| RESEARCH ARTICLE

Prediction of Translation Quality by Risk-Taking and Critical Thinking Among Translation Learners

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| ABSTRACT

The main objective of the present study was to investigate the relationship between Iranian translation learners' critical thinking (CT), risk-taking (RT), and their English-to-Persian translation quality. To achieve this aim, a group of 120 male and female university students majoring in English translation (ET) were selected based on convenience sampling. Then, two questionnaires, namely CT and RT, were administered to them. Along with the questionnaires, two texts were given to all participants to translate. The quality of translations was assessed based on Farahzad's (1992) model by two raters. After data collection and analysis, it was revealed that there was a positive and significant relationship between participants' CT and RT and their translation quality. Moreover, further data analysis showed that RT was a better predictor of translation quality than CT. The findings of this study would be applicable to translation learners, teachers, and translation training courses.

1. Introduction

Nowadays, translation seems to be one of the most important channels of communication. It has led to the elimination of the cultural and social boundaries between different societies. As Farahzad (1992) asserts, "the need of societies to gain access to scientific and technical knowledge, the great thoughts, and the artistic achievements of other languages led to the establishment of translation as an independent subject instead of a device in teaching foreign languages" (p. 271).

Translation can be verified from multiple perspectives. Hatim and Munday (2004) claim that translation has two senses; "the first of these senses relate to translation as a process, the second to the product" (p.3). In the same vein, House (2018) states, "Translation viewed as a product refers to the text that results from the process of translation, which happens in the translator's mind" (pp.15-16).

When it comes to the translator's mind, psychological-related factors could be examined, as well. Elezabi (2016) believes that the "psychology of translation tries to read the black box including the cognitive aspect of the translation process" (p.9). As a result, the psychology of translation can be referred to as an interdisciplinary approach. With regard to this approach, House (2015) asserts.

A multidisciplinary approach to translation theory integrating these aspects in a plausible manner is needed. Further, a theory of translation is not possible without a reflection on the role of one of its core concepts: equivalence in translation. Looking at equivalence leads directly to a discussion of how one would go about evaluating the quality of a translation (p.1).

Besides, the evaluation of translation quality or translation quality assessment (TQA) is one of the significant issues in translation studies. As House (2001) states, "How do we know when a translation is good? This question is one of the most important questions to be asked in connection with the translation "(p.127). Also, she asserts that "translation quality assessment can be said to be at the heart of any theory of translation" (p.1).

In line with what has been mentioned so far, as translation deals with translators' decision-making in selection equivalences, any psychological trait that influences on translator's decision-making in the translation process and translation quality in consequence is worthy to be investigated. One of these traits could be critical thinking (CT) as "the art of analyzing and evaluating thinking with a view to improving it" (Paul & Elder, 2006, p.4) and can be employed for modern education in different fields of studies (Schafersman, 1991. Moreover, Kashirina (2015) asserts that "teaching critical thinking must be a necessary part of translator professional training because it is not only important as such but also leads students to acquisition of mature creative thinking, which is crucial for translation problem-solving" (p.274).

The other one might be translators' risk-taking (RT). Shojaee and Sahragard (2012) state that "translation as a task is full of surprises and ambiguities. In the process of translation, the translator has to make decisions when s/he encounters ambiguities. The study of how s/he deals with the uncertainty in relation to ambiguity leads to the study of risk-taking" (p.2).

2. Literature Review
2.1. Translation and Psychological Features
It is believed, "In a rapidly changing world in which knowledge is expanding at an unprecedented rate, information transfer is coming to depend more and more on efficient and effective translation" (Bell, 1991, p.16). Due to the importance of translation, many studies have been done on translation and the factors affecting it.

