Exploratory Factor Analysis of a Japanese Version of the Survey of Achievement Responsibility (SOAR)

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Abstract

Attribution theory has emerged as a potentially important area of inquiry with respect to the problem of varying outcomes in foreign language learning, although the area remains relatively less researched in the Japanese context. Tournat (2012a, 2012b, 2014, 2016) has pursued a foundational line of research aimed at evidence-based measures, adapted for the Japanese population, which could assist with addressing this deficit. One measure, the Survey of Achievement Responsibility (SOAR) designed by Ryckman and Rallo (1983), was adapted by Tournat (2012a) into the Japanese population, and submitted to confirmatory factor analysis (CFA). The evidence for the model hypothesized by the original authors (Ryckman & Rallo, 1983) was negative in scores from this population. The purpose of the research reported in this paper was to proceed from the a priori analysis (using CFA) and reported in Tournat (2012a) to an a posteriori exploratory factor analysis (EFA). The main finding was that the construct representing luck found weak empirical expression in the factor structure for the instrument in both the success and failure condition.

Keywords: Survey of Achievement Responsibility; Exploratory Factor Analysis; Attribution Theory; Second Language Acquisition; Applied Linguistics; Validity

Introduction

The bi-polar concept of success versus failure has long been an area of interest in fields connected with achievement and for obvious reasons. On a broader and disciplinary level these fields would include, for example, psychology and education, while on a performance and more situated level fields of research connected with sport and business would be included. Whatever the field, however, how causes are ascribed to the outcomes of success or failure was not well understood in the past. Early experimental psychologists, therefore, began to investigate this line of research by first determining whether or not the ascriptions for causes of success or failure could be identified and quantitatively measured (e.g. Foersterling, 1980; Weiner, Frieze, Kukla, Reed, Rest & Rosenbaum, 1971). Importantly, Weiner (1972) and Weiner, et al. (1971) found that ability, effort, luck and task difficulty were the main causes that people ascribe to outcomes of success and/or failure; and these four causes became the theoretical basis for what is now known as *attribution theory*; that is, the theoretical endeavor of explaining how people ascribe causes to success and failure, the nature of these ascriptions and the contingencies surrounding their ascription.

The foundations for attribution theory in fact started as early as the late 1950s, before culminating in the work associated with Weiner (cited above) in the early 1970s, and incorporated the research of several different experimental psychologists. Each of their contributions forms one of the three main pillars of attribution theory today, and taken together, these pillars provide the theoretical basis for an explanation of the relationship between the ascribed causes (ability, effort, luck, and task difficulty) for success and failure and the actual achievement outcomes themselves. These pillars are the locus of control dimension (Heider, 1958; Rotter, 1966); the stability dimension (Weiner, et al., 1971); and the controllability dimension (Rosenbaum, 1972). Weiner (1972) then conjoined these three dimensions and relabeled them attribution theory.

The locus of control dimension separates individuals into "internals" and "externals" (Heider, 1958; Rotter, 1966). In other words, individuals with an internal locus of control are more likely to ascribe their own ability and effort to outcomes of success and/or failure and, conversely, individuals with an external locus of control are more likely to ascribe the causes to external contingencies such as task difficulty and luck (Rotter, 1966; Weiner, 1976). Moreover, work much later from, for example, Graham (1991) and Yan and Li (2008), found that individuals with an internal locus of control tend to be high-achievers and those with an external locus of control tend to be low-achievers. The stability dimension separates ascribed causes into those that remain relatively constant such as ability/aptitude and those that are transient such as task difficulty (Weiner, et al., 1971). The controllability dimension further separates causes into those that can be regulated by an individual's own will, such as effort, and those that can't such as luck (Rosenbaum, 1972).

The practical application of attribution theory for pedagogical and performance-related events includes its use as a model to predict success and failure outcomes (Gobel & Mori, 2007; Kovenklioglu & Greenhaus, 1978; Weiner, 1972, 1976, 1979). However, in order to accomplish this task, sound instrumentation is needed to quantitatively measure the above mentioned causal ascriptions for success and/or failure. A number of instruments emerged, but only four major instruments could be considered as having gained significant impact in the literature. These four were developed using exploratory factor analysis (EFA) and include: the Survey of Achievement Responsibility (SOAR) designed by Ryckman and Rallo (1983); the Sydney Attribution Scale (SAS) designed by Marsh (1984); the Causal Dimension Scale II (CDS II) designed by McAuley, Duncan, and Russell (1992); and the Critical Incident Attribution Measure (CIAM) designed by Vispoel and Austin (1995). Of these four instruments, the SAS, CDS II and CIAM have also been directly tested using confirmatory factor analysis (CFA).

The respective role of EFA and CFA in providing validity evidence for the structural properties of scores generated by instrumentation is important. The purpose of conducting an EFA is to identify the number and operational composition of latent constructs (factors) in a given dataset, and in an inductive way, so that evidence can be obtained in terms of what is actually being measured (Kline, 1994). In other words, we conduct an EFA when we do not have a model in mind which we want to directly test against the dimensionality present in a given dataset, but rather want to explore, in a data-led manner of discovery, what dimensionality is actually present in the data. A CFA, on the other hand, is conducted when we do have such a model already in mind, and we want to directly test this model to establish its plausibility as an account for the dimensionality present in a given dataset (Nunnally & Bernstein, 1994). Quite often EFA is associated with the development of an instrument whereby the theoretical conception for the proposed instrument is brought into alignment with the discovered structure of sets of scores for an initial pool of items. This is usually an iterative process. CFA would be reserved for the end of this process and when there is a presumed alignment between the theoretical conception for an instrument and the empirical properties of scores it produces, and this needs to be tested in a fresh and made-for-purpose sample from the intended population. If the test produces a positive result, confirmatory evidence is provided for the measurement model hypothesized for the instrument. However, in the case that the test produces a negative result, a return to EFA may be required as part of the process of discovering what the dimensionality of scores may in fact be, if not in alignment with the theoretical conception for it.

