ROCZNIKI PSYCHOLOGICZNE / ANNALS OF PSYCHOLOGY
2017, XX, 4, 875-894
DOI: http://dx.doi.org/10.18290/rpsych.2017.20.4-5en

BOGUSŁAWA LACHOWSKA
KAROLINA LUDWIKOWSKA
The John Paul II Catholic University of Lublin
Institute of Psychology

THE RESULTS OF THE PRELIMINARY VALIDATION OF THE POLISH VERSION OF THE MULTIPLE STIMULUS TYPES AMBIGUITY TOLERANCE SCALE

This paper presents the Polish version of the Multiple Stimulus Types Ambiguity Tolerance Scale (MSTAT-II) developed by D. L. McLain: a short 13-item measure of an individual's orientation, ranging from aversion to attraction, toward stimuli that are complex, unfamiliar, and insoluble. The aim of the study was to determine the validity and reliability of the scale. The participants in the study were 303 first-year students, aged 17 to 24: 234 women and 69 men. The authors chose this kind of sample because the significance of ambiguity tolerance should be particularly high in the case of the individual's adaptation to the demands of a new and complex situation, such as the beginning of studies. Confirmatory factor analysis confirmed the hypothesized one-factor structure of the model of ambiguity tolerance. The study also revealed a moderate positive relationship between MSTAT-II/PL scores and scores on the Tolerance for Ambiguity Scale (TAS) by Herman and colleagues, measuring ambiguity tolerance; MSTAT-II/PL scores were positively related to extraversion, openness to experience, conscientiousness, positive affect, and satisfaction with life, as well as negatively related to neuroticism and negative affect. The results obtained support the use of the Polish version of the Multiple Stimulus Types Ambiguity Tolerance Scale as a reliable (Cronbach's $\alpha = .85$) and valid measure of ambiguity tolerance.

Keywords: tolerance of ambiguity; intolerance of ambiguity; measure.

Addres for correspondence: BOGUSŁAWA LACHOWSKA – The John Paul II Catholic University of Lublin, Institute of Psychology, Al. Racławickie 14, 20-950 Lublin; e-mail: lachow@kul.lublin.pl

INTRODUCTION

Researchers have investigated the issue of tolerance or intolerance of ambiguity for nearly 60 years. Significant changes in the understanding of this construct have occurred over this time. Its new conceptualizations made it possible to use the concept of ambiguity tolerance in many areas of research, mainly in studies on organizational behavior (Judge, Thoresen, Pucik, & Welbourne, 1999), creativity (Merrotsy, 2013; Zenasni, Besançon, & Lubart, 2008), and migration-related processes (Yakhnich & Ben-Zur, 2008) as well as in the field of educational psychology (Bardi, Guerra, & Ramdeny, 2009) and in medical science (Geller, Tambor, Chase, & Holtzman, 1993). Furnham and Marks (2013) report that tolerance of ambiguity has begun to be treated as an important variable with a fundamental influence on the perception of situations and on making choices.

The concept of ambiguity (in)tolerance

The scholar who is commonly recognized as the author of the conception of ambiguity intolerance is Else Frenkel-Brunswik, who published her first studies devoted to this issue in the 1940s. She defined ambiguity intolerance as a personality variable comprising an emotional component and a perceptual component: denial of emotional ambivalence and intolerance of cognitive ambiguity. In her works, based on case studies of individuals with low and high tolerance of ambiguity, Frenkel-Brunswik (1949, 1951) described many behaviors connected with the lack of ambiguity tolerance. These included behaviors such as hasty and overconfident judgment in a situation marked by perceptual ambiguity, inability to allow for the occurrence of positive and negative characteristics in the same person at the same time, a "black-and-white" view of reality, certainty seeking, a tendency to rigid dichotomization into established categories, acceptance of attitude-related declarations expressing rigidity, resistance to changes in the evidently fluctuating stimulus, premature closure, or remaining closed to stimulus characteristics other than the already known and familiar ones. In contrast, individuals with high tolerance of ambiguity are believed to perceive ambiguous situations as desirable and interesting, and also as a challenge (McLain, 1993, 2009). Frenkel-Brunswik concluded that intolerance of ambiguity was generalizes to many aspects of individuals' cognitive and emotional functioning as well as determines their cognitive style, systems of beliefs and attitudes, interpersonal functioning, and problem solving. McLain (2009) reports that, initially, the enormous interest in the concept of ambiguity tolerance stemmed from the belief

that it would help understand authoritarianism and ethnocentrism, and that intolerance was treated as a complex indicator of ethnic discrimination, fascism, dogmatism, and other constructs associated with the concept of authoritarian personality. Research did not confirm these expectations, however. Yet, interest in ambiguity tolerance did not decrease; quite the contrary – it grew, which was connected with changes taking place in the understanding of this construct.

Significant progress in the understanding of ambiguity tolerance occurred thanks to the studies published by Budner (1962), who proposed a new perspective on this construct – defining it as a reaction to a particular type of stimulus rather than as a personality variable. Budner (1962) believed that the perception of ambiguity was caused by the following properties of stimuli: their complexity, unfamiliarity, or insolubility. In his opinion, complex stimuli "flood" and "overwhelm" the perceiving person, who needs to "sift through" and "sort out" this bulk of information in order to understand the situation. Budner also referred to stimulus unfamiliarity as "novelty" or "newness," and this property refers to situations experienced rarely or never; even if aspects or components of a situation are well known and familiar to the perceiving individual, what is new and unfamiliar is the way in which they are linked or the way they behave together. An insoluble stimulus, according to Budner (1962), represents conflicts in information that should be solved for the situation to be understood. These conflicts can take various forms, from little inconsistencies to irreconcilable contradictions, which may lead to various interpretations of the situation (Poesio, 1996; as cited in McLain, 2009). Ambiguity is understood as the lack of information necessary to understand the situation and make a decision with a predictable outcome. This means ambiguity makes it more difficult to assess risk, make the right decision, and predict. According to Budner (1962) intolerance of ambiguity means aversion to this kind of lack of information, expressing the need for a full understanding the situation. Aversion to situations perceived as threats and sources of discomfort comprises the following reactions: stress, avoidance, delay, suppression, and denial. As regards tolerance of ambiguity, Budner (1962) defined it as a tendency to perceive ambiguous situations as acceptable or even appealing and desirable.