For instance, House (2015) believes that "Translation is both a cognitive procedure which occurs in a human being's, the translator's, head, and a social, cross-linguistic and cross-cultural practice. Any valid theory of translation must embrace these two aspects" (p.1). So, according to her, it is necessary to look at the theory of translation from an interdisciplinary approach. Because translation is related to the human mind, it is also associated with psychological factors. So, psychology is one of the disciplines that can be related to translation.

In this regard, Pahlavani and Asroush (2013) assert that "Psychology always seeks to identify, characterize, manage, and measure the different aspects of individuals" (p.43). People use language to talk about events, memories, emotions, and sensations. They use language to inform other people of different cultures and different nationalities; the main bridge between different languages is translation. By translation, people around the world get information about different issues. Translation is a task that is done by individuals, so there can be a close relationship between translation and psychology (p.43).

When it comes to psychology and translation, the role of the translator as an important agent in translation becomes more prominent. The translator, of course, is a "special category of a communicator" (Hatim & Mason, 1997) who more and more tries to closely interact with both source and target texts of all kinds for particular purposes and particular recipients and eventually to a specific effect. The translator has his feelings about language and his translation. This feeling consists of a 'sixth sense' (Newmark, 1988), but it includes intelligence and sensitivity, as well as knowledge. The combination of all these feelings comes into play in the task of translation.

Moreover, the translator faces many problems, and s/he is always at a crossroads between choices and decisions. She/he must think so that s/he can solve problems and make decisions. Robinson (2003) proposes that "translation is an intelligent activity, requiring creative problem-solving in novel, textual, social, and cultural conditions" (p.50). In this regard, Varzande and Jadidi (2015) claim that "It is widely accepted that translation can be viewed as a problem-solving process in which the translator encounters problems of various sources and uses tools and resources to solve them" (p.104).

Therefore, the problem-solving process is one of the issues raised in the translation and the process of the translator's work. In this way, it can be concluded that a translator who can solve problems better will have better decision-making power, which in turn will affect the quality of her/his translation. Since thinking, decision-making, and problem-solving are in the realm of mind and psychology, the personality and psychological characteristics of the translator must be taken into account.

2.1.1 Critical Thinking
Critical thinking plays an important role in human life. In the field of thinking, Paul and Elder (2002) assert that "critical thinking provides the tools of mind you need to think well through any and everything that requires thought—at work and in all parts of life" (p.29). As Ennis (1996) argues, "critical thinking is reasonable reflective thinking focused on deciding what to believe or do.

The emphasis is on reasonableness, reflection, and the process of making decisions" (p.166). Moreover, Starkey (2004) holds "critical thinking as both problem-solving and reasoning. In fact, these terms are often used interchangeably" (p. 8).

In other words, it can be said the basis of critical thinking theory is based on the ability to solve problems. According to Schaferman (1991), Critical thinking skills are "nothing more than problem-solving skills that result in reliable knowledge" (p.4). Also, he goes on to assert,

Critical thinking is an important and vital topic in modern education, and the purpose of specifically teaching critical thinking in the sciences or any other discipline is to improve the thinking skills of students and thus better prepare them to succeed in the world (p.1).

Today, translation is taught as a field of study. So, looking at translating as a field of study, it identifies its relevance to critical thinking. In this regard, Kashirina (2015) claims that "Treatment of critical thinking as parts of complex tasks solving seems to be relevant for translation studies, for in terms of cognitive psychology translation is a complex task (p.274).

In terms of the translation process, CT is considered a cognitive skill to both analyze the source text from "linguistic, extra-linguistic and pragmatic aspects and to evaluate target text in its adequacy in relation to ST and particular conditions of the given instance of translation" (Kashirina, 2015, p. 297).

2.1.2 Risk-Taking

In defining risk-taking, Beeb (1983, as cited Shahila and Meenakshi, 2012) states that "Risk-taking is a situation where an individual has to make a decision involving a choice between alternatives of different desirability; the outcome of the choice is uncertain; there is a possibility of failure" (p.36).

