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THE POLISH ADAPTATION OF THE WATERLOO USES OF HUMOR INVENTORY (WUHI)

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Humor, as a multifaceted aspect of human experience, has long been recognized as an integral feature of healthy personality traits and a coping strategy. The Waterloo Uses of Humor Inventory (WUHI), proposed by Stacy Elizabeth Thomas, offers a comprehensive framework for assessing different styles of humor and their utilization in stress management. The presented study is an adaptation of the WUHI for use in the Polish cultural and linguistic context (N = 1,180), marking a novel contribution to the field. Psychometric analyses, including confirmatory factor analysis and measurement invariance testing, were conducted to validate the adapted measure. The results, supported by satisfactory psychometric indices, indicated robust fit of the adapted WUHI model to the Polish context. Conclusions drawn from the study underscore the utility of the adapted WUHI in assessing humor usage in coping with stress among Polish individuals, offering valuable insights for both research and clinical practice in psychology and related fields.

Keywords: humor; WUHI-Polish version; validation; gender and age measurement invariance

Humor, as a complex aspect of human experience, constitutes a fascinating subject of research. It is a universally highly valued trait. As it turns out, between 81% and 90% of respondents claim to have an above-average sense of

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humor, while only 2% indicate below-average levels (Allport, 1961; Cann & Calhoun, 2001; Lefcourt & Martin, 1986; Martin & Lefcourt, 1983). In common understanding, humor is seen as a positive feature that evokes many personal and interpersonal benefits. The findings suggest that people hold implicit theories about the connection between humor and personality, applying them consistently to both themselves and others (Beins & O'Toole, 2010). Individuals with a sense of humor are perceived as more pleasant and interesting but less likely to complain or be shallow (Cann & Calhoun, 2001). Additionally, humor is perceived as a highly effective strategy in mate attraction. Research results indicate that a sense of humor is a trait recognized as important across various types of relationships, rated significantly more important (necessary) in romantic relationships than in friendships (Antonovici, 2018). The connection between sense of humor and the quality of relationships has also been noted in educational settings. Solhi et al. (2023) observed that sense of humor positively moderates the relationship between perceived appropriate humor and the quality of the teacher–student relationship, which in turn positively impacts student engagement. Another study found that a positive atmosphere in the classroom enhances students' feelings towards both lessons and the school (Yalçıntaş & Kartal, 2023).

Positive psychology regards humor as both a personal quality and a successful coping mechanism that fosters a more optimistic outlook on life, enhances resilience, and contributes to well-being (Amjad & Dasti, 2022; Kuiper, 2012; Oliveira et al., 2023). According to the Values in Action (VIA) Classification of Strengths and Virtues (Peterson & Seligman, 2004), humor (under the category of pleasantness) is classified among the 24 character strengths outlined in the cornerstone of positive psychology, the "handbook of mental health". It is assumed a priori that along with spirituality, hope, gratitude, and appreciation of beauty, humor influences the development of the virtue of transcendence. In subsequent studies (McGrath, 2015), which identified a three-virtue model, humor was included either in the factor of Inquisitiveness (alongside creativity and curiosity) or in Caring (alongside hope and love). The association of humor with both "heart strengths" and "head strengths" (Park & Peterson, 2009; Peterson & Park, 2009) points to the complexity of this disposition and its multifaceted role. This complexity is reflected in various research directions.