While the above mentioned instruments with respect to attribution theory have been applied to a variety of academic and performance related settings, and more recently to foreign language learning (e.g. Grant & Dweck, 2003; Hsieh & Kang, 2010; Hsieh & Schallert, 2008; McAuley, Russell, & Gross, 1983; Rees, 2005; Ryckman & Peckham, 1987), attribution theory remains relatively less applied to language learning research in the Japanese context. Tournat (2012a, 2012b, 2014, 2016), in an effort to remedy this deficit, has pursued a foundational line of research aimed at providing evidence-based measures adapted for the Japanese population. The four instruments mentioned above (SOAR, SAS, CDS II & CIAM) were adapted into the Japanese second language acquisition (SLA) context, and scores were tested for conformity, using CFA, with the respective hypothesized models. The CDS II (McAuley, Duncan, & Russell, 1992) and CIAM (Vispoel & Austin, 1995) studies provided positive evidence for the adaptation, while the SOAR (Ryckman & Rallo, 1983) and SAS (Marsh, 1984) provided negative evidence.

The SOAR, which is the focus of this study, presents as a specific area of research concern, because the original version of the instrument was not tested under a CFA in the original population. The authors only presented the reliability estimates (Cronbach's alphas) which are not a good indication of the unidimensionality of scores on subscales, and therefore should not be used as the only analysis in verifying model fit (Gerbing & Anderson, 1988). Thus, the CFA conducted for the adaptation (Tournat, 2012a) actually represents the first such use of CFA in any population, and of course as mentioned above, the model hypothesized by the authors did not fit. In the face of this negative evidence for the model hypothesized by the original authors, the question then turns to one of inductively discovering what the dimensionality of scores for the instrument actually is, if not consistent with the measurement model originally hypothesized. It is this question which underpins the rationale for the analyses reported in this paper; and EFA is the analytical or methodological centerpiece of these analyses. A sub-question is the issue of whether the lack of correspondence between the hypothesized model and the scores generated for the Japanese adaptation was due to inherent flaws in the original instrument or to errors in the adaptation process. This question is particularly difficult to adjudicate without data from the original population, and ultimately the results reported in this paper speak only to the dimensionality of scores for the Japanese version of the instrument.

The original SOAR instrument was designed by Ryckman and Rallo (1983) to measure students' causal attributions (ability, effort, task difficulty and luck) for success and failure outcomes in the three subject areas of math/science, language arts/social studies, and physical education. The instrument comprises 24 subscales which can be represented by the formula 4 (causal attributions) x 2 (outcomes) x 3 (subject areas) = 24 subscales (Ryckman, Peckham, Mizokawa, & Sprague, 1990). Moreover, there are 160 items comprised of 40 short hypothetical situations which can be answered by selecting only one of the four randomly placed causal attributions (40 x 4 = 160). The causal attribution identified by the respondent for each of the hypothetical situations is given one point and a zero is given to the causes not selected. Out of the 160 items, 64 (success - 32, failure - 32) were used to measure the subscales for math/science, 64 (success - 32, failure - 32) for language arts/social studies, and 32 (success - 16, failure - 16) for physical education (Mizokawa & Ryckman, 1990). Mizokawa and Ryckman (1990) found that the majority of people ascribe their success and failure outcomes in physical education to either task difficulty or luck and so the ability and effort scales were excluded in this subject area, leading to a shorter scale (32 rather than 64 for the subject area). The only statistics reported by Ryckman et al. (1990) for the original SOAR instrument were the reliability estimates which ranged between .24 and .89.

Ryckman and Peckham (1987) applied the SOAR in a study to determine if there were any differences in the way boys and girls ascribed causes for success and failure outcomes in a variety of different school subjects. They found that girls tend to ascribe achievement outcomes to the amount of effort they put forth and that boys tend to ascribe achievement outcomes to ability and luck. Mizokawa and Ryckman (1990) looked at Asian-Americans (Chinese, Filipino, Japanese, Korean, Vietnamese and other) and found that most respondents in these groups ascribed causes for success and failure outcomes to effort. While these results are important to report, it is also important to note the findings presume the good psychometric properties of the SOAR which was not properly established at the time; that is, they had not been established by proceeding beyond reliability estimates to more powerful methods such as CFA.

Tournat (2012a) adapted the SOAR into the Japanese SLA context, with a focus on addressing the psychometric deficit with respect to this instrument in the past, and this was done following the guidelines of the International Test Commission (Hambleton, Merenda, & Spielberger, 2005). The results for the success outcome, using the four fit indexes recommended by Hu and Bentler (1999), were as follows (cutoff values included in parentheses for reference): TLI .82 (>.95), CFI .84 (>.95), RMSEA .07 (<06), and SRMSR .09 (<.08). The results for the failure outcome (using the same four indexes) were as follows: TLI .74 (>.95), CFI .76 (>.95), RMSEA .07 (<06), and SRMSR .09 (<.08). These results were unsatisfactory and showed that the model hypothesized by Ryckman and Rallo (1983) for the SOAR instrument did not fit the dataset obtained from the Japanese university student population. As stated above, it is difficult to determine whether this is a population-specific result, because such analyses have not been conducted by the original authors, or indeed any other researchers, in the original population. The question does, however, remain as to what the dimensional structure of scores from the Japanese adaptation is, if not in alignment with the model hypothesized by the original authors and tested by Tournat (2012a). The purpose of the research reported in this paper is therefore to proceed from the a priori analysis (using CFA) and reported in Tournat (2012a) to an a posteriori analysis (using EFA), with the primarily diagnostic purpose of establishing further evidence related to the possible reason for the negative result of the earlier reported CFA.

