Temporal stability of DPES-J – on the sub-scale of Awe –

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Introduction

This study investigated the extent to which the awe scale of DPES-J showed measurement stability over a very short period against the effects of high-impact events.

Different positive emotions help people resist different psychological threats (Fredrickson, 1998). The researched list of positive emotions contained the following constructs: hope (Snyder et al., 1996), gratitude (McCullough, Kilpatrick, Emmons, & Larson, 2001), elevation (Haidt, 2003), and interest (Fredrickson, 1998). And Shiota et al., (2006) listed and summed up the constructs of positive emotion that showed fitness-enhancing function unifying the constructs from diverse theories: Joy, Contentment, Pride, Love, Compassion, Amusement, and Awe. To measure individual differences of the seven constructs, Shiota et al. (2006) developed Dispositional Positive Emotion Scales (DPES) that had composed of corresponding seven subscales in which each sub-scale consisted of five or 6 items. All seven sub-scales showed positive correlations with the Extraversion sub-scale contained in the scale of Big Five (NEO-PIR: Costa, McCrae, & Dye, 1991), Conscientiousness in NEO-PIR was correlated with Joy, Contentment and Pride in DPES, Agreeableness in NEO-PIR was correlated with Love and Compassion in DPES and some correlations were observed between sub-scale of NEO-PIR and DPES.

DPES (Shiota et al., 2006) was developed as a tool for measuring trait-level characteristics then the stability of measurements was required. Internal consistency was examined in original scale (Shiota et al, 2006), English version (Dixson et al., 2019), Turkish version (Akin et al., 2014), German version (Güsewell & Rush, 2012), Chinese version (Guan et al., 2018) and Japanese version (Sugawara et al., 2020). However, only the Japanese version (Sugawara et al., 2020) examined retest reliability. If DPES adequately measures the dispositional construct rather than situated construct, a sufficient stability should be ensured, because disposition was, by definition, relatively invariant and longitudinal reliability should be realized in test-retest design. However, the verification seems insufficient in previous research. This study investigated whether the awe scale of DPES showed sufficient retest reliability at a very short interval.

As Guan et al., (2018) noted, "awe has long been of interest in philosophy, sociology, and religion, which is different from other related states such as elevation, admiration, inspiration and the epiphanic experience (Keltner and Haidt, 2003). With the rise of positive psychology and the seminal work of Keltner and Haidt (2003), experience of awe emotion has recently drawn rather considerable interest by psychologists." Keltner & Haidt (2003) insisted that the central features of a sense of awe were a perception of

vastness and need for accommodation. A perception of vastness refers to the perception that anything such as a physical entity and society (fame, authority, or prestige) was perceived as being larger than the self. Accommodation means that the cognitive schema changes to match the new experience rather than to match the experience to the cognition. Dispositional awe provoked quite desirable emotion because it related to positive emotions and prosocial competencies: the score of awe scale in Japanese version (Sugawara et al., 2020) positively related to extroversion, agreeableness, openness to experience, positive affection, life satisfaction, self-esteem, and competencies of loving, being loved, being kind, being humor and being aesthetic; German version (Güsewell & Ruch, 2012) related to 24 competencies such as being creative, curious for anything, honesty, kind, social, or fair.

In scientifically describing the characteristics of dispositional awe, it would be useful to check the measurement stability of frequently used measurement scales because the characteristics of a construct cannot be ascertained unless it is realized in a measurement item and the measurement was temporally stable. This study investigated whether the score of the awe scale of DPES was unchanged before and after the event in which the sense of awe was provoked.

Method

Participants and procedure

Eighty participants responded a questionnaire (age: M=21.0, SD=0.99, n: male=104, female=64, unknown=4). Respondents answered the pre-class questionnaire at the beginning of class, and the post-class questionnaire at the end of class. The post-class questionnaire was the same as the pre-class questionnaire. All study participants provided informed consent, and the study design was approved by an ethics review board (approved on 29/7/2021, No. 21-007, at Yamanashigakuin university).