Humor as a Coping Mechanism

Research highlights the effectiveness of humor-based interventions in enhancing emotional well-being, life satisfaction, psychological health, subjective health, positive mood, optimism, as well as lessening depression, stress, and suicidal tendencies (e.g., Crawford & Caltabiano, 2011; Falkenberg et al., 2011; McGhee, 2010; Papousek & Schulter, 2008; Ruch, Heintz et al., 2018; Ruch, Wagner et al., 2018; Tagalidou et al., 2018). It is a strategy aimed at reducing or managing emotional stress (Simione & Gnagnarella, 2023) and is most often used when people feel that nothing can be done to change the source of their stress. Thus, it can be expected that humor will be most frequently and effectively utilized in response to situations perceived as demanding endurance because they are chronic and beyond control, or because they have already occurred and cannot be changed. However, the role of sense of humor in these processes remains uncertain. For instance, Gander et al. (2013) implemented a "three funny things" intervention (writing down three funny events each day) and found it effective in increasing happiness for up to 3 months and reducing depressive symptoms for up to 6 months, compared to a placebo control condition. Similar effects were observed in a study using humorous movies as a nursing intervention (Sousa et al., 2019); however, such outcomes were found not to be universal. For example, Wellenzohn et al. (2016a, 2016b) observed that while the "three funny things" intervention led to an increase in well-being, it did not result in a reduction of depressive symptoms. Similarly, Wellenzohn et al. (2018) noted that sense of humor, when conceptualized as a set of learned skills aimed at enhancing coping and well-being (McGhee, 2010), did not moderate the effectiveness of five humor-based interventions. However, they did find that the increase in the sense of humor during and after the interventions was associated with their effectiveness, suggesting that developing a sense of humor requires systematic training. Ruch, Wagner et al. (2018) found that unsystematic exposure to humor may induce humor-related mood in the short term but does not foster a long-term sense of humor. The 7-Humor Habits Program (7HHP; Ruch, Hofmann et al., 2018) appears to be an effective intervention for promoting positive changes in one's mood . It includes habits such as surrounding oneself with humor, cultivating a playful attitude, laughing more often, creating verbal humor, finding humor in daily life, laughing at oneself, and finding humor in stressful situations.

Humor can also be used as a problem-solving mechanism (Zhou et al., 2021). Unlike humor used to cope with reactions to stressors, humor employed to take control of external situations is much riskier, requiring the ability to handle humor consciously and skillfully (Booth-Butterfield & Wanzer, 2017; Williams, 2000). The success of this strategy also depends on the receptivity of the recipient, which, in turn, is influenced by various factors such as the speaker's status, their relationship with the recipients, and the recipients' ability to appreciate humor in a given situation (Romero & Cruthirds, 2006). Delivering a joke during a stressful event may also be inconsistent with the ability to focus on aspects of the situation that require attention (Veatch, 1998). Therefore, in addition to the possibility of inappropriate reception, using humor to take control of a stressful interaction may be less effective than coping with own emotions, due to greater demand on personal resources (Cheng et al., 2021; Nezlek & Derks, 2001).

Measuring Humor in Psychological Research

Traditional humor measures often focus on humor styles, personality correlates, or humor appreciation, but relatively few instruments examine the ways humor is used in coping with stress and regulating emotions. In this context, the Waterloo Uses of Humor Inventory (WUHI) proposed by Thomas (2000), provides an interesting alternative. The WUHI focuses on a detailed assessment of different types of humor and the situations in which they are applied. It may lead to a better understanding of individual differences in the use of humor in coping with stress (Doosje et al., 2012; Thomas, 2000). The WUHI posits that humor can serve as a stress moderator in two ways: as a personality trait acting as a "buffer" against stress, and as a coping strategy in which humor is consciously and intentionally used to reduce the negative effects of stress (Doosje et al., 2010; Thomas, 2000). In order to comprehensively define coping with humor, the WUHI takes into account its various functions, different forms and contexts of humor expression, and different emotions associated with it (Thomas, 2000).