Further progress in work on the understanding of ambiguity tolerance and intolerance was ushered in by McLain's (1993, 2009) achievements. McLain expanded the definition of ambiguity tolerance proposed by Budner (1962) to include contextual factors. He defined tolerance of ambiguity as "a range, from rejection to attraction, of reactions to stimuli perceived as unfamiliar, complex, dynamically uncertain, or subject to multiple conflicting interpretations"

(McLain, 1993, p. 184). According to McLain (2009), the most frequent reaction to such stimuli is aversion, since ambiguity makes it more difficult to assess risk and make the right decision. If an ambiguous situation demands action from the perceiving person, the situation may be perceived as a threat and a source of discomfort. Yet, as McLain (2009) observes, some people are attracted by mystery or by the cognitive challenge stemming from the incompleteness of information, particularly when no threat is perceived in this connection. Drawing on the study by Viscuci and Chesson (1999, as cited in McLain, 2009), he states that ambiguity can be appealing also when the occurrence of negative outcomes connected with a given situation is probable and the ambiguity of that situation makes it possible to hope to avoid them.

Related concepts

Related concepts can be encountered in the literature, namely: *uncertainty avoidance*, the related concept of *tolerance of uncertainty*, and the concept of *risk-taking propensity*.

The majority of researchers believe that *risk* and *uncertainty* are distinct from *ambiguity*. They try to pinpoint the differences between these concepts. For instance, McLain (2009) follows Ellsberg (1961; as cited in McLain, 2009) in assuming that the essence of ambiguity is a temporary lack of information necessary to understand the situation or to identify its possible states in the future (i.e., all its possible outcomes). Consequently, ambiguity understood as lack of information is considered to be distinct from risk or uncertainty, both of which require the awareness of all possible outcomes. In McLain's opinion, however, all these states are interrelated. Other scholars also subscribe to the view that ambiguity and uncertainty are distinct concepts. One of the authors voicing this view is Boss (2007), who strongly emphasizes that these terms are not synonymous. Also Krohne (1989; as cited in Furnham & Marks, 2013) considers ambiguity and uncertainty to be distinct constructs. According to this scholar, ambiguity is a property of a stimulus, whereas uncertainty is an emotional state induced by that stimulus. According to Grenier and colleagues (2005; as cited in Furnham & Marks, 2013), the difference between these concepts concerns time, since tolerance of ambiguity concerns individual reaction to an ambiguous stimulus in the present, while tolerance of uncertainty is a characteristic denoting an individual's orientation toward the future, when the individual reacts to uncertainty concerning the future. Research results confirm the relationship of uncertainty tolerance with worries and negative expectations regarding the future (Rosen, Ivanova,

& Knäuper, 2014). In studies conducted in Poland, authors also assume that ambiguity tolerance and orientation to uncertainty are distinct concepts (Kossowska, 2005). Some researchers, however, use the terms "tolerance of ambiguity" and "tolerance of uncertainty" interchangeably (e.g., Bardi et al., 2009).

As far as risk-taking propensity is concerned, Lauriola, Levin, and Hart (2007; as cited in Furnham & Marks, 2013) believe it to be a stable dispositional trait underlying the tendency to take risky decisions and to make decisions in situations of uncertainty in experimental tasks. According to Furnham and Marks (2013), Ellsberg (1961; as cited in Furnham & Marks, 2013) distinguished making decisions in a situation of uncertainty from taking risky decisions.

Furnham and Marks (2013) believe that despite the large amount of work that has been done on the interrelated concepts mentioned above and hard to differentiate, there is still no clear operational definition of tolerance or intolerance of ambiguity and no clear distinction between their manifestations and correlates; good theoretical background is also lacking.

Correlates of ambiguity tolerance/intolerance

McLain (2009) found a positive relationship of ambiguity tolerance with the individual's cognitive orientation toward other forms of perceived inadequacy of information, such as risk and uncertainty: with sensation seeking (r = .27) and risk-taking propensity (r = .33). Buhr and Dugas (2006) found a positive relationship of ambiguity tolerance with tolerance of uncertainty (r = .42) and with age (r = .24) as well as a negative relationship with tendency to worry (r = -.27), perceived limitations (r = -.32), and perfectionism: self-oriented (r = - .19), other-oriented (r = -.15), and socially expected (r = -.35). A positive relationship was also found with novelty seeking (r = .45; Rajagopal & Hamouz, 2009) and with the Proactive Personality Scale (r = .43; Bors, Gruman, & Shukla, 2010). A study of emigrants revealed that after moving to a different country individuals with higher tolerance of ambiguity experienced higher well-being (Yakhnich & Ben-Zur, 2008). Bardi and colleagues (2009) found that the higher was the ambiguity tolerance, the higher was the tendency for university students to perceive the requirements connected with studies as a challenge and the higher was their satisfaction with life and positive affect. The relationship was found only in first--year students, who were confronted by the necessity of adapting to the new situation of taking up studies. It was not found in the group of students in higher years. Moreover, individuals with high ambiguity tolerance exhibit higher self--efficacy (r = .31; Wolfrad, Oubaid, Straube, Bischoff, & Mischo, 1999) and

have high cross-cultural competence (Caligiuri & Tarique, 2012). In other studies, researchers found that high tolerance of ambiguity was related to entrepreneurial activity (Teoh & Foo, 1997) and moderated the relationship between role conflict and entrepreneurial activity indicators (Teoh & Foo, 1997) as well as between role ambiguity and job stress in a sample of managers (Srivastava, 2007). McLain (2009) found that individual with high tolerance of ambiguity perceived their environment as less threatening (r = -.13), and in the case of dangerous jobs (e.g., firefighters) these individuals experienced lower stress and fewer somatic problems (r = -.23) and tended to perceive the health care offered to them as adequate. Research also confirmed the negative relationship between ambiguity tolerance and depression (Andersen & Schwartz, 1992).