In expressing the importance of risk-taking, Roeser, Hilerbrand, Sandin, and Peterson (2012, p.3) believe that "Risk is an important topic in contemporary society". Therefore, from what they say, it can be concluded that there is a close relationship between the basis of risk theory and decision-making. The translator faces challenges and problems in translation that require decision-making and problem-solving. S/he must be able to take risks and decide even if s/he is wrong.

Since risk-taking is one of the most important factors in learning (Brown,2000), this factor can be useful in learning translation and training translators. In this regard, Shojaee and Sahragard (2012) hold that "in translation training, the students desire to get the strategies of translation and try different methods in order to do their best" (p.2). They continue, "This can be obtained by interacting and consulting the instructor. One of the easiest ways to interact with instructors is to take the risk of failure. This can be contributed to translation classes" (p.2).

Moreover, they hold that "Translation trainees should take risks in expressing their ideas and suggested translations and strategies in order to catch the best strategies and methods. Such experiences make them more confident, and by the lapse of time competent and proficient" (p.2).

2.2 Translation Quality Assessment (TQA)

Translation evaluation is one of the topics discussed in the translation studies. Shahraki and Karimnia (2011) assert that "From the beginning of the practice of translation, there have always been some evaluators to assess (or even mark) the translations" (p.5219).

Holmes (1998, as cited in Munday, 2001, p.12) considers the issue of translation quality assessment as a part of translation criticism, a branch of applied translation studies. The applied branch of Holmes's framework concerns translator training, translation aids, and translation criticism, and Munday defines translation criticism as the "Evaluation of translations, including the marking of student translations and the reviews of published translations". In this regard, House (2018) believe that.

"Translation quality assessment has two functional components, an ideational and an interpersonal one, that lead to two separable steps: the first and primary one referring to linguistic analysis, description and explanation based on knowledge and research; the second and secondary one referring to value judgments, social and ethical questions of relevance and personal taste. In the study of translation, we need both. Judging without analyzing is irresponsible, and analyzing without judging is pointless" (p.96).

Accordingly, it seems these two variables, i.e., critical thinking and risk taking, have a close contribution to the translator's decision-making in the process of translation, and their relationship could be investigated with translation performance in general and translation quality in specific. Figure 1 illustrates this issue.

In this regard, the main goal of this study was to probe the predictability of Iranian learners' translation quality by critical thinking and risk-taking. Therefore, the current study is going to examine this purpose through the following research questions:

1. Is there any relationship between Iranian translation learners' critical thinking, risk-taking and their translation quality?
2. Can risk-taking and critical thinking be predictors of translation quality among Iranian translation learners?

3. Methodology
3.1. Design and Context of the Study
The design of this research was ex post facto as there was no treatment in this study, and due to the nature of the research project, which was looking for the contribution between critical thinking and risk-taking of the translator and the quality of translation, this research was a correlational one.

3.2. Participants
All the participants of this study were 120 male and female undergraduate university students in the age ranges of 20 to 26 in English translation majors at Islamic Azad University Qazvin branch and South Tehran branch, and they were selected based on a convenience sampling method. All participants had passed two courses in *translation of simple texts* and *advanced translation* at their universities in advance. In other words, they were familiar with the principles of English-to-Persian translation.

3.3. Instruments
In this study, three instruments and a rubric were utilized.

3.3.1. Critical Thinking (CT) Questionnaire
The CT questionnaire developed by Honey (2005) was used in this research. It consists of 30 items on a 5-point- Likert scale (from never = 1, rarely = 2, sometimes = 3, often = 4, and always = 5) exploring things that individuals might or might not do when critically thinking about a subject. Therefore, each person's score could range from 30 to 150. A lower score indicates less CT ability, and a higher score indicates more CT ability. The reported reliability index of this questionnaire is 0.83, which is an acceptable one (See Appendix 1).