Class

To evoke the sense of awe in students, a class was prepared in the course of theory of moral education, which was operated as a teaching subject. In the class, we introduced the works and life of Yukio Tabuchi (1905-1989). In the study of alpine butterflies, for example, it was shown that the *Oeneis norna* spends three years on the ridge from egg to adult by Tabuchi. Tabuchi drew many miniatures of alpine butterfly larvae, pupae, and adults. As a photographer, he published many mountain photographs expressing the sublimity of the mountains.

The class was facilitated as follow: (1) introduced Yukio Taguchi's career and achievements, (2) introduced detailed drawings of alpine butterflies and mountain photographs, (3) read aloud "黄色いテント"（田淵，2018）, (4) question: 'What are the differences between you and Yukio Tabuchi, and what do you have in common with him?

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5) discuss in groups and share with the whole group, and (6) describe impressions of this lesson.

Did the class evoke the sense of awe in reality? The score of the sense of situated awe measured by diminished-self sub-scale in Situated Awe Scale (Sawada & Nomura, 2022) measured in the class was significantly higher than the other control class[1] in which the same instructor facilitated (t(51.26)=-2.59, p=.012; target class: M=3.31, SD=0.77; control class: M=2.85, SD=0.88).

Items

Sub-scale of awe in DPES-J: six items developed by Shiota, et al. (2006) were adopted: I often feel awe, I see beauty all around me, I seek out experiences that challenge my understanding of the world, I have many opportunities to see the beauty of nature, I feel wonder almost every day, I often look for patterns in the objects around me. Responses were performed using 5-point Likert scales "1 not applicable" to "5 applicable."

Analysis

Factor analyses were conducted both on pre-data and post-data sets to confirm the factor structure. Differences in average scores were compared between pre-class and post-class via the general linear model and random-effects model.

results

Factor analyses of Awe-DPES at pre-class and post-class

Diagonal SMC, MAP, parallel analysis, Diagonal SMC all suggested a one-factor solution at pre-data set and factor analysis with maximum likelihood (Promax rotation) was performed (Tab.1). The fit indexes showed a good fit (CFI=.984, RMSEA = .058). At post-data set, Diagonal SMC, MAP, parallel analysis suggested one-factor solution and Diagonal SMC suggested a two-factor solution. and factor analysis with maximum likelihood (Promax rotation) was performed (Tab.1). The fit was better at the two-factor structure than at one-factor structure (one-factor structure: CFI=.925, RMSEA = .127, AIC=45.046, BIC=63.718; two-factor solution: CFI=.997, RMSEA = .035, AIC=26.801, BIC=61.032).

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[1] The control class was practical teaching seminar. Thirty-two new students were facilitated by the same teacher as the target class (age: M= 21.84, SD=0.11). The contents of the control class targeted by a measurement was data science.

Tab. 1 Pattern matrix of Awe-DPES at pre-class and post-class

Item	Pre		Post				
			One-factor		Two-factor		
	λ	h^2	λ	h^2	λ-1	λ-2	h^2
I seek out experiences that challenge my understanding of the world.	**.77**	.60	**.70**	.49	**.43**	.32	.48
I see beauty all around me.	**.76**	.58	**.83**	.69	.24	**.65**	.69
I feel wonder almost every day.	**.72**	.52	**.55**	.31	**.74**	-.10	.45
I have many opportunities to see the beauty of nature.	**.65**	.42	**.66**	.43	**.76**	-.01	.57
I often feel awe.	**.58**	.33	**.68**	.47	-.15	**.92**	.69
I often look for patterns in the objects sround me.	**.57**	.32	**.53**	.28	**.41**	.17	.29
Factor contribution	2.77		2.66		2.41	2.34	