Many aspects that influence how people use humor to cope with stress were taken into account in creating the WUHI (Thomas, 2000). Humor can serve various purposes in the coping process, e.g., distancing from stressful situations (Borgella et al., 2020; Deckman & Skolnick, 2023; Steir-Livny, 2024), maintaining or repairing status or self-esteem (Nezlek & Derks, 2001), avoid-

ing thoughts or situations causing anxiety (Borgella et al., 2020; Dionigi et al., 2021), and gaining social support and promoting affiliation (Salavera et al., 2020). Humor can be expressed in both public and private settings (Holmes & Marra, 2002; Rosenberg et al., 2024), so both public displays of humor and more private ones, such as internal reflections and quiet chuckles, were included. The timing of using humor in the coping process can affect its effectiveness (Cann et al., 2000), so humor used during stressful situations and after their resolution was considered. Both men and women can engage in different forms of humor as a way of coping with stress (Hofmann et al., 2023; Salavera et al., 2020; Tsai et al., 2023), so different ways of expressing humor, such as joking, laughter, or telling humorous stories, was analyzed. Emotions elicited by a stressful situation can affect the type of humor (Chan, 2014; Mahajan & Zaveri, 2020), so anger, embarrassment, fear, or general stress, were analyzed. By incorporating these various aspects, the WUHI seeks to provide a comprehensive understanding of ways in which people use humor to cope with stress, taking into account individual differences and situational context.

Research conducted during the development of the WUHI confirmed the factor structure and reliability of WUHI scores for both men and women (Thomas, 2000). The results of the analyses indicate that the WUHI items are well-represented by a three-factor model consisting of perspective-taking humor, aggressive humor, and avoidant humor. Perspective-taking humor consists of nine items and reflects the ability to adopt a humorous perspective to stressful events and personal shortcomings (e.g., "I share stories about my more embarrassing moments to make people laugh"). This style allows individuals to reframe negative experiences in a lighthearted manner, reducing emotional distress and promoting resilience. Often used in social settings, perspective-taking humor helps people share humorous stories about past challenges, fostering a sense of support and connection with others (Hampes, 2016; Nazir & Rafique, 2019). The second style—aggressive humor—is represented by six items and characterized by the use of sarcasm, teasing, or ridiculing others as a reaction to stress or frustration ("I privately make fun of people when they bother me"). This form of humor can serve as a coping strategy by allowing individuals to reassert control or dominance in difficult situations. However, while it may provide short-term relief, excessive use of aggressive humor can strain relationships and lead to interpersonal conflicts (Huang et al., 2023; Zhu et al., 2022). Lastly, avoidant humor, measured by six items, functions as a means of distraction, helping individuals deflect attention from stressful situations ("I change my moods at times of crisis by

imagining funny things"). Those who engage in avoidant humor often make jokes or engage in playful banter to lighten the mood, allowing them to momentarily escape their worries. While this can serve as a temporary relief from distress, overreliance on avoidant humor may prevent individuals from directly addressing and resolving the underlying causes of stress (Bippus et al., 2012; Dozois et al., 2009; Nazir & Rafique, 2019). The results of confirmatory factor analyses conducted on a different sample indicated that the three-factor model was replicable and that there were no significant differences in model fit between men and women. The unit-weighted scores for each of the three factors also proved to be equally reliable for both genders.

The WUHI applied in various cultural and occupational contexts has proven its adaptability to measure humor-based coping (Samson & Gross, 2014). One notable application of the WUHI is in occupational humorous coping, where humor is recognized as a key mechanism for managing workplace stress. This led to the development of the Questionnaire of Occupational Humorous Coping (QOHC), which borrowed from the WUHI to assess different humor styles, including perspective-taking, avoidant, and aggressive humor. Findings indicated that perspective-taking humor facilitates cognitive reframing of stressors, while avoidant humor functions as a short-term emotion regulation strategy (Doosje et al., 2010). The WUHI has also been utilized in the Italian validation of the Coping Humor Scale (CHS; Burro et al., 2022), supporting the development of a psychometrically robust instrument for assessing humor coping strategies among healthcare professionals. The study highlighted humor's role in mitigating stress and promoting well-being, particularly in high-pressure occupational settings. The WUHI also contributed to the development of a scale adapted for the cultural context of Japan. This adaptation confirmed the validity of perspective-taking, aggressive, and avoidant humor in a non-Western setting, reinforcing universal yet culturally modulated role of humor in coping (Koshii & Oikawa, 2024).