3.3.2. Risk-Taking (RT) Questionnaire
The RT questionnaire developed by Eysenck (1969) was used in this research. There are 31 items in this questionnaire with three responses: yes, maybe, and no. Each question is scored either one, half, or zero points. Yes or no answers with an * get one point. Maybe answers get half a point, and yes or no answers without an * get zero points. Eventually, the scores are added up. The norm of this trait is between 15-16 points. The scores among 1-15 show the lack of the trait, and the scores among 16-31 show the risk-taker trait. In other words, the more score an individual gets, the more risk-taking personality he has. The reported reliability index of this questionnaire is 0.79, which is an acceptable one (See Appendix 2).

3.3.3. Translation Performance Text
To evaluate the participants' translation quality, two short paragraphs were given to all participants to translate. The criteria for selecting the texts were their moderate level of difficulty and having familiar topics for the participants.

3.3.4. TQA Model
In order to analyze the quality of students' translation, Farahzad's (1992) model was used. She maintains that "in scoring, two main features are to be checked for each unit of translation: 1) Accuracy: the translation should convey the information in the source text precisely, and 2) Appropriateness: the sentences should sound fluent and native, and should be correct in terms of structure" (p.276). So, she recommends the following scheme including:

1. Accuracy   20 percent
2. Appropriateness   20 percent
3. Naturalness   20 percent
4. Cohesion   20 percent
5. Style of discourse/choice of word   20 percent

3.4. Data Collection Procedure
To investigate the contribution of translation learners' RT and CT with their TQ, the researcher fulfilled the following steps. First, the questionnaires were selected by the researchers and were administered to 30 translation learners with the same characteristics as the target sample to check the reliability indices. Next, the researchers distributed the questionnaires in English translation to

120 university students after explaining the objectives of the study. Hence, taking part in the present study was voluntary. After completing the questionnaires, all the participants translated a text from English into Persian. Two raters evaluated and scored the translation quality of all translated texts based on Farahzad's model (1992) to ensure inter-rater reliability. Finally, all scores were analyzed through statistical procedures, i.e., the Spearman coefficient of correlation and the Multiple Regression Analysis, to provide the answers to research questions.

4. Results and Discussion

Before answering the research questions of this study, it was necessary to check a number of assumptions and perform some preliminary analyses. These analyses would determine the legitimacy of running the analyses along with the type of statistical techniques, i.e., parametric or non-parametric. To begin with, assumptions of interval data and the independence of participants (Tabachnick & Fidell, 2007) were already met as the present data were measured on an interval scale, and the participants were independent of one another. In addition, it was necessary to check some other significant assumptions by inspecting the features of the data. These assumptions, according to Tabachnick and Fidell (2007), are:

1. A linear relation between each pair of variables,
2. Homoscedasticity, and
3. Normality of the distribution of variables.

The following sections will check the three abovementioned assumptions, which are related to the first question of the study. However, as the legitimacy of addressing the second research question is dependent on the answers given to the initial research question, the preliminary analyses pertinent to the second research question are reported after addressing the first research question.

4.1. Linear Relation between Each Pair of Variables and Homoscedasticity

To check the linearity of relations, the researcher needed to visually inspect the data by creating scatterplots. Since there were three variables in the study, and based on the focus of the first research question, the researcher created multiple scatterplots, which are presented in Figure 1.
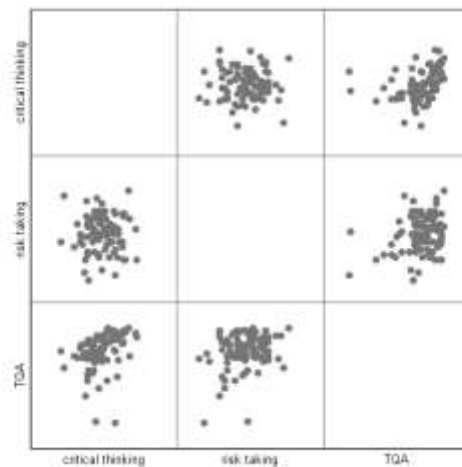

Figure 1. A scatter plot of learners' TQ, risk-taking, and critical thinking.