Tab. 2 Coincidence coefficient

		Coef.	test-value	P
Ave	ICC	.58	3.734 [.415 , .682]	.00
	Kendall W	.81	119.945	.00
Item1	ICC	.60	3.980 [.445 , .697]	.00
	Kendall W	.79	120.250	.00
Item2	ICC	.57	3.699 [.414 , .678]	.00
	Kendall W	.80	121.792	.00
Item3	ICC	.45	2.652 [.259 , .585]	.00
	Kendall W	.72	108.421	.01
Item4	ICC	.59	3.900 [.436 , .692]	.00
	Kendall W	.83	126.261	.00
Item5	ICC	.41	2.416 [.213 , .556]	.00
	Kendall W	.68	102.594	.02
Item6	ICC	.37	2.184 [.165 , .521]	.00
	Kendall W	.68	103.150	.02

Item1: I often feel awe; Item2: I see beauty all around me; Item3: I seek out experiences that challenge my understanding of the world; Item4: I have many opportunities to see the beauty of nature; Item5: I feel wonder almost every day; Item6: I often look for patterns in the objects around me.

Test-retest reliability

ICC and Kendall W were calculated, and it was shown that for all items, ICC and Kendall W reached a significant level (Tab.2).

Comparison on average scores of Awe-DPES between pre-class and post-class

The random-effects model (GLMM) (student's ID was indicated as group identifier and pre-post factor was indicated as within factor of level one variable) showed a significant effect of pre-post on scores (Tab.3). To examine interaction between different items (6: within) × pre-post (2: within), two-way ANOVA was conducted: pre-post did not reach a significant level ($F(1, 152)=1.775$, $\eta^2_P=.012[.000, .066]$, $p=.075$), different items reached a significant level ($F(5, 760)=30.894$, $\eta^2_P=.169$, $p<.000$), and the interaction term reached the level of significant trend ($F(5, 760)=2.043$, $\eta^2_P=.013$, $p=.075$) (Fig.1).

Tab. 3 Fixed and random effect of mixed effect modeling on average score regressed by pre-post

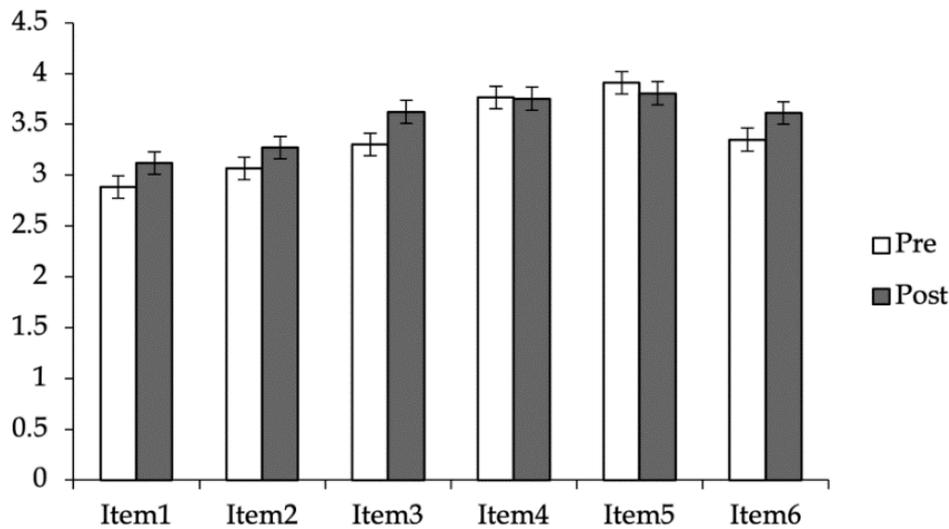| Fixed effects	b	*SE*	df	*t*-value
Intercept	3.53**	0.08	112.94	43.9
pre-post｜ref=post				
pre	-0.15**	0.07	76.00	-2.07
Random effects	Variance	*SD*		
Group	0.29	0.54		
Residual	0.20	0.45		

Fig. 1 Average score of each item contained in Awe-DPES sliced by pre-post

Item1: I often feel awe; Item2: I see beauty all around me; Item3: I seek out experiences that challenge my understanding of the world; Item4: I have many opportunities to see the beauty of nature; Item5: I feel wonder almost every day; Item6: I often look for patterns in the objects around me.