Method

The method is reported in terms of three aspects, namely, the instrument itself and its overall design, instrument administration, and analytical procedure. The analytical procedure focuses on the EFA which is the most important part and central contribution of the paper.

Instrument

The adapted version of the SOAR instrument (Tournat, 2012a) was designed to measure Japanese university students' causal attributions (ability, effort, task difficulty and luck) for success and failure outcomes in only one domain (English oral communication). The adaptation process, as reported in the 2012a study, involved reducing the number of domains from three (math/science, language arts/social studies, and physical education) to one (English oral communication), doing forward and back translations (original English to Japanese and then back into English), and changing the categorical scales (choosing only one of the four causes for each of the 40 situations) to ordinal scales (6-point Likert scale).

The adapted instrument comprises eight subscales and is represented by the formula 4 (causal attributions) x 2 (outcomes) x 1 (English oral communication) = 8 subscales (Tournat, 2012a). There are 64 items (success - 32, failure - 32) that are comprised of 16 short hypothetical situations each with four randomly placed statements that the respondents self-report on using a 6-point Likert scale (16 x 4 = 64). Thus, the subscales are each measured by 8 of the 64 items. The subscales and items for the success outcome are: Ability (Items 2b, 3b, 6b, 7d, 9a, 12b, 13c, 15a); Effort (Items 2d, 3c, 6a, 7a, 9d, 12d, 13d, 15b); Luck (Items 2a, 3a, 6c, 7c, 9c, 12a, 13a, 15c); and Task Difficulty (Items 2c, 3d, 6d, 7b, 9b, 12c, 13b, 15d). The subscales and items for the failure outcome are: Ability (Items 1a, 4d, 5a, 8c, 10a, 11b, 14d, 16a); Effort (Items 1d, 4c, 5c, 8b, 10d, 11d, 14c, 16d); Luck (Items 1c, 4a, 5d, 8a, 10b, 11a, 14b, 16c); and Task Difficulty (Items 1b, 4b, 5b, 8d, 10c, 11c, 14a, 16b).

The forward translation was conducted by requesting a Japanese national with some experience in test construction and with near-native English ability to translate the original English instrument into Japanese. A second Japanese national, also with some experience in test construction and with near-native English ability, was then requested to back translate the Japanese version into English without referring to the original. The back-translated English version was then compared to the original English version to detect and correct errors in nuance and meaning. When the back-translated version was as close to the original version as possible it was administered to a group of Japanese university EFL students.

Instrument Administration

The adapted version of the SOAR instrument was administered, under informed consent, to 654 Japanese university students (18 to 24 years old) studying English whose major fields of study included English, law, engineering, medicine, Japanese, social welfare, education, communications, science, and business. A visual inspection of the dataset revealed that there were 90 records with missing values (not systematic), and therefore these records were deleted leaving a sample of 564. There were 311 male respondents and 253 female respondents. Moreover, the following background information was also obtained; age, major, academic year, and date (no names or identifying information). The questionnaire took about 15 minutes to complete.

Analytical Procedure

The IBM/Statistical Package for the Social Sciences (SPSS) software (Version 21.0) was used to conduct a series of EFA solutions. These solutions followed the typical procedure of using a simple and unrotated Principal Components Analysis (PCA) to determine the appropriate number of factors to extract, followed by the extraction of a further model with number of factors to extract specified. The second extraction in the case of each solution pursued also came with further specification including the type of rotation.

Results

The results are presented in terms of the descriptive statistics, which describe the properties of the sample and score distribution, and the derived solutions for the EFA analyses. The descriptive statistics have been previously reported (see Tournat, 2012a), but are presented again for the reader in abbreviated form and under citation, because these results describe the sample and score properties of the dataset upon which the EFAs, which represent new analyses, are premised. Additionally, they provide interpretive value for the results of the EFA.

Descriptive Statistics

The descriptive statistics (abbreviated and re-reported from Tournat, 2012a) are represented in Table 1 below, and include the means, standard deviations, and the critical ratios for both skew and kurtosis. Means ranged from 2.65 (S01C) to 4.74 (S07A) and standard deviations ranged from 0.908 (S06D) to 1.464 (S02A). The criterion for adjudicating an item's score distribution as having significant skew or kurtosis was 3.0, and this was the same criterion as applied in Tournat (2012a). In terms of this criterion, more than half of the items were skewed (39 items out of 64, or 61% of items) while fewer items presented with kurtosis (12 items out of 64, or 19%).

Table 1
Descriptive Statistics for the Sample

Test Items	Mean	Std. Deviation	Skewness	Kurtosis
	Statistic	Statistic	Critical Ratio	Critical Ratio
S01A (Ability) F	4.57	1.063	*-10.6	*6.4
S01B (Task) F	3.47	1.063	-1.4	-2.6
S01C (Luck) F	2.65	1.096	*4.1	-.14
S01D (Effort) F	4.40	.999	*-6.4	*3.7
S02A (Luck) S	3.34	1.464	.10	*-4.7
S02B (Ability) S	2.96	1.151	*3.4	-1.3
S02C (Task) S	4.26	1.126	*-3.6	-.45
S02D (Effort) S	3.97	1.196	*-3.3	-1.9
S03A (Luck) S	3.70	1.327	-2.9	-2.9