Furthermore, the results of existing studies show a relation of high ambiguity tolerance with preference for surrealist works of art (the values of correlation coefficients ranging from r = .22 to r = .31; Furnham & Avison, 1997; Swami, Stieger, Pietschnig, & Voracek, 2010) and surrealistic movies (correlation coefficients ranging from r = .18 to r = .19; Swami et al., 2010) as well as with creativity (Zenasni et al., 2008). Individuals with high tolerance of ambiguity are characterized by extraversion (r = .37), openness to experience (r = .29), and low agreeableness (r = -.19; Caligiuri & Tarique, 2012). In their research on Erikson's final stage of psychosocial development, Hearn, Saulnier, Strayer, Glenham, Koopman, and Marcia (2012) found that ambiguity tolerance increased with an increase in personal integrity and decreased with an increase in the individual's tendency not to explore.

Bors, Gruman, and Shukla (2010), however, stress the high inconsistency of the results of existing studies on ambiguity tolerance. Some of them did not reveal the relations described above or even revealed the reverse relations. The causes of discrepancies in the results of the studies conducted to date are considered to be sampling errors as well as the high diversity of measures used and their low psychometric value. For example, Furnham (1994) found that correlations between the results obtained by means of four measures of ambiguity tolerance ranged from r = .44 to r = .62. In the light of the above data, all activities aimed at developing a valid and reliable instrument measuring ambiguity tolerance seem to be important and fully justified.

Ambiguity tolerance measurement

Since the concept of ambiguity tolerance was introduced into science, many instruments measuring this construct have been developed. The oldest scales ones are Budner's (1962) and MacDonald's (1970), the latter being a revised version of the earlier Rydell-Rosen Ambiguity Tolerance Scale (1966). Few studies have been conducted to assess the psychometric properties of these scales, and those that have been conducted revealed their numerous shortcomings. For example, in the case of Budner's scale, which used to be the most often used measure of ambiguity tolerance, the author did not perform factor analysis to confirm its validity, and the reliability of the scale expressed as Cronbach's α coefficient was .49 – much below the required level. In response to these and other shortcomings of Budner's scale, David McLain developed the Multiple Stimulus Types Ambiguity Tolerance Scale (MSTAT), of which there are two versions – the longer MSTAT-I (McLain, 1993) and the shorter and more recent MSTAT-II (McLain, 2009). Based on the results of confirmatory factor analysis as well as on the results of analyses of correlations of scores on McLain's and Budner's scales with intelligence measured by means of Raven's Progressive Matrices test and proactive personality, Bors, Gruman, and Shukla (2010) found that McLain's scale was a much better instrument for measuring ambiguity tolerance than Budner's scale and recommend its use in further research. Furnham and Marks (2013) mention several important advantages of this scale, which – in their opinion – have ensured its high popularity. First, many studies have confirmed its validity and reliability. Second, it is a fairly short scale, consisting of 13 simple items, which facilitates its application and favors its popularity. This makes it possible to use it in studies whose time is limited or in studies in which many other scales are administered. Its other advantage is the simplicity of wording and the absence of references to contextual factors other than stimulus ambiguity. By ensuring this, the authors avoided the shortcoming pointed out in other scales, such as the one developed by Budner (1962), consisting in the fact that the content of some items refers to specific situations or people, which may influence the subject's reactions. As a result, the subject's responses may not be reactions to the ambiguity of the stimulus but to other factors connected with the context of the stimulus. These are items referring, for example, to teachers, experts, and professional career. By contrast, MSTAT items are very general and, in some researchers' opinion, some subjects may find it difficult to respond to them. What attests to the high popularity of the scale is the fact that it has been adapted into Spanish (Arquero & McLain, 2010) and Japanese (Tokuyoshi, Suzuki,

& Iwasaki, 2010). Based on a review of the ambiguity tolerance measures that are in use, Furnham and Marks (2013) conclude that MSTAT-II is currently one of the most popular scales.

McLain (2009, p. 975) states that the aim of MSTAT-II is to measure tolerance of ambiguity understood as "an orientation, ranging from aversion to attraction, toward stimuli that are complex, unfamiliar, and insoluble." As highlighted in its name (Multiple Stimulus Types Ambiguity Tolerance Scale), the items included in the scale refer to various types of ambiguous stimuli (Table 1): new/unfamiliar/novel stimuli (N), complex stimuli, (C), uncertain/dynamically uncertain stimuli (U), insoluble/illogical/irreducible/internally inconsistent stimuli (I), ambiguous stimuli in general (G) (McLain, 1993, p. 184).

The scale consists of 13 items. The participant rates the extent to which the descriptions provided in the items correspond to his or her feelings and behaviors. Answers are given on a 5-point rating scale, from 1 – *strongly disagree*, through 3 – *neither agree not disagree*, to 5 – *strongly agree*. Adding up all item scores (some of them having been reversed – see Table 1) gives the total score, ranging between 13 and 65; the higher the score, the higher the tolerance of ambiguity. Cronbach's α reliability coefficient for the original version of the scale is $\alpha = .83$. The results of exploratory factor analysis and scree plot analysis (McLain, 2009) allowed the author of the scale to propose one factor. Confirmatory factor analysis confirmed that the one-factor theoretical model was well fitted to the data. The original version of the scale was confirmed to be valid (McLain, 2009).

Polish version development

In order to prepare a Polish version of the questionnaire, when consent had been obtained from the author of the original version, two English language specialists independently translated the scale into Polish. After comparing their translations, we agreed on the final Polish version of the questionnaire (Table 1), which was then translated back into English; the comparison revealed satisfactory consistency of the translation with the original version.