Through inspecting a scatterplot of scores- learners' TQ, risk-taking, and critical thinking - it can be inferred that the relationship among these variables, although not perfectly linear, is not fundamentally non-linear. So, the linearity of relations can be confirmed. In addition, the distribution of scores was not a funnel shape, i.e., wide at one end and narrow at the other; therefore, the assumption of homoscedasticity was met for these variables.

4.2. Normality of the Distributions

Two procedures were followed in order to check the normality of the distributions. First, the descriptive statistics of the data were obtained, and kurtosis and skewness ratios were calculated. Second, the Kolmogorov-Smirnov test was run as a further attempt to inspect the normality of the distributions.

4.2.1 Descriptive Statistics of Scores

The descriptive statistics related to the obtained scores on the instruments, including the calculated values of skewness ratio and kurtosis ratio, appear below in Table 1.

Table 1. *Descriptive Statistics of Learners' TQ, RT, and CT*

		Statistic	Std. Error	Ratio
critical thinking (CT)	Mean	107.41	1.328	
	Std. Deviation	14.545		
		74		
	Skewness	.035	.250	**.14**
	Kurtosis	.005	.495	**.01**
risk taking (RT)	Mean	14.18	.367	
	Std. Deviation	3.544		
	Skewness	-.204	.250	**-.816**
	Kurtosis	-.120	.495	**-.24**
Translation quality(TQ)	Mean	79.11	1.430	
	Std. Deviation	13.793		
	Skewness	-1.702	.250	**-6.8**
	Kurtosis	4.470	.495	**9.03**

As demonstrated in Table 1, if both skewness ratio and kurtosis ratio values fall within the range of -1.96 and +1.96, this point can support the normality of distribution for the scores (Tabachnick & Fidell, 2007). Accordingly, all scores related to learners' translation quality were not normal, whereas the obtained scores related to both CT and RT were normal.

4.3. Kolmogorov-Smirnov Test of Normality
In order to examine the normality of the distributions further, the Kolmogorov-Smirnov test was run, the results of which are presented in Table 2.

Table 2. *Tests of Normality*

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
critical thinking	.069	120	**.200***	.986	120	**.243***
risk taking	.079	120	**.064**	.986	120	**.228***
Translation quality	.111	120	**.001**	.869	120	**.000**

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

As presented in Table 2, the p-value for learners' translation quality is less than .05. This point suggests that the assumption of normality was violated for this variable. However, the normality assumption for learners' RT and CT was met. In this regard, the researcher concluded that the data did not meet the assumptions of the parametric statistical technique. Therefore, the pertinent research questions were answered by employing non-parametric tests.

4.4. The First Research Question
As stated earlier, the first driving force behind conducting this study was to systematically investigate the relationship between Iranian translation learners' translation quality and their risk-taking and critical thinking. Therefore, the subsequent research question and hypothesis were posed as the first research question of this study. In order to answer this question, the data were analyzed using the Spearman coefficient of correlation, which is a non-parametric formula. Table 3 shows the result of this analysis.

Table 3. *Correlation between Iranian learners' translation quality and their risk-taking and critical thinking*

			CT	RT
Spearman's rho	Learners' translation quality	Correlation Coefficient	.570**	.378**
		Sig. (2-tailed)	.000	.000
		N	120	120

** Correlation is significant at the 0.01 level (2-tailed).

According to the results of the analysis reported in Table 3, it was concluded that there was a positive and significant correlation between Iranian translation learners' translation quality and their CT (r=.570., p=0.000, N=120), as well as a positive and significant correlation between Iranian translation learners' translation quality and their RT (r=.378, p=0.000, N=120), as p-values are less than 0.05.