Despite its widespread application in various research contexts, to the best of our knowledge, WUHI has not yet been adapted and validated for use in any specific country. While previous studies have utilized the WUHI as a reference point for developing related instruments or measuring humor-based coping strategies in occupational and cultural settings, these efforts have primarily focused on applying the scale rather than formally validating it within a new linguistic or cultural context. A systematic adaptation process, including rigorous psychometric validation, is necessary to ensure its cross-cultural validity and reliability.

The Present Study

The aim of this research is to adapt the Waterloo Uses of Humor Inventory (WUHI) for use in the Polish cultural and linguistic context. Humor plays a role in the reinterpretation of situations and reduction of stress and unpleasant feelings (Tomczuk-Wasilewska, 2009). In the context of Lazarus and Folkman's cognitive stress theory, humor acts as a coping strategy to alleviate tension through cognitive appraisal (Kuiper et al., 1993; Lazarus & Folkman, 1984). Using humor can help perceive stressful conditions as less threatening (Cann & Collette, 2014), replacing negative feelings with positive ones, thus enhancing coping abilities (Olah & Ford, 2021; Wilkins & Eisenbraun, 2009). However, humor extends beyond mere distraction, as it plays a crucial role in adaptive problem-solving and finding benefits in situations (Perchtold et al., 2019). The adaptation of the WUHI to Polish culture aims at supporting humor-based interventions for stress management in Poland.

Our approach to adapting the WUHI scale followed a structured validation process, ensuring its psychometric robustness for application. The adaptation procedure consisted of several key steps, each linked to a specific hypothesis (H1–H5), designed to assess reliability, validity, and measurement invariance.

H1: Reliability

Before assessing the validity of the WUHI, it was essential to assess the reliability of the scale. Reliability ensures that the construct is measured consistently across test items and respondents. It is proposed that the WUHI scales, constructed from the test items maintain an acceptable level of internal consistency and reliability, indicating that responses remain stable and replicable (H1).

H2: Theoretical Validity and Model Fit

Once reliability is confirmed, the next step was to evaluate whether the scale structure aligned with the theoretical model. Goodness-of-fit criteria were applied to test whether the proposed factor structure of the WUHI fit the data. This step ensured that the scale was theoretically sound and appropriately captured the intended psychological construct (H2).

H3: Measurement Invariance (Gender and Age)

Testing measurement invariance was a crucial step in ensuring that the WUHI could be meaningfully used across different respondent groups. We propose that the scale demonstrates measurement invariance across both gender and age (H3). Confirming age invariance is particularly important because it ensures that the scale measures the same construct consistently across different life stages. Without confirming invariance, potential differences found between younger and older respondents could result from variations in item interpretation rather than actual differences in the underlying construct (Tsai et al., 2021).

H4: Convergent Validity

To further support the validity of WUHI, its correlation with other scales measuring similar constructs was tested. We hypothesize that the WUHI exhibits convergent validity with the Humor Styles Questionnaire scales, which measure related psychological traits (Páez et al., 2013).

H5: Discriminant Validity

Finally, we aimed to test the correlation of the WUHI with theoretically unrelated scales to confirm its distinctiveness from unrelated constructs. We propose that the WUHI is characterized by high discriminant validity by showing low correlation coefficients with Centrality of Religiosity Scale (C-15), indicating that it measures a unique construct. The current state of research suggests that religiosity is not inherently linked to high or low levels of humor, but rather to differences in how humor is expressed (Saroglou, 2002, 2004; Saroglou & Jaspard, 2001). There is no strong positive or negative correlation between religiosity and overall sense of humor, only variation in preferred humor styles.