S03B (Ability) S	3.16	1.125	2.5	-1.1
S03C (Effort) S	4.41	1.135	*-5.9	.45
S03D (Task) S	4.39	1.016	*-4.0	1.2
S04A (Luck) F	2.98	1.272	2.1	*-3.4
S04B (Task) F	3.89	1.046	*-4.0	1.0
S04C (Effort) F	4.58	.961	*-6.9	3.0
S04D (Ability) F	4.47	1.051	*-7.5	*4.0
S05A (Ability) F	4.55	.924	*-5.1	2.1
S05B (Task) F	4.54	.989	*-6.3	*3.6
S05C (Effort) F	4.15	1.038	*-4.3	-.20
S05D (Luck) F	3.25	1.131	.15	-2.1
S06A (Effort) S	4.26	.982	*-5.2	*4.1
S06B (Ability) S	3.02	1.135	*3.6	-.80
S06C (Luck) S	4.30	.995	*-6.4	3.0
S06D (Task) S	4.51	.908	*-4.3	1.1
S07A (Effort) S	4.74	.931	*-8.0	*7.5
S07B (Task) S	4.24	.963	*-3.8	1.5
S07C (Luck) S	2.70	1.086	*6.0	1.1
S07D (Ability) S	2.72	1.105	*3.3	-1.4
S08A (Luck) F	3.93	1.033	*-4.4	. 70
S08B (Effort) F	4.25	1.000	*-5.1	.92
S08C (Ability) F	4.63	.959	*-5.7	2.1
S08D (Task) F	3.25	1.037	1.9	.13
S09A (Ability) S	3.04	1.216	1.8	-3.0
S09B (Task) S	3.80	1.060	-2.1	-1.5
S09C (Luck) S	3.76	1.149	-1.3	2.3
S09D (Effort) S	3.71	1.138	-.30	-2.2
S10A (Ability) F	4.08	1.064	*-3.4	-.01
S10B (Luck) F	3.18	1.255	1 . 5	-2.8
S10C (Task) F	3.88	1.026	*-3.8	1.6
S10D (Effort) F	4.14	1.114	*-4.2	-.30
S11A (Luck) F	3.05	1.293	2.5	*-3.2
S11B (Ability) F	4.26	1.077	*-6.2	-2.5
S11C (Task) F	3.56	1.000	-1.3	-.50
S11D (Effort) F	4.61	.919	*-8.7	*8.9
S12A (Luck) S	3.89	1.103	*-3.4	-.07
S12B (Ability) S	3.89	.984	*-4.7	2.9
S12C (Task) S	3.32	1.041	2.1	.35
S12D (Effort) S	4.26	1.032	*-5.9	*3.1
S13A (Luck) S	3.66	1.302	-2.4	-2.9
S13B (Task) S	4.18	1.045	*-4.5	1.4

S13C (Ability) S	3.28	1.193	1.2	-1.8
S13D (Effort) S	4.22	1.133	*-4.0	-.94
S14A (Task) F	3.46	1.188	.26	-1.6
S14B (Luck) F	3.35	1.306	.62	*-3.1
S14C (Effort) F	4.14	1.217	*-5.2	-1.1
S14D (Ability) F	3.69	1.181	-.71	-1.4
S15A (Ability) S	3.09	1.094	2.0	.25
S15B (Effort) S	4.14	1.084	*-3.8	-.10
S15C (Luck) S	3.60	1.020	-.35	.83
S15D (Task) S	3.80	1.074	-2.4	.16
S16A (Ability) F	4.35	1.062	*-6.0	2.2
S16B (Task) F	3.28	1.018	2.4	.25
S16C (Luck) F	3.33	1.018	1.8	.15
S16D (Effort) F	4.34	1.069	*-6.6	1.9
Valid N				

Note 1: The table is adapted from Table 2 and Table 3 in Tournat (2012a).
Note 2: An asterisk indicates skewness or kurtosis which exceeds a threshold of 3.0.

Exploratory Factor Analyses

For the purpose of analysis, and consistent with the general approach taken in Tournat (2012a), the data was broadly separated into items responded to under the success condition and items responded to under the failure condition. Both datasets were initially examined for suitability for factor analysis using Bartlett's Test of Sphericity and the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy. These analyses are typically conducted before performing EFA. Under the success condition, the KMO value returned was .89 and Bartlett's Test of Sphericity was significant. Both of these results indicated suitability for factor analysis. Under the failure condition, the KMO value was .86 and Bartlett's Test of Sphericity was also significant. Similar to the success condition, both of these results indicated suitability for factor analysis. Following these preliminary analyses which are associated with the assumptions for conducting EFA, initial solutions were sought for both the success and the failure conditions using the typical process of deriving an unrotated PCA.

In the case of the success condition, the eigenvalue-greater-than-one rule suggested six factors should be extracted while the scree-plot clearly suggested 5 factors. Given that the eigenvalue-greater-than-one rule has a propensity to overestimate the number of factors, and that the drop from the fifth eigenvalue to the sixth eigenvalue was trivial (only an additional 3% of variance was accounted for by the sixth factor), a five factor solution was selected for extraction (Success Condition - Five Factor Solution). As a further analytical direction, a four-factor solution (Success Condition - Four Factor Solution) was also selected for extraction. The rationale behind this extraction was two-fold. Firstly, the original conception for the instrument was to have four factors, and additionally, the drop in the eigenvalue from the fifth to the fourth factor was also relatively trivial (with the fifth factor only accounting for an additional 4% of variance).

In the case of the failure condition, the eigenvalue-greater-than-one rule suggested a six-factor solution. However, inspection of the scree plot indicated quite clearly a four-factor solution which was commensurate with the original conception for the instrument; with the fifth and sixth factors indicating only a small drop in eigenvalues and accounting for only an additional 5% and 4% of variance in each case, respectively. Thus for the failure condition, only a four-factor solution was extracted (Failure Condition - Four Factor Solution).