4.5. The Second Research Question

The second intention of this study was to systematically investigate whether learners' translation quality could be predicted by their RT and CT. As Iranian translation learners' translation quality had a positive and significant relationship with their RT and CT, the second research question of this study was answered by running a standard multiple regression analysis. However, the legitimate number of participants needed to run a multiple regression was checked. As Tabachnick and Fidell's (2007) criterion is highly recommended by many scholars, their formula for calculating sample size requirements was taken into account, i.e., the number of independent variables: N > 50 + 8m (m = the number of independent variables). In this analysis, there were two independent/predictor variables, calling for a sample including more than 66 participants. Including 120 cases, the sample pool seemed to be large enough to meet this assumption.

In order to answer this question, a multiple regression analysis was considered. Table 4 presents the regression model summary, including the R and R2.

Table 4. *Model Summary.*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.540a	.291	.279	10.995

a. Predictors: (Constant), risk taking, critical thinking

b. Dependent Variable: translation quality

As reported in the above table, R came out to be 0.54, and R2 came out to be 0.291. This means that the model explains 29 percent of the variance in learners' translation quality (Cohen, Cohen, West, & Aiken, 2003). Table 5 reports the results of ANOVA (F (2, 117) = 24.060, p = 0.000), the results of which were considered significant. This means that the model can significantly predict Iranian learners' translation quality.

Table 5 *ANOVA*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5817.312	2	2908.656	24.060	.000b
	Residual	14144.555	117	120.894		
	Total	19961.867	119			

a. Dependent Variable: translation quality

b. Predictors: (Constant), risk taking, critical thinking

Table 6 demonstrates the Standardized Beta Coefficients, which signify the degree to which each predictor variable contributes to the prediction of the predicted variable.

Table 6 *Coefficient*

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations		
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part
1	(Constant)	27.109	8.117		3.340	.001			
	Critical thinking	.296	.071	**.333**	4.193	**.000**			
	Risk taking	1.397	.305	**.364**	4.587	**.000**	.405	.361	.326

a. Dependent Variable: translation quality

The inspection of the *p-values* showed Iranian translation learners' risk-taking and critical thinking as predictor variables make a statistically significant unique contribution to the equation as their p-values are less than .05. In other words, translation learners'

translation quality could be predicted by their CT and RT. However, by inspection of *Beta coefficients*, it was revealed that Iranian translation learners' risk-taking (Beta coefficient= .364) could be a better predictor for their translation quality in comparison with their critical thinking (Beta coefficient= .333).

The main goal of the present study was to investigate whether there is a relationship between a translator's critical thinking and risk-taking with translation quality among Iranian translation learners. Based on the findings, the researchers concluded there was a positive and significant correlation between TQ and translation learners' CT and RT. Also, further analysis revealed TQ could be predicted by both CT and RT. However, by inspection of Beta coefficients, it was found that Iranian translation learners' RT could be a better predictor for TQ than CT.

When it comes to evaluating the quality of a translation, it seems one of the issues that arise is the ability of the translator's problem-solving and decision-making. Since problem-solving and decision-making abilities are the basis of the theory of critical thinking and risk-taking, a logical justification can be found for measuring these variables.

On the other hand, it was concluded that risk-taking is a better predictor of translation quality. Perhaps it can be explained that risk-taking has a greater impact on decision-making (Pym, 2015). Risk-taking and critical thinking are two individual characteristics. According to Schafersman (1991), "Children are not born with the power to think critically, nor do they develop this ability naturally beyond survival level thinking. Critical thinking is a learned ability that must be taught" (p.3). He asserts that "Most individuals never learn it. Critical thinking cannot be taught reliably to students by peers or by most parents. Trained and knowledgeable instructors are necessary to impart the proper information and skills" (p.3). Since critical thinking is growing, it needs training. However, risk-taking does not need training. People are either risk-takers or have low-risk power. In translation, too, the translator needs to make an instant decision, so risk-taking will help him/her make the decision. And the more risk-taker a person is, the better his/her decision-making power will be. This can affect the quality of his/her translation.