Discussion

The awe sub-scale of DPES-J should be unchangeable between before and after the awe-provoking event because the sub-scale was developed as a measurement not for situated

awe but dispositional awe. Sugawara et al. (2020) ascertained the sufficient measurement reliability via a 2-week interval retest procedure. This study investigated whether the awe scale of DPES-J showed a measurement robustness from the impact of awe-provoking event. The short-term test-retest procedure (the interval was about 60 minutes) was performed, and the results were undecided. The difference scores between the beginning of and ending of event was significantly large when analyzed via GLMM but were not significantly large when analyzed via LM (two-way ANOVA). This study does not negate the reliability of this scale at all. The size of the difference score would not be evaluated sufficiently clearly. Alternatively, the present results were significant as one of the experimental reports for examining the retest reliability of dispositional awe scale of DPES-J and another examination will be followed up.

Reference

Akın, A., Akın, U., Turan, M. E., Kaya, Ç., & Altundağ,Y. 2014. The validity and reliability of the Turkish version of the dispositional positive emotion scales. *Procedia-Social and Behavioral Science*, **152**. 78–81.

Costa, P. T., McCrae, R. R., & Dye, D. A. 1991. Facet scales for agreeableness and conscientiousness: A revision of the NEO personality inventory. *Personality and Individual Differences*, **12**, 887–898.

Dixson, D., Anderson, C., & Keltner, D. 2019. Measuring positive emotions: An examination of the reliability and structural validity of scores on the seven dispositional positive emotions scales. *Journal of Well-Being Assessment*, **2**, 115–133.

Fredrickson, B. L. 1998. What good are positive emotions? *Review of General Psychology*, **2**, 300–319.

Guan F, Xiang Y, Chen O, Wang W and Chen J 2018. Neural Basis of Dispositional Awe. *Front. Behav. Neurosci*. 12:209

Güsewell, A., & Ruch, W. 2012. Are only emotional strengths emotional? Character strengths and disposition to positive emotions. *Applied Psychology: Health and Well-Being*, **4**, 218–239

Haidt, J. 2003. Elevation and the positive psychology of morality. In C. L. M. Keyes & J. Haidt (Eds.), *Flourishing: Positive psychology and the life well-lived*, 275–289. Washington, DC: APA.

Keltner, D., and Haidt, J. (2003). Approaching awe, a moral, spiritual, and aesthetic emotion. *Cogn. Emot*. **17**, 297–314. doi: 10.1080/02699930302297

McCullough, M. C., Kilpatrick, S. D., Emmons, R. A., & Larson, D. B. 2001. Is gratitude a moral affect? *Psychological Bulletin*, **127**, 249–266.

Sawada, K. and Nomura, M. 2022. Developing and validating the Japanese version of the situational Awe scale (SAS-J). *Current Psychology*, https://doi.org/10.1007/s12144-022-

02808-6

Shiota, M. N., Keltner, D., and John, O. P. 2006. Positive emotion dispositions differentially associated with Big Five personality and attachment style. *J. Posit. Psychol*. **1**, 61–71.

Snyder, C. R., Sympson, S. C., Ybasco, F. C., Borders, T. F., Babyak, M. A., & Higgins, R. L. 1996. Development and validation of the State Hope Scale. *Journal of Personality and Social Psychology*, **70**, 321–335.

Sugagwara, D., Arimitsu, K. and Sugie, M, 2020. Development of the Japanese version of Dispositioonal Positive Emotion Scales. *Journal of Health Psychology Research*, **33**(1), 57-65.

田淵行男. 2018. 黄色いテント. ヤマケイ文庫.