These three solutions are reported in turn below. In all of the solutions, .40 was stipulated as the threshold coefficient for an item being considered to represent the factor. In all tables reporting the factor pattern matrices for the respective solutions, items with coefficients below .40 are suppressed.

1) Success Condition – Five Factor Solution

For the five-factor solution under the success condition, ML-estimation was used to extract five factors with oblique rotation (Direct Oblimin), and this is consistent with the assumption (see Kline, 1994) that factors within the behavioral sciences are unlikely to be orthogonal or uncorrelated. The factor pattern matrix is presented in Table 2 for inspection.

Table 2
Factor Pattern Matrix for the Five-Factor Solution to the Success Condition

	Factor				
	1 (E)	**2 (T)**	**3 (A)**	**4 (L)**	**5**
S02A (Luck)				.756	
S02B (Ability)			-.644		
S02C (Task)		.638			
S02D (Effort)	.709				
S03A (Luck)				.780	
S03B (Ability)			-.797		
S03C (Effort)	.818				
S03D (Task)		.828			
S06A (Effort)	.641				
S06B (Ability)			-.843		
S06C (Luck)		.469			
S06D (Task)		.755			
S07A (Effort)	.770				
S07B (Task)		.762			
S07C (Luck)	---	---	---	---	
S07D (Ability)			-.790		
S09A (Ability)			-.554		
S09B (Task)		.482			
S09C (Luck)	---	---	---	---	
S09D (Effort)	.534				

S12A (Luck)				.593	
S12B (Ability)	---	---	---	---	
S12C (Task)	---	---	---	---	
S12D (Effort)	.722				
S13A (Luck)				.814	
S13B (Task)		.551			
S13C (Ability)			-.754		
S13D (Effort)	.785				
S15A (Ability)			-.691		
S15B (Effort)	.727				
S15C (Luck)	---	---	---	---	
S15D (Task)		.471			

Note 1: Coefficients below .40 have been suppressed in the table.
Note 2: Items on which no factor returned a coefficient above .40 are highlighted with a row of dashes.
Note 3: The letter in parentheses adjacent to the factor number in the title row assists with indicating the items which dominate the factor (based on what these items were hypothesized to measure in the original conception for the instrument).
A = Ability; E = Effort; L = Luck; and T = Task.

The most notable overall aspect of the result for the five-factor solution is that no items appeared on the fifth factor with a coefficient above .40; and hence its demarcation by shading in Table 2. All eight originally hypothesized Effort items appear on Factor 1 with S09D (.534) appearing to be the weakest representative of the factor, although it was obviously above the threshold of .40 (set in advance). Thus the label of Effort was retained for Factor 1 without much empirical qualification. Seven of the originally hypothesized Task items emerged on Factor 2. Item S12C, originally hypothesized to measure the Task subscale, failed to emerge on Factor 2, and notably failed to emerge above the threshold of .40 on any other factor. There was one extraneous item which emerged on the factor (S06C - Luck) with a relatively low coefficient of .469. S09B (.482) and S15D (.471) met the threshold of .40 but were nonetheless relatively weak representatives of the factor when compared with the remaining items. The label of Task was retained for this factor with only minor empirical qualification. Seven of the items originally hypothesized to measure the Ability subscale emerged on Factor 3. All of these items had good coefficients with S09A (.554) being the lowest. S12B, originally hypothesized to measure Ability, did not appear on the factor, but did not appear on any other factor above a threshold of .40 either. All items on this factor emerged with a negative orientation to it, and hence the minus signs fronting each coefficient. Therefore, the label of Ability was retained for this factor with only minor empirical qualification. Finally, four of the items originally hypothesized to measure the Luck subscale appeared on Factor 4. Items S06C, S07C, S09C, and S15C did not emerge on Factor 4 along with the other items originally hypothesized to measure the Luck subscale; with Item S06C extraneously appearing on Factor 2 (Task) although with a relatively low coefficient (.469) as reported above. The label of Luck was retained for this factor, but with considerable empirical qualification given that it was comprised of only four of the original eight hypothesized items.

2) Success Condition – Four Factor Solution

For the four-factor solution under the success condition, the same form of extraction was conducted. ML-estimation was selected to extract four rotated factors under a correlated solution (Direct Oblimin). The factor pattern matrix is presented in Table 3 for inspection.

Table 3
Factor Pattern Matrix for the Four-Factor Solution to the Success Condition

	Factor			
	1 (E)	**2 (T)**	**3 (A)**	**4 (L)**
S02A (Luck)				.761
S02B (Ability)			-.625	
S02C (Task)		.623		
S02D (Effort)	.672			
S03A (Luck)				.761
S03B (Ability)			-.768	
S03C (Effort)	.763			
S03D (Task)		.801		
S06A (Effort)	.665			
S06B (Ability)			-.835	
S06C (Luck)		.476		
S06D (Task)		.778		
S07A (Effort)	.783			
S07B (Task)		.784		
S07C (Luck)	---	---	---	---
S07D (Ability)			-.806	
S09A (Ability)			-.553	
S09B (Task)		.489		
S09C (Luck)	---	---	---	---
S09D (Effort)	.554			
S12A (Luck)				.597
S12B (Ability)	---	---	---	---
S12C (Task)	---	---	---	---
S12D (Effort)	.745			
S13A (Luck)				.808
S13B (Task)		.556		
S13C (Ability)			-.766	
S13D (Effort)	.814			
S15A (Ability)			-.712	
S15B (Effort)	.758			

S15C (Luck)	---	---	---	---
S15D (Task)		.488		

Note 1: Coefficients below .40 have been suppressed in the table.
Note 2: Items on which no factor returned a coefficient above .40 are highlighted with a row of dashes.
Note 3: The letter in parentheses adjacent to the factor number in the title row assists with indicating the items which dominate the factor (based on what these items were hypothesized to measure in the original conception for the instrument).
A = Ability; E = Effort; L = Luck; and T = Task.