5. Conclusion
The findings of the present research could be useful in the field of translation studies and especially in translation training, and it would be beneficial for translators who attempt to improve the quality of translations. Also, this study might be beneficial for translation learners who try to learn the translation. Also, this study may be an incentive for researchers to examine other psychological factors and their impact on translation.

Conflicts of Interest: The authors declare no conflict of interest.
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APPENDIX 1.
Critical Thinking Questionnaire

Name/ Last name: years of experience: institute:

Gender: Male   Female   Major: Age:

Here are 30 statements exploring things you might or might not do when critically thinking about a subject. Simply read each description and click on the box to indicate how often you do it. The choices are:

‧Never ‧ Rarely ‧ Sometimes ‧ Often ‧ Always

Be sure to mark every item.

1.   I make notes on the important elements of people's arguments or propositions (e.g., the topic, issues, thesis and main points).

‧Never ‧ Rarely ‧ Sometimes ‧ Often ‧ Always

2. I test the assumptions underpinning an argument or proposition.

‧Never ‧ Rarely ‧ Sometimes ‧ Often ‧ Always

3. I state my reasons for accepting or rejecting arguments and propositions

‧Never ‧ Rarely ‧ Sometimes ‧ Often ‧ Always

4. I put material I have read or seen into my own words to help me understand it.

‧Never ‧ Rarely ‧ Sometimes ‧ Often ‧ Always

5. I distinguish between facts and opinions.

‧Never ‧ Rarely ‧ Sometimes ‧ Often ‧ Always

6. I double-check facts for accuracy.

‧Never ‧ Rarely ‧ Sometimes ‧ Often ‧ Always

7. I check other people's understanding of issues.

‧Never ‧ Rarely ‧ Sometimes ‧ Often ‧ Always

8. I search for parallels and similarities between different issues.

‧Never ‧ Rarely ‧ Sometimes ‧ Often ‧ Always

9. I use a set of criteria against which to evaluate the strength of the argument or proposition.

・Never・Rarely・Sometimes・Often・Always

10. I summarize what I have heard or read to ensure I have understood properly.

・Never・Rarely・Sometimes・Often・Always

11. I break down material so that I can see how ideas are ordered and raised.

・Never・Rarely・Sometimes・Often・Always

12. I assess the credibility of the person presenting the material I am evaluating.

・Never・Rarely・Sometimes・Often・Always

13. I play devil's advocate in order to improve my grasp of an argument or proposition.

・Never・Rarely・Sometimes・Often・Always

14. I set aside emotive language to avoid being swayed by bias or opinionated statements.

・Never・Rarely・Sometimes・Often・Always

15. I evaluate the evidence for an argument or proposition to see if it is strong enough to warrant belief. ・Never・Rarely・Sometimes・Often・Always

16. I explore statements for ambiguity to ensure I do not misconstrue their meaning.

・Never・Rarely・Sometimes・Often・Always

17. I challenge proposals and arguments that appear to lack rigour.

・Never・Rarely・Sometimes・Often・Always

18. I weigh up the reliability of people's opinions.

・Never・Rarely・Sometimes・Often・Always

19. I ask questions to reinforce my understanding of the issue.

・Never・Rarely・Sometimes・Often・Always

20. I establish the assumptions that an argument rests upon.

・Never・Rarely・Sometimes・Often・Always

21. I draw conclusions from data I have analyzed in order to decide whether to accept or reject a proposition or argument.