METHOD

Participants

The sample consisted of adult Poles with 53.8% females ($n = 631$) and 46.2% males ($n = 549$). The average age of the participants was 32.96 years,

with a standard deviation of 12.89. Regarding education, 41.9% had higher education, 43.6% had secondary education, 10.4% had vocational education, 2.5% had primary education, and 1.6% had completed junior high school. Concerning marital status, the majority of participants (57.5%) were single, 30.8% were married, 7.0% were divorced, and 4.7% were widowed. In terms of employment status, 53.0% of participants were employed (n = 625), while 47.0% were unemployed (n = 555). The majority of unemployed individuals in emerging adulthood (n = 377) were still studying.

The sample size was determined based on a commonly used rule-of-thumb approach, which, although practical, does not ensure optimal statistical power. Therefore, to justify the adequacy of the sample size for confirmatory factor analysis (CFA), a sensitivity analysis was performed using RMSEA (Root Mean Square Error of Approximation) as the effect size index. The analysis examined the smallest RMSEA values that could be reliably detected with 80% statistical power (α = .05) for a CFA model with 186 degrees of freedom. Results indicated that with a sample size of N = 300, the minimum detectable RMSEA was approximately .032, 95% CI [.030, .032], which decreased to .025, 95% CI [.024, .025] at N = 500 and further to .016, 95% CI [.016, .017] at N = 1200. This demonstrates that even small deviations from perfect model fit (i.e., RMSEA < .03) can be effectively detected with sample sizes of at least N = 400.

In the present study, the total sample size was N = 1,180, which exceeds the threshold required to detect very small model misfit with sufficient power. Subgroup sizes included 631 women, 549 men, 564 individuals in emerging adulthood, 236 in early adulthood, 348 in middle adulthood, and 36 in late adulthood. With the exception of the smallest group (late adulthood), all subgroups were large enough to allow for reliable model testing. These results support the adequacy of the overall and subgroup sample sizes for robust structural equation modeling and CFA.

The Polish Translation

The translation process of the WUHI from English to Polish followed a rigorous procedure with the assistance of two professional linguists. Following the initial translation, the translated items were subjected to a back-translation process. This step was conducted by an independent bilingual linguist who had no involvement in the original translation. The back-translated ver-

sion was then compared with the original English text to identify any discrepancies or ambiguities. Any inconsistencies were discussed and resolved to ensure clarity and coherence. This meticulous process aimed to maintain the fidelity of the original items while ensuring their comprehensibility in the target language. The goal of the translation of the WUHI from English to Polish was to maintain the original test items as consistent as possible.

Procedure

The research was conducted between June 1 and June 30, 2024, to collect empirical data necessary to answer the research questions and test the hypotheses. A minimum sample size of 10 participants per item was ensured (Kyriazos, 2018). Additionally, considering the invariance measurement testing, three between-subject groups were included. As a result, approximately 210 participants per age group were gathered to properly test the model. The study was carried out using a survey created on the Google Forms platform to reach a broad cross-section of participants. Respondents completed the survey online by accessing a link posted on support groups. A detailed instruction preceding the questionnaire was included. Additionally, some participants were recruited using the snowball sampling method. While the study did not implement strict quotas for gender representation, the balanced distribution of male and female participants likely resulted from the varied channels of dissemination and self-selection process inherent in online research. Completing the survey took up to 30 minutes. Participants were informed about the anonymity and the scientific purpose of the study. At the beginning of the survey all participants received a detailed information sheet, outlining the purpose of the study, data confidentiality, and their rights as participants. Everyone was duly informed that their participation in the study was voluntary, and they retained the right to withdraw at any point. If the participant agreed to take part in the study, they proceeded to the section with the questionnaire.

The present study was a part of a broader project "Personal and Environmental Determinants of Quality of Life in Adults" that received approval from the Research Ethics Committee of the Institute of Psychology at the John Paul II Catholic University of Lublin (decision no. KEBN_32/2024). The research adhered to the ethical guidelines outlined by the World Medical Association (Declaration of Helsinki) for human research.