The four-factor solution produced a factor structure strongly aligned with the five-factor solution where the fifth factor failed to have any representative items above a threshold of .40, and was arguably, therefore, a four-factor solution in the result, even if not in the stipulated number of factors that were requested to be extracted for the estimation executed on SPSS. All eight items originally hypothesized to measure the Effort subscale appeared on Factor 1. Item S09D, as with the five-factor solution above, was the weakest representative of this factor (Factor 1) in the four-factor solution. There was a general pattern of coefficients being slightly higher on this factor when compared with Factor 1 in the five-factor solution, and this is to be expected given that there was one less overall factor on which shared variance could be distributed. The label of Effort was therefore retained for this factor with minimal empirical qualification. Seven of the items originally hypothesized to measure the Task subscale appeared on Factor 2. Similar to Factor 2 on the five-factor solution, Items S09B (.489) and S15D (.488) featured with relatively weak coefficients. Additionally, one extraneous item (the same one as in the five-factor solution), Item S06C, originally hypothesized to measure the Luck subscale, emerged on the factor. This factor was therefore retained under the Task label with minor empirical qualification. With respect to Factor 3, the picture again paralleled the picture for Factor 3 on the five-factor solution, with seven of the items originally hypothesized to measure the Ability subscale emerging quite strongly on the factor, and all with a negative orientation to the factor. Again S12B was the exceptional item, originally hypothesized to measure the Ability subscale, which did not emerge on Factor 3, and similar to the five-factor solution it did not emerge on any other factor either. The label of Ability was retained for this factor with only minor empirical qualification to its overall coherence. The final factor, Factor 4, corresponded strongly with Factor 4 in the five-factor solution. Four of the items originally hypothesized to measure the Luck subscale appeared on this factor, and they were the same four items as those which appeared on Factor 4 of the five factor solution. The label of Luck was again retained for this factor, but also with the considerable empirical qualification applied to Factor 4 in the five-factor solution.

Overall, therefore, the four-factor solution, as stated above, corresponded strongly in dimensional structure with the five-factor solution where a fifth factor was extracted but without item representation on this factor in the resulting pattern matrix.

3) Failure Condition – Four Factor Solution

With respect to the four-factor solution extracted for the failure condition, the general coherence of four factors aligned relatively well with the originally hypothesized four subscales was maintained, but with some level of loss of signal and greater qualification than was the case for the success condition. The factor pattern matrix is presented in Table 4 for inspection.

Table 4
Factor Pattern Matrix for the Four-Factor Solution to the Failure Condition

	Factor			
	1 (E)	**2 (T)**	**3 (A)**	**4 (L)**
S01A (Ability)			-.561	
S01B (Task)	.591			
S01C (Luck)	---	---	---	---
S01D (Effort)	---	---	---	---
S04A (Luck)				-.643
S04B (Task)	.533			
S04C (Effort)		.517		
S04D (Ability)			-.670	
S05A (Ability)			-.715	
S05B (Task)			-.598	
S05C (Effort)		.649		
S05D (Luck)	---	---	---	---
S08A (Luck)	---	---	---	---
S08B (Effort)		.623		
S08C (Ability)			-.530	
S08D (Task)	.643			
S10A (Ability)	---	---	---	---
S10B (Luck)				-.802
S10C (Task)	.575			
S10D (Effort)		.735		
S11A (Luck)				-.756
S11B (Ability)			-.680	
S11C (Task)	.598			
S11D (Effort)		.455		
S14A (Task)	.544			
S14B (Luck)				-.645
S14C (Effort)		.693		
S14D (Ability)	---	---	---	---
S16A (Ability)			-.499	
S16B (Task)	.448			
S16C (Luck)	.448			
S16D (Effort)		.675		

Note 1: Coefficients below .40 have been suppressed in the table.
Note 2: Items on which no factor returned a coefficient above .40 are highlighted with a row of dashes.
Note 3: The letter in parentheses adjacent to the factor number in the title row assists with indicating the items which dominate the factor (based on what these items were hypothesized to measure in the original conception for the instrument).
A = Ability; E = Effort; L = Luck; and T = Task.

On Factor 1, seven of the items originally hypothesized to measure the Task subscale featured. Item S05B failed to emerge with the other seven items on the factor, and instead emerged, extraneously, on Factor 3 (-.598) with negative orientation to that factor. There were two notable aspects to the factor when compared with the Task factor under the success condition. First, and overall, the coefficients were relatively lower than for the same factor under the success condition, and second, the factor was the first to be extracted, whereas under the success condition it was the second to be extracted. The label of Task was retained for this factor but with these observations about its place in the factor order, and the strength of its empirical representation, noted. On Factor 2, seven of the items originally hypothesized to measure the Effort subscale were represented. Item S01D failed to emerge along with its associated Effort items, but notably, also did not emerge on any other factor. The Effort factor emerged as the first factor extracted under the success condition, whereas here, under the failure condition, it emerged as the second factor. The label of Effort was retained for this factor. With respect to Factor 3, six of the items originally hypothesized to measure the Ability construct were represented. All of these items had a negative orientation toward the factor. Items S10A and S14D did not reach the coefficient threshold of .40 and were, therefore, not represented on the factor. Neither item was represented above the threshold of .40 on any other factor. The factor reserved its position as the third factor extracted when compared with the extraction order for the success condition. The label of Ability was retained for this factor with a moderate degree of empirical qualification. The final factor, Factor 4, displayed correspondences with the fourth factor under the success condition, whether for the four-factor or five-factor extraction, with four of the items originally hypothesized to measure the Luck subscale represented. The label for this factor was therefore retained as Luck, but with a considerable degree of empirical qualification given that four items originally hypothesized to represent the Luck subscale were not represented on the factor.