・Never・Rarely・Sometimes・Often・Always

22. I solicit input from other people to broaden my understanding of a subject.

・Never・Rarely・Sometimes・Often・Always

23. I analyze propositions to see if the logic is sound.

・Never・Rarely・Sometimes・Often・Always

24. I set aside my prejudices to evaluate arguments in a dispassionate, objective way.

・Never・Rarely・Sometimes・Often・Always

25. I distinguish major points from minor points.

・Never・Rarely・Sometimes・Often・Always

26. I look for what isn't there rather than concentrate solely on what is there.

・Never・Rarely・Sometimes・Often・Always

27. I reach my own conclusions rather than let myself be swayed by the opinions of others.

・Never・Rarely・Sometimes・Often・Always

28. I research a subject to enhance my understanding.

・Never・Rarely・Sometimes・Often・Always

29. I establish the underlying purpose of an argument or proposition.

・Never・Rarely・Sometimes・Often・Always

30. I consider new information to see whether I need to re-evaluate a previous conclusion.

・Never・Rarely・Sometimes・Often・Always

APPENDIX 2.

Risk-Taking Questionnaire

Name/ Last name: years of experience: institute:

Gender: Male ....   Female ....   Major: Age:

Here are 31 statements exploring things you might or might not do when risk-taking about a subject. Simply read each description and click on the box to indicate how often you do it. The choices are:

・Yes・Maybe・NO

Be sure to mark every item.

1.   Would you prefer a job involving change, travel and variety, even though the job is insecure?

Yes* | Maybe | No

2.   Do you quite enjoy taking risks?

Yes* | Maybe | No

3.   Do you carefully lock up your house at night?

Yes | Maybe | No*

4.   Do you think that young children should learn to cross roads by themselves?

Yes* | Maybe | No

5.   When the odds are against you, do you still feel it's worth taking a chance?

Yes* | Maybe | No

6.   When you are catching a train, do you often arrive at the last minute?

Yes* | Maybe | No

7.   Would life with no danger in it be too dull for you?

Yes* | Maybe | No

8.   Do you save regularly?

Yes* | Maybe | No

9.   Would you enjoy fast driving?

Yes* | Maybe | No

    10. Would you make quite sure you had another job before giving up your old one?

Yes* | Maybe | No

    11. Do people who drive very carefully annoy you?

Yes* | Maybe | No

    12. Are you rather cautious in unusual situations?

Yes | Maybe | No*

    13. Would you do almost anything for a dare?

Yes* | Maybe | No

    14. When buying things, do you usually examine the guarantee?

Yes | Maybe | No*

    15. Do you think people spend too much effort guarding their future with savings and insurance, etc.?

Yes* | Maybe | No

    16. Do you go in for regular health checks?

Yes | Maybe | No*

    17. Do you always wear a safety belt when traveling in a car?

Yes | Maybe | No*

    18. Do you sometimes gamble money on races, elections or such-like?

Yes* | Maybe | No

    19. Would you agree that an element of risk adds spice to life?

Yes* | Maybe | No

    20. Do you disagree with borrowing or lending money?

Yes | Maybe | No*

    21. Would being in debt worry you?

Yes | Maybe | No*

    22. Do you find that you have sometimes crossed a road leaving more careful companions on the other side?

Yes* | Maybe | No

    23. Do you think the risk of lung cancer from smoking has been exaggerated?

Yes* | Maybe | No

    24. Would you always read the small print before signing a contract?

Yes | Maybe | No*

    25. Does the risk of failure in a business undertaking worry you?

Yes | Maybe | No*

    26. Do you usually keep your feelings to yourself in case the other person would think you are foolish?

Yes | Maybe | No*

27. Does driving a fast car or jet airplane appeal to you?

Yes* | Maybe | No

28. Would you be careful to declare everything at the customs if you had been traveling abroad?

Yes | Maybe | No*

29. Are you sure to arrive at appointments with plenty of time to spare?

Yes | Maybe | No*

30. When traveling in an aero plane, bus or train, do you choose your seat with safety in mind?

Yes | Maybe | No*

31. Does the fear of rejection concern you if you want to invite somebody for a meal or night out?

Yes | Maybe | No*