Table 1

Item Contents and Stimulus Type

Item content	Type of stimulus	*M*	*SD*
1. *Źle znoszę niejednoznaczne sytuacje* * (English version: I don't tolerate ambiguous situations well)	G1	3.27	1.16
2. *Wolałbym raczej uniknąć rozwiązywania problemu, który należy rozpatrywać z różnych perspektyw* * (I would rather avoid solving a problem that must be viewed from several different perspectives)	I1	2.66	1.23
3. *Staram się unikać sytuacji, które są niejednoznaczne* * (I try to avoid situations that are ambiguous)	G2	3.22	1.22
4. *Wolę sytuacje znane niż nowe* * (I prefer familiar situations to new ones)	N1	3.31	1.28
5. *Problemy, których nie można rozpatrywać tylko z jednego punktu widzenia są nieco zagrażające* * (Problems that cannot be considered from just one point of view are a little threatening)	I2	2.77	1.21
6. *Unikam sytuacji, które są dla mnie zbyt skomplikowane, aby je łatwo zrozumieć* * (I avoid situations that are too complicated for me to easily understand)	C1	2.74	1.19
7. *Dobrze znoszę niejednoznaczne sytuacje* (I am tolerant of ambiguous situations)	G3	3.07	1.11
8. *Lubię mieć do czynienia z problemami, które są na tyle skomplikowane, że są niejednoznaczne* (I enjoy tackling problems that are complex enough to be ambiguous)	C2	3.07	1.19
9. *Staram się unikać problemów, które wydają się nie mieć tylko jednego „najlepszego" rozwiązania* * (I try to avoid problems that don't seem to have only one "best" solution)	I3	2.76	1.16
10. *Na ogół wolę to co nowe, niż to co znane* (I generally prefer novelty over familiarity)	N2	3.00	1.20
11. *Nie lubię niejednoznacznych sytuacji* * (I dislike ambiguous situations)	G4	3.24	1.22
12. *Trudno mi dokonać wyboru, jeśli wynik jest niepewny* * (I find it hard to make a choice when the outcome is uncertain)	U1	3.38	1.15
13. *Wolę sytuacje, w których jest nieco niejednoznaczności* (I prefer a situation in which there is some ambiguity)	G5	3.13	1.01

Note. G – ambiguous stimuli in general; C – complex stimuli; N – new/unfamiliar/novel stimuli; I – insoluble/illogical/irreducible/internally inconsistent stimuli; U – uncertain/dynamically uncertain stimuli; *M* – mean computed after reversing the scores. * Reverse-coded items.

METHOD

Participants

We assessed the psychometric properties of the Polish version of the scale based on the scores of 303 first-year university students (234 women and 69 men). The selection of the sample of first-year students was inspired by reports stating that ambiguity tolerance is particularly important when people encounter novel situations, one of which is the beginning of studies. The participants' age ranged from 17 to 24 (M = 19.64, SD = 1.18), the mean age being significantly higher in the group of men (M = 20.06, SD = 1.56) than in the group of women (M = 19.52, SD = 1.02; $t(299) = -3.37$, $p \leq .001$).

Measures

To measure general satisfaction with life, we used the Polish version (Juczyński, 2001) of the Satisfaction With Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985). We also used the Positive and Negative Affect Scale (PANAS) by Watson, Clark, and Tellegen (1988), as translated into Polish by Sobol-Kwapińska (2007). This instrument consists of 20 adjectives referring to emotional states; 10 of them make up the Positive Affect scale and the other 10 make up the Negative Affect scale. The reliability (Cronbach's α) of this measure assessed in the present study was .86 for the Positive Affect scale and .87 for the Negative Affect scale. These are acceptable values, comparable to those obtained for the original scale, where Cronbach's α = .89 for positive affect and α = .85 for negative affect. To measure personality traits, we used the NEO-FFI Personality Inventory by Costa and McCrae, as adapted into Polish by Zawadzki and colleagues (1998). The questionnaire consists of five scales, measuring five basic personality traits: neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. The reliability of each scale of the Polish version of this questionnaire assessed by means of Cronbach's α coefficient is acceptable, and the values of α range from .68 to .80 (Zawadzki et al., 1998). To measure tolerance of ambiguity understood in accordance with Budner' conception, we used the Tolerance for Ambiguity Scale (TAS; Herman, Stevens, Bird, Mendenhall, & Oddon, 2010), developed on the basis of Budner's (1962) Tolerance of Ambiguity Scale. The scale consists of 12 items. The reliability of the Polish version of the scale assessed in the present study was Cronbach's α = .63, which is lower than the reliability of the original scale (α = .73).

THE PSYCHOMETRIC PROPERTIES OF THE POLISH VERSION OF THE MSTAT-II

Reliability

We assessed the reliability of the test by measuring internal consistency using Cronbach's α coefficient. The more homogeneous the sample of items making up a given scale, the higher this coefficient (Hornowska, 2014). The value of the reliability coefficient for the Polish version of the scale – α = .85 – is acceptable and does not increase after the removal of any of the items.

Validity

McLain (2009) assumed a one-factor structure of the scale. This structure was confirmed in a study using the original version of the scale conducted by its author (McLain, 2009) and in a study conducted in Spain with the Spanish version (Arquero & McLain, 2010). To establish to what extent the one-factor structure of the adapted measure, postulated by its author, is valid in confrontation with data obtained in the present study, we performed confirmatory factor analysis (CFA) using the computer solution proposed in the AMOS.22 package. We performed the analyses in two stages. First, we assumed the noncorrelation of measurement errors. The obtained fit indices of the postulated model show its low but acceptable fit to the data. Although RMSEA = .093 exceeds the value of .05, considered to be the upper limit of good model fit, the range of RMSEA values (from .081 to .106) falls partly andonly slightly outside the range from .08 to .10 indicating a "poor fit" of the tested model. In other words,a part of the range of RMSEA valuesslightly exceeds the value of .10, above which the model would be unacceptable (Browne & Cudeck, 1993, as cited in Konarski, 2009). As regards other indices, SRMR = .0718 does not exceed the critical value of model acceptability, established at .08 (Hu & Bentler, 1999, as cited in Konarski, 2009). The remaining fit indices for this model – namely, χ^2 = 235.81 (df = 65, $p < .001$), χ^2/df = 3.63, CFI = .838, TLI = .805, NFI = .791 – also indicate a poor fit of the model in which the noncorrelation of measurement errors is assumed. It should be noted, however, that the fit indices obtained in the present study are similar to or even better than those obtained by the author of the questionnaire during his work on the measure: χ^2 = 377 ($p < .001$), RFI = .74,TLI = .78, NFI = .78, RMSEA = .10 (McLain, 2009). The author of the method considers it justified to allow correlations between errors. In his opinion, it is legitimate to

expect a common ground for various types of stimuli, explaining the correlations of measurement errors between the items of scales measuring the perception of various groups of ambiguous stimuli. In accordance with these views held by the author of the measure, based on the analysis of modification indices, in our tested model we allowed the correlation of measurement errors between items 4 and 10, which are similar to each other in terms of content and belong to the same category of new/unfamiliar/novel stimuli (category N). We also allowed the correlation of measurement errors between items 2 and 5, belonging to the same category of insoluble/illogical/irreducible/internally inconsistent stimuli (category I). Moreover, we allowed the correlation of measurement errors between item 6 and items 5 and 2, which represent different categories of stimuli (category C and category I in the case of items 5 and 2, respectively) but are nevertheless similar in terms of content. The values of fit for the model with correlated measurement errors, based on a χ^2 test, are as follows: $\chi^2 = 128.21$, $df = 61$ ($p < .001$), $\chi^2/df = 2.102$. They do not support the hypothesis postulating the lack of differences between the observed covariance matrix and the one implied by the model. However, because this test makes it easy to reject a hypothesis when the sample is large (the sample in this study was 303 subjects, which makes it fairly large), we used other measures of fit, independent of sample size. The value of RMSEA = .060 does exceed the established acceptability level (.05) for the hypothesis postulating a close fit of the model, but the 90% confidence interval for the value of RMSEA [.040, .075] indicates that the model approximation error is within the limits established for close model fit: the lower limit of the interval (.040) does not reach the value of .00, which suggests that the close fit hypothesis is not realistic, but the upper limit of this interval (.075) does not reach the value of .08, which means that the approximation error is within the acceptable limits for approximate fit (Konarski, 2009). The values of other measures of fit also confirm the adequacy of this model. For example, SRMR = = .055 as well as TLI = .918 and CFI = .936 do reach the established levels of model acceptability (which are TLI = .08 and CFI = .90). The value of NFI = = .887 is below its minimum acceptablevalue (.95), but the situation in which fit measures do not yield an entirely consistent indication regarding the fit level of the tested model is not surprising and need not automatically challenge the adequacy of that model (Konarski, 2009). Therefore, the analysis of the values of all the obtained fit indices makes it possible to conclude that the model assuming the existence of one factor in the structure of the scale turned out to be relatively valid. It allows error correlation, however. The values of factor loadings range from .42 to .74, except for the fifth item, for which the loading is .33.

Construct validity is also defined by the convergent and discriminant aspects (Hornowska, 2014). To determine convergent validity, we analyzed the correlation coefficients between MSTAT-II/PL scores with scores on scales measuring characteristics similar to ambiguity tolerance. These included the measurement of ambiguity tolerance with the Tolerance for Ambiguity Scale (TAS; Herman et al., 2010) as well as the measurement of openness to experience and extraversion by means of the NEO-FFI Personality Inventory by Costa and McCrae as adapted into Polish by Zawadzki and colleagues (1998). We also expected that tolerance of ambiguity would co-occur with conscientiousness and agreeableness. In view of the difficulties in identifying a scale measuring a characteristic other than ambiguity tolerance, we assumed that discriminant validity would be determined on the basis of correlation with the score on the Neuroticism scale of the NEO-FFI Personality Inventory (Zawadzki et al., 1998). Table 2 presents descriptive statistics for the distributions of the analyzed variables.

Table 2

Descriptive Statistics for the Distributions of the Variables

Variable	*M*	*SD*	Score range	Skewness	*SE*	Kurtosis	*SE*	S-W test $p\leq$
Tolerance of ambiguity MSTAT-II/PL	39.65	9.24	13-65	0.04	0.143	0.09	0.285	.18
Tolerance for Ambiguity Scale (TAS)	31.77	6.38	15-52	0.19	0.143	0.10	0.285	.28
Satisfaction with life	19.95	5.64	5-33	-0.23	0.143	-0.34	0.285	.04
Positive affect	4.72	0.95	1.00-6.78	-0.40	0.143	0.45	0.285	.006
Negative affect	2.73	1.08	1.00-6.30	0.70	0.143	0.20	0.285	.001
Neuroticism	24.54	8.80	2-48	0.11	0.143	-0.43	0.285	.26
Extraversion	28.42	7.52	2-45	-0.43	0.143	0.12	0.285	.003
Openness	28.05	6.26	11-46	0.04	0.143	0.06	0.285	.43
Agreeableness	29.28	6.80	4-45	-0.28	0.143	-0.19	0.285	.01
Conscientiousness	29.77	7.40	6-48	-0.23	0.143	-0.02	0.285	.31

Note. S-W – the Shapiro-Wilk test.

The analysis of the shape of distributions of the values of the measured variables using the Shapiro–Wilk test showed that in the case of satisfaction with life, positive affect, negative affect, extraversion, and agreeableness these distributions significantly diverged from normal distribution (Tab. 2). The analysis of skewness and kurtosis makes it possible to conclude that all the problems con-

nected with the distribution of the values of variables concern their skewness. As recommended (Bedyńska & Książek, 2012), we performed mathematical transformations (logarithmization as well as squaring and cubing) on raw data in order to normalize the distribution. As a result of these operations, we managed to eliminate the skewness of distributions.

Table 3

Correlations Between the Variables

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. MSTAT-II/PL	–								
2. Tolerance for Ambiguity Scale (TAS)	.53***	–							
3. SWLS	.12*	.07							
4. Positive affect	.17**	.19***	.35***						
5. Negative affect	-.26***	-.20***	-.31***	-.41***	–				
6. Neuroticism	-.35***	-.32***	-.41***	-.25***	.48***				
7. Extraversion	.22***	.27***	.31***	.34***	-.26***	-.46***	–		
8. Openness	.18**	.22***	.05	.16**	-.03	-.01	.06	–	
9. Agreeableness	.01	.08	.02	.15**	-.21***	-.09	.24***	-.07	–
10. Conscientiousness	.14*	.01	.23***	.27***	-.17**	-.20***	.18**	-.12*	.34***

Note. * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Openness to experience is related to: intelligence, unconventionality, originality, imagination, invention, cognitive curiosity, creativity, acceptance of changes and novelty, and sensation seeking (Zawadzki et al., 1998). The willingness of people high in openness to consider new ideas, values, and perspectives as well as their curiosity and creativity (McCrae & Costa, 2005) should promote the perception of ambiguity as attractive and appealing. These people are characterized by tolerance and exploration of that which is unknown (Oleś, 2003), which should also be conducive to the perception of ambiguous stimuli as attractive and as an opportunity to develop. According to McCrae (1996), tolerance of ambiguity represents the motivational aspect of openness to experience. As far as extrovert individuals are concerned, due to their high level of energy they have a greater chance to seek and accumulate resources and, as a result, to face various demands, including those that stem from stimulus ambiguity. Consequently,

they may perceive this type of stimuli as less threatening. Due to their focus on positive aspects of situations, they may perceive ambiguity as less threatening or stressful and more as a challenge: attractive and appealing. Their tendency to experience positive emotions and eager engagement in events may also promote the perception of ambiguous situations as attractive. The results of existing studies confirm the relationship of ambiguity tolerance with high extraversion and openness to experience (Caligiuri & Tarique, 2012).

Neuroticism is associated with sensitivity to stress, tendency to experience anxiety, concern, and tension, as well as with tendency to worry and react defensively (Zawadzki et al., 1998), which may result in people with a high level of this trait experiencing greater stress when confronted by the ambiguity of situations. Given their tendency to react with fearfulness, a sense of helplessness, and withdrawal, it can be expected that in the case of encountering difficulties involving ambiguity they will perceive them as more threatening and react with withdrawal and discouragement.

The results of the analyses performed in the present study confirm the construct validity of the MSTAT-II/PL scale (Table 3). As expected, there is a relationship between MSTAT-II/PL scores and scores on the Tolerance for Ambiguity Scale (TAS; Herman et al., 2009), which, according to its authors, measures ambiguity tolerance in various cultural contexts. Although the value of the correlation coefficient between the scores on these two scales is not as high as could be expected, this result should be considered satisfactory, given the fact that in his studies McLain (2009) found no relationship between MSTAT-II scores and scores on Budner's scale (1962) based on which the TAS was developed. McLain (2009) explained the lack of relationship between the scores on these two scales as stemming from the psychometric weakness and serious deficiencies of Budner's scale. Because the TAS was developed on the basis of Budner's scale, then despite its authors' declarations that it is a new, corrected, and better version of Budner's scale it is still not free from some of the shortcomings of the source version, such as items referring to contextual factors other than ambiguity of situations, such as "good teacher" or "good job." The shortcomings of this scale may have decreased the value of the analyzed correlation coefficient.

The study also confirmed the expected positive relationships of ambiguity tolerance with openness to experience, extraversion, and conscientiousness as well as its negative relation with neuroticism. We found no significant relationship between ambiguity tolerance and agreeableness.

Another aspect of the validity of a measure is its concurrent validity (Hornowska, 2014). To determine the concurrent validity of the Polish version of the MSTAT-II, we analyzed the correlations of scores on this scale with scores on scales measuring satisfaction with life as well as positive and negative affect, treating them as indicators of adaptation of the tested first-year students to the demands involved in taking up studies. Positive adaptation to new demands is linked with the individual's well-being. According to Diener's (1984) proposal, subjective well-being (SWB) comprises three basic elements: satisfaction with life, positive affect, and negative affect. Taking up studies is undoubtedly a novel and complex situation, marked by high ambiguity. According to Budner (1962), stimulus ambiguity is a source of stress. It can therefore be expected that individuals with higher tolerance of ambiguity will experience lower stress and discomfort when confronted with this kind of stimuli. Emmons, Diener, and Larsen (1986) state, referring to the person–environment fit theory, that individuals should experience more positive emotions in situations consistent with their traits. Referring to this statement by Emmons and colleagues, Bardi, Guerra, and Ramdeny (2009) advance the thesis that high tolerance of ambiguity will be associated with the individual's well-being in cases when it is necessary to adapt to new situations, such as taking up studies. It is therefore reasonable to expect a positive relation of ambiguity tolerance with satisfaction with lifeand positive affect and a negative relationship with negative affect. The analyses confirmed the concurrent validity of the scale (Table 3). In accordance with the assumptions of the theory, they confirmed the positive correlation of ambiguity tolerance measured by means of the MSTAT-II/PL with satisfaction with life and positive affect as well as its negative correlation with negative affect. As postulated by the theory, ambiguity tolerance measured by MSTAT-II/PL is correlated with the individual's adaptation to the demands of the new, ambiguous, uncertain, complex situation of of taking up studies.

Nevertheless, when discussing the relationships that have been found we need to remember that even though the correlation coefficients between variables are statistically significant ($p \leq .05$), some of them (those below .30) attest to weak correlations (Bedyńska & Cypryańska, 2013). Some authors believe, however, that the interpretation of the value of the obtained correlation coefficient should be supplemented with effect size assessment, which in turn should be performed with sample size and scientific discipline taken into account[1]. Cohen

[1] A more detailed review of positions and arguments of supporters and opponents of effect size assessment can be found in the following publication: W. Szymczak (2015). Pojęcie wielkości efektu na tle teorii Neymana-Pearsona testowania hipotez statystycznych [The concept of effect

(1992) proposed interpreting effect sizes regardless of sample size and scientific discipline. According to this proposal, $r = .10$ is low effect amounting to 1% of total variance, $r = .30$ is medium effect amounting to approximately 9% of total variance, and $r = .50$ is high or considerably large effect amounting to approximately 25% of total variance. In the light of this classification, most effects found in the present study should be considered low or – at best – medium. Effect size assessment, however, should also depend on sample size (Thompson, 1944, as cited in Szymczak, 2015), and in the present study the sample consisted of 303 subjects, which makes it relatively large. Moreover, Valentine and Cooper (2003, as cited in Szymczak, 2015) express the view that effect size assessment should take into account the scientific discipline, since certain areas, such as social sciences (including psychology), probably have lower effect size values than others, and literal use of Cohen's limits may be misleading here. Stelmach (2014, as cited in Szymczak, 2015) stresses that a researcher should take into account the smaller effect size that he or she considers substantially interesting in the field of research he or she is investigating. In the light of the above considerations, we assume that the effects we obtained, even those explaining a small percentage of total variance, are important, significant, and noteworthy from the point of view of the analyzed issue.

CONCLUSIONS

In this article we have presented the results of preliminary analyses aimed at determining the validity and reliability of the Polish version McLain's (2009) MSTAT-II scale. The results of these analyses are encouraging. The pattern of relations between MSTAT-II/PL score and a set of other variables makes legitimate to conclude that the scale is a valid measure of ambiguity tolerance. Other analyses confirmed the postulated one-factor structure of the model of ambiguity tolerance and the reliability of the scale. We found that all MSTAT-II/PL items are significantly correlated with the main factor. Further studies are needed, however, to achieve a better understanding of the construct of ambiguity tolerance and its links with other variables. It is also necessary to conduct studies with samples other than only university students, as was the case in the study presented in this paper.

size in the light of the Neyman-Pearson theory of testing statistical hypotheses]. *Acta Universitatis Lodziensis Folia Psychologica, 19*, 5-41.

REFERENCES

Andersen, S. M., & Schwartz, M. H. (1992). Intolerance of ambiguity and depression: A cognitive vulnerability factor linked to hopelessness. *Social Cognition, 10*(3), 271-298.

Arquero, J. L., & McLain, D. (2010). Preliminary validation of the Spanish version of the Multiple Stimulus Types Ambiguity Tolerance Scale (MSTAT-II). *The Spanish Journal of Psychology,13*(1), 476-484.

Bardi, A., Guerra, V. M., & Ramdeny, G. S. D. (2009). Openness and ambiguity intolerance: Their differential relations to well-being in the context of an academic life transition. *Personality and Individual Differences, 47*, 219-223.

Bedyńska, S., & Cypryańska, M. (2013). *Statystyczny drogowskaz 1. Praktyczne wprowadzenie do wnioskowania statystycznego [Statistical signpost 1: A practical introduction to statistical inference].*Warsaw, Poland: Wydawnictwo Akademickie Sedno.

Bedyńska, S., & Książek, M. (2012). *Statystyczny drogowskaz 1. Praktyczny przewodnik wykorzystania modeli regresji oraz równań strukturalnych [Statistical signpost 1: A practical guide to the use of regression models and structural equations].* Warsaw, Poland: Wydawnictwo Akademickie Sedno.

Bors, D. A., Gruman, J. A., & Shukla, S. (2010). Measuring tolerance of ambiguity: Item polarity, dimensionality, and criterion validity. *Revue Européenne de Psychologie Appliquée, 60*, 239-245.

Boss, P. (2007). Ambiguous loss theory: Challenges for scholars and practitioners. *Family Relations, 56* (April 2007), 105-111.

Budner, S. (1962). Intolerance of ambiguity as a personality variable. *Journal of Personality, 30*, 29-50.

Buhr, K., & Dugas, M. J. (2006). Investigating the construct validity of intolerance of uncertainty and its unique relationship with worry. *Journal of Anxiety Disorders, 20*, 222-236.

Caligiuri, P., & Tarique, I. (2012). Dynamic cross-cultural competencies and global leadership effectiveness. *Journal of World Business, 47*(4), 612-622.

Cohen, J. (1992). Statistical power analysis. *Current Directions in Psychological Sciences, 1*(3), 98-101.

Diener, E. (1984). Subjective well-being. *Psychological Bulletin, 95*, 542-575.

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction With Life Scale. *Journal of PersonalityAssessment, 49*, 71-75.

Emmons, R. A., Diener, E., & Larsen, R. J. (1986). Choice and avoidance of everyday situations and affect congruence: Two models of reciprocal interactionism. *Journal of Personality and Social Psychology, 51*(4), 815-826.

Frenkel-Brunswik, E. (1949). Intolerance of ambiguity as an emotional and perceptual personality variable. *Journal of Personality, 18*, 108-143.

Frenkel-Brunswik, E. (1951). Personality theory and perception. In R. Blake & E. Ramsey (Eds.), *Perception: An approach to personality* (pp. 356-419). New York: Ronald.

Furnham, A. (1994). A content, correlational and factor analytic study of four tolerance of ambiquity questionnaires. *Personality and Individual Differences, 16*, 403-410.

Furnham, A., & Avison, M. (1997). Personality and preference for surreal paintings. *Personality and Individual Differences, 23*, 923-935.

Furnham, A., & Marks, J. (2013). Tolerance of ambiguity: A review of the recent literature. *Psychology, 4*(9), 717-728.

Geller, G., Tambor, E. S., Chase, G. A., & Holtzman, N. A. (1993). Measuring physicians' tolerance for ambiguity and its relationship to their reported practices regarding genetic testing. *Medical Care, 31*(11), 989-1001.

Hearn, S., Saulnier, G., Strayer, J., Glenham, M., Koopman, R., & Marcia, J. E. (2012). Between integrity and despair: toward construct validation of Erikson's eighth stage. *Journal of Adult Development, 19*,1- 20.

Herman, J. L., Stevens, M. J., Bird, A., Mendenhall, M., & Oddou, G. (2010). The Tolerance for Ambiguity Scale: Towards a more refined measure for international management research. *International Journal of Intercultural Relations, 34*, 58-65.

Hornowska, E. (2014). *Testy psychologiczne. Teoria i praktyka [Psychological tests: Theory and practice]*. Warsaw, Poland: Wydawnictwo Naukowe Scholar.

Juczyński, Z. (2001). Narzędzia pomiaru w promocji i psychologii zdrowia [Measurement instruments in health promotion and psychology]. Warsaw, Poland: Psychological Test Laboratory of the Polish Psychological Association.

Judge, T. A., Thorensen, C. J., Pucik, V., & Welbourne, T. M. (1999). Managerial coping with organization change: A dispositional perspective. *Journal of Applied Psychology, 84*, 107-122.

Konarski, R. (2009). *Modele równań strukturalnych. Teoria i praktyka [Structural equation models: Theory and practice]*. Warsaw, Poland: Wydawnictwo Naukowe PWN.

Kossowska, M. (2005). *Umysł niezmienny. Poznawcze mechanizmy sztywności [The unchanging mind: Cognitive mechanisms of rigidity]*. Cracow, Poland: Jagiellonian University Press.

MacDonald, A. P. (1970). Revised scale for ambiguity tolerance: Reliability and validity. *Psychological Reports, 26*, 791-798.

McCrae, R. R. (1996). Social consequences of experiential openness. *Psychological Bulletin, 120*, 323-337.

McCrae, R. R., & Costa, P. T. Jr (2005). *Osobowość dorosłego człowieka [Personality in adulthood]*. Cracow, Poland: Wydawnictwo WAM.

McLain, D. L. (1993). The MSTAT-I: A new measure of an individual tolerance for ambiguity. *Educational and Psychological Measurement, 53*, 183-189.

McLain, D. L. (2009). Evidence of the properties of an ambiguity tolerance measure: The Multiple Stimulus Types Ambiguity Tolerance Scale – II (MSTAT-II). *Psychological Reports, 105*, 975-988.

Merrotsy, P. (2013). Tolerance of ambiguity: A trait of creative personality. *Creativity Research Journal, 25*, 232-237.

Oleś, P. K. (2003). *Wprowadzenie do psychologii osobowości [Introduction to the psychology of personality]*. Warsaw, Poland: Wydawnictwo Naukowe Scholar.

Rajagopal, L., & Hamouz, F. L. (2009). Use of food attitudes and behaviors in determination of the personality characteristic of openness: A pilot study. *International Journal of Intercultural Relations, 33*, 254-258.

Rosen, N. O., Ivanova E., & Knäuper, B. (2014). Differentiating intolerance of uncertainty from three related but distinct constructs. *Anxiety, Stress and Coping, 27*(1), 55-73.

Rydell, S. T., & Rosen, E. (1966). Measurement and some correlates of need-cognition. *Psychological Reports, 19*, 139-165.

Sobol-Kwapińska M. (2007). *Żyć chwilą? Koncentracja na teraźniejszości a poczucie szczęścia [To live the moment? Focus on the present and the sense of happiness]*. Lublin, Poland: Catholic University of Lublin Press.

Srivastava, S. (2007). Tolerance of ambiguity and locus of control as moderators for work stress among private sector managers. *Abhigyan, 25*(2), 48-53.

Swami, V., Stieger, S., Pietschnig, J., & Voracek, M. (2010). The disinterested play of thought: Individual differences and preference for surrealist motion pictures. *Personality and Individual Differences, 48*, 855-859.

Szymczak, W. (2015). Pojęcie wielkości efektu na tle teorii Neymana-Pearsona testowania hipotez statystycznych [The concept of effect size in the light of the Neyman–Pearson theory of testing statistical hypotheses]. *Acta Universitatis Lodziensis Folia Psychologica, 19*, 5-41.

Teoh, H. Y., & Foo, S. L. (1997). Moderating effects of tolerance for ambiguity and risk-taking propensity on the role conflict–perceived performance relationship: Evidence from Singaporean entrepreneurs. *Journal of Business Venturing, 12*, 67-81.

Tokuyoshi, Y., Suzuki, D., & Iwasaki, S. (2010). *The relationship between MSTAT-II and attention functions. The preliminary validation of the Japanese version of the Multiple Stimulus Types Ambiguity Tolerance Scale (MSTAT-II). Symposium: Attention and Cognition*, Tohoku University, September 18th, 2010.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*, 1063-1070.

Wolfradt, U., Oubaid, V., Straube, E. R., Bischoff, N., & Mischo, J. (1999). Thinking styles, schizotypal traits and anomalous experiences. *Personality and Individual Differences, 27*, 855-859.

Yakhnich, L., & Ben-Zur, H. (2008). Personal resources, appraisal, and coping in the adaptation process of immigrants from the former Soviet Union. *American Journal of Orthopsychiatry, 78*, 152-162.

Zawadzki, B., Strelau, J., Szczepaniak, P., & Śliwińska, M. (1998). Inwentarz Osobowości NEO-FFI Costy i McCrae. Adaptacja polska. Podręcznik. [The NEO-FFI personality inventory by Costa and McCrae: Polish adaptation. A manual] Warsaw, Poland: Psychological Test Laboratory of the Polish Psychological Association.

Zenasni, F., Besancon, M., & Lubart, T. (2008). Creativity and tolerance of ambiguity: An empirical study. *Journal of Creativity Behavior, 42*, 61-73.

The preparation of the English version of *Roczniki Psychologiczne* (*Annals of Psychology*) and its publication in electronic databases was financed under contract no. 753/P–DUN/2017 from the resources of the Minister of Science and Higher Education for the popularization of science.