course of treatment. They may also use the profile of the subscales of the SDS in selecting the treatment approach. It may be that cognitive behavioural therapy is more effective for patients with higher scores on cognitive symptoms. Although link was established between depression and perceived rearing, there is evidence that only cognitive symptomatology is linked to low care, while affective symptomatology is linked to the overprotectiveness of parents (Kitamura et al., 1999).

Limitations of this study should be noted. Although the very large number of student subjects is strength of this study, it dealt only with a nonclinical population. The factor profile may be different in a clinical population of the same age group. Nevertheless, several studies have shown that the prevalence of diagnosable depression is high among a nonclinical population of adolescents and young adults. Therefore, we believe that a substantial proportion of our student sample is currently suffering from diagnosable depression. Thus, applying a cutoff point of 42/43 (Kitamura et al., 1994), we found that 22% of the present students were SDS “positive”. A second drawback of the present study is a lack of validation through direct diagnostic interview. Among a Japanese population, Kitamura et al. (1994) confirmed the validity of the SDS by using a structured diagnostic interview. We cannot easily extrapolate this finding to the present one because of the different nature of the population (pregnant women in one, university students in the other), but we can expect that the validity of the three subscales of the SDS will be supported in a future study using a structured interview.

In conclusion, the present study confirmed the three-factor structure of the SDS items. This may be used in both clinical and research psychiatry.

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