Measures

Waterloo Uses of Humor Inventory (WUHI)

The Waterloo Uses of Humor Inventory (WUHI), a 21-item scale created by Thomas (2000), consists of three subscales. They include perspective-taking humor (WUHI-P, 9 items), aggressive humor (WUHI-AG, 6 items), and avoidant humor (WUHI-AV, 6 items), each depicting a different style of humorous coping (the complete method is included in Appendix A). Perspective-taking humor aligns with cognitive reappraisal strategies, while avoidant humor parallels response-focused coping strategies. Aggressive humor, on the other hand, is associated with externalized coping mechanisms, where humor is used to express frustration, assert dominance, or manage interpersonal stress by ridiculing or teasing others. The response scales of all WUHI items range from 1 (*never*) to 5 (*always*).

Humor Styles Questionnaire (HSQ)

The Humor Styles Questionnaire (HSQ), developed by Rod A. Martin and his team (Martin et al., 2003) at the University of Western Ontario, is a psychometric tool designed to measure four distinct styles of humor. These include affiliative humor, which is used to enhance interpersonal relationships and reduce tension among groups; self-enhancing humor, which refers to the ability to maintain a humorous outlook on life, particularly useful in coping with stress or adversity; aggressive humor, characterized by sarcasm, ridicule, or teasing that often enhances the self at the expense of others; and self-defeating humor, which involves making oneself the target of jokes to gain approval from others, often sacrificing personal dignity in the process.

The HSQ was validated through extensive studies that confirmed its links to various psychological outcomes such as mood, well-being, and social support. Its development was based on a strong conceptual framework which differentiates between humor that is beneficial and humor that is detrimental to psychological health. This instrument is especially valuable in research exploring the role of humor in psychological well-being and assessing how different styles of humor contribute to or detract from an one's mental health. The HSQ's focus on adaptive and maladaptive functions of humor makes it a crucial tool in clinical settings and positive psychology research. In this study, we used the method adapted by Hornowska and Charytonik (2011). We ob-

tained the following Cronbach's alpha values: α = .80 for affiliative humor; α = .81 for self-enhancing humor; α = .84 for aggressive humor; and α = .78 for self-defeating humor. The response options for all HSQ items ranged between 1 and 7.

Centrality of Religiosity Scale (CRS)

The Centrality of Religiosity Scale (CRS), devised by Stefan Huber (Huber & Huber, 2012), serves as a sophisticated psychometric tool to evaluate the significance and influence of religious beliefs and practices in an individual's life. It effectively measures how central religion is to a person's identity and daily functioning. The scale examines five critical dimensions of religiosity: public practice (such as attending services), private practice (like personal prayer or meditation), religious experience (personal encounters or feelings perceived as spiritual), religious ideology (specific beliefs or doctrines), and intellectual engagement with religious content (exploring and questioning religious issues). These dimensions collectively provide a comprehensive view of one's religious life. Psychometrically, the CRS is built to capture the breadth and depth of religious expression across various contexts and cultures, making it suitable for international studies. It calculates the intensity of each dimension to produce an overall score that reflects the centrality of religiosity in one's personality. This score is pivotal for understanding how deeply embedded religious values and behaviors are. It can be used for comparative studies among different religious groups. The scale's robust application in over 100 studies worldwide highlights its utility and relevance in both academic research and practical assessments of religiosity, supporting its reliability and validity as a measure of religious centrality. In this study, we used the method adapted by Zarzycka (2007). For 13 items the values of the CRS range between 1 and 5, while items 14–15 were converted to a 1–5 scale in accordance with the original methodology. In the present study, the scale demonstrated excellent internal consistency, with a Cronbach's alpha of α = .961 for the overall score. The reliability of the individual subscales was also high, with intellectual engagement with religious content α = .88, religious ideology α = .92, private practice α = .87, religious experience α = .92, and public practice α = .87. These results indicate strong internal consistency across all dimensions of religiosity.