Discussion

From the point of view of score distributions, there were 39 items which could be considered as skewed (i.e. under the criterion of the critical ratio for skew being above a level of absolute value 3.0). A notable feature of these 39 items is that 34 of them (87%) were negatively skewed, with only 5 of them (13%) being positively skewed. Some further and general observations can be made. If one considers particularly severe cases of skew, defined as greater than absolute value 5.0, there were 19 cases. Of these 19 cases, 6 cases were Ability items and 10 cases were Effort items, meaning that the significant majority of cases related to the internal dimension. All 6 cases of significant skew on the Ability items were under the failure condition. For the Effort items, the cases of significant skew were also weighted toward the failure condition (6 cases) rather than the success condition (4 cases). Additionally, it can be seen from Table 1 that all items with skew above absolute value 6.0 on the internal dimensions (Effort and Ability) and under the failure condition were negatively skewed. This indicates a general problem with respect to score distribution on these internal dimensions when responded to under the failure condition and, furthermore, indicates the direction of this general problem.

With respect to the discussion of the results for the EFA, only two of the three solutions derived are discussed, namely the two four-factor solutions; one under the success condition and one under the failure condition. The five-factor solution is not discussed, despite its reporting in the results section, because no items emerged with a coefficient of above .40 on the fifth factor (i.e. the cutoff value above which an item was considered as representing or expressing the factor). While the initial-run PCA, and associated eigenvalues and scree plot, suggested the five factor solution as plausible, its actual execution produced results which can only be interpreted as comprising a redundant fifth factor.

Turning, therefore, to the first of the four-factor solutions which was the solution executed under the success condition, the overall solution illustrates a remarkable coherence with the original conception for the instrument. In other words, items predominantly appeared on factors with other items for which they were intended to have an association. This was especially so for the first three factors, and it was only the last factor, or Factor 4 (Luck), which prevented an entirely coherent picture from emerging. Factor 1 (labelled Effort) in the first four-factor solution (success), and as reported in the results, comprised all eight of the Effort items, and there were no other extraneous items appearing in the factor either; that is, items purportedly measuring other scales but which nonetheless appeared with a coefficient of above .40 on the factor. Item S09D had the lowest coefficient on this factor (.554), but even this item was quite well above the coefficient cutoff of .40. This factor, therefore, seemed to evidence fairly good properties in terms of operational representation. Factor 2 (labelled Task) comprised seven of the eight items intended to measure it. One Task item (Item S12C) did not appear on the factor and one extraneous item (Item S06C – a Luck Item, .476) did appear on the factor, although not very strongly. Items S09B (.489) and S15D (.488) presented as fairly weak, because although they fell above the threshold of .40, they only just did so. This factor also, therefore, seems to evidence fairly good operational properties, although not quite as good as Factor 1 (Effort). Factor 3 (labelled Ability) comprised seven of the eight items originally conceived for it, with only S12B failing to appear on the factor with a coefficient above .40. There were no extraneous items on the factor, and all items appeared as negative values which is not an empirical problem, and only suggests that the items have a negative orientation to the construct. Additionally, there were no items which were conspicuously weak.

Factor 4, the fourth and final factor (labelled Luck), and as stated above, was the most problematic of all the factors in this four-factor solution for the success condition. The weakness of this factor represents one of the most important findings of the study. The four items which appeared on this factor at a threshold of greater than .40 (S02A, .761; S03A, .761; S12A, .597; and S13A, .808) were all items originally conceived to measure the external dimension of luck, and therefore this factor was labelled accordingly. Additionally, these four items offered coefficients which were relatively high with S12A being the lowest at a still relatively high .60 (rounded off). However, four items originally intended to measure the luck construct did not appear in the factor (S06C, S07C, S09C, and S15C) due to their coefficients falling below the .40 threshold on the fourth factor. One of these items (S06C) appeared, spuriously, on Factor 2 (Task) which was otherwise populated by original Task items, while the other three did not appear on any factor above a threshold of .40. Overall, therefore, while the relatively high loadings of the four items which did appear on the factor were noteworthy, the absence of the other four, and the presence of one of these on another factor, is problematic. It may be the case that these eight items indicate more than one underlying construct, although one would presume that the five-factor solution would have registered such misspecification through the presence of some of the Luck items on the fifth factor, which did not happen. Nonetheless, it is notable that some of the Luck items operationalize fairly nondescript appeals to platitude such as (S02A, S03A and S09C) while others will front the presence of a teacher (S06C and S07C) or a friend (S12A). This fronting of external persons (or external agency), while consistent with the external conception for the Luck construct, may be fracturing the operational coherence of luck as a construct associated with the randomness usually implied by changes of fortune. External agents, while external, would be presumed to operate intentionally and systematically rather than in accordance with the randomness implied by the notion of luck.

Turning to the four-factor solution derived for the failure condition, the overall picture of coherence for this solution was less compelling than for the success condition. While the fundamental structure of four constructs was retained, coefficients were generally lower than under the success condition. Also, under the success condition 26 of a possible 32 items appeared along with items they were supposed to associate with on a factor, while for the failure condition only 24 did so. Finally, there were two anomalous placings of items on factors with which they were not supposed to associate, while for the success condition there was only one such anomalous case. An additional overall observation was that Effort was Factor 1 and Task was Factor 2 in the success solution, while for the failure solution this order was inverted; that is Task was Factor 1 and Effort was Factor 2.

Turning to Factor 1 (labelled Task) within this overall picture, seven of the original Task items appeared on this factor above a threshold of .40. Item S05B did not appear along with these seven items, and instead appeared anomalously on Factor 3 (Ability) with a coefficient of -.598 (i.e. negatively oriented to the construct). The content of this item is as follows: "The oral presentation in English was just plain too hard." While, superficially, the item does clearly represent a task-related issue (i.e. the difficulty of the task), the implication is also that the respondent would perceive him/herself as not having the ability to handle the task if he/she were to endorse this item with respect to self. This provides a rationale for the appearance of the item on the Ability Factor (Factor 3). However, comparable observations could be made about other task related items like S04B which did not appear on the Ability Factor, but which had the following, and very similar, item content (i.e. similar to that of S05B): "The test was just too hard." Nonetheless, and from a theoretical point of view, the inextricable link between variable task difficulty and the perception of ability in the face of such variability is an issue requiring further elaboration with respect to future research on the measurement of either or both. One item (S16C) from the Luck Factor (Factor 4) appeared extraneously along with the seven Task items comprising Factor 1. Notably, the word "task" comes up in the item content of Item S16C although it was intended to measure the construct of luck: "The teacher only listened to part of my English oral communication task." Additionally, and with overall respect to this factor, it is worth noting that the factor coefficients were not particularly high, with only one item (S08D) rising above .60.

Factor 2 (labelled Effort) comprised seven of the items originally intended to measure effort which was one less than the case for the success condition where all eight items emerged on the same factor (i.e. on Factor 1 in the four-factor solution for the success condition). The item which failed to emerge on the Effort Factor in this solution was S01D. It had the following content: "I probably didn't work hard enough." This content is semantically aligned with the notion of task in a convincing manner, and it is difficult to explain why it did not emerge with other similarly aligned items. Notably, it did not appear extraneously on any other factor because the coefficients for it on all factors fell below .40.

Factor 3 (labelled Ability) presented with six of the original items intended to measure the ability construct. The two items which did not appear were S10A and S14D with the following item content, respectively: "I just can't seem to learn English oral communication" and "English oral communication is beyond me." While these two items do not seem to depart significantly from the sematic alignment of other items purported to measure ability, they do seem to depart in how emphatic they are about a sense of helplessness connected to the lack of ability. This analysis of the two, however, is not entirely supported by the results for skew. Both items were skewed above a threshold of 3.0, but they were not included in the items with extreme skew (i.e. above a threshold of 6.0).

Factor 4 (labelled Luck) presented as the weakest of the four factors in a manner quite resonant of the solution for the success condition. Four of the original items intended to measure the construct of luck did not appear along with the others on this factor, and these were S01C, S05D, S08A, and S16C. As discussed above with respect to Factor 1 (Task), one of these, S16C, appeared extraneously on the Task Factor although with a relatively weak coefficient of .448. Notably, a Luck item (Item S06C) also appeared extraneously on the Task Factor under the four-factor solution for the success condition.

Overall, the results from the EFA solutions executed in this study serve to elucidate the underlying dimensional structure of scores which comprise the SOAR, and in a manner which methodologically departs from the approach taken in Tournat (2012a) which was confirmatory in nature. In this study, the dimensional structure observed in the respective EFA solutions is led by the data, rather than hypothesized in advance for the purposes of being directly tested against the data. What is notable about the outcome of the analyses, therefore, is the extent to which the structure conceived of by the authors is preserved in the models which emerge through the EFA solutions discussed in this paper. While the preservation of the originally intended dimensional structure in these two models is notable, it is also clear that the over-riding concern for both solutions lies with the external dimension of luck; represented in both solutions (success and failure) as the fourth and weakest factor. In both solutions, only four (half) of the original Luck items appeared together on a factor, and other items either did not appear at all on any factor, or if they did, they appeared extraneously on the factor populated with Task items.

Interestingly, the issue of extreme skew seemed to be present for the internal dimensions of ability and effort, and was therefore not a source of explanation for the structural weakness of the Luck factor. This does not imply that the weak distributional properties for the two internal dimensions should be neglected. On the contrary, these distributional weakness should be addressed, and perhaps also speak to cross-cultural issues with respect to reporting aspects of self and personal agency (i.e. ability and effort) as causal with respect to achievement outcomes. However, it does imply that the explanation for why the Luck construct is not fully represented in an empirical factor must go beyond the issue of score distributions and onto the issue of item content. One profitable line of analysis here would appear to be the semantic distinction between items which appeal to a more basic notion of life's randomness and those which front a significant other person; be this person a teacher or a friend.

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日本語版成果責任調査（SOAR）の探索的因子分析

アイズマンガー・イアン、トーネ・トッド

帰属理論は、外国語学習における様々な学習成果の問題に関して可能性のある重要な領域の研究として認識されている。しかし、この領域は日本人の英語学習状況においてはまだ十分な研究がなされてはいない。Tournat（2012a, 2012b, 2014, 2016）は、エビデンスに基づく心理測量を目的とした基礎研究を追求し、日本人に適合したと報告した。それらは当分野での研究を充実させ得ると考えられている。Ryckman and Rallo（1983）により考案された心理尺度のSurvey of Achievement Responsibility（SOAR）は、日本語に翻訳され確証的因子分析（confirmatory factor analysis: CFA）が行われた（Tournat, 2012a)。しかし、Ryckman と Rallo（1983）が提案したモデルは、日本語版では適合しなかった（Tournat, 2012a)。本研究の目的は、Tournat（2012a）が実施したア・プリオリ（先験的）に設定されたCFA 解析をア・ポステリオリ（帰納的）に設定した探索的因子分析（exploratory factor analysis: EFA）に展開することであった。主な結果は、運を意味する構成概念は成功および失敗の両状況において、心理測定尺度の因子構造における実証的な脆弱さを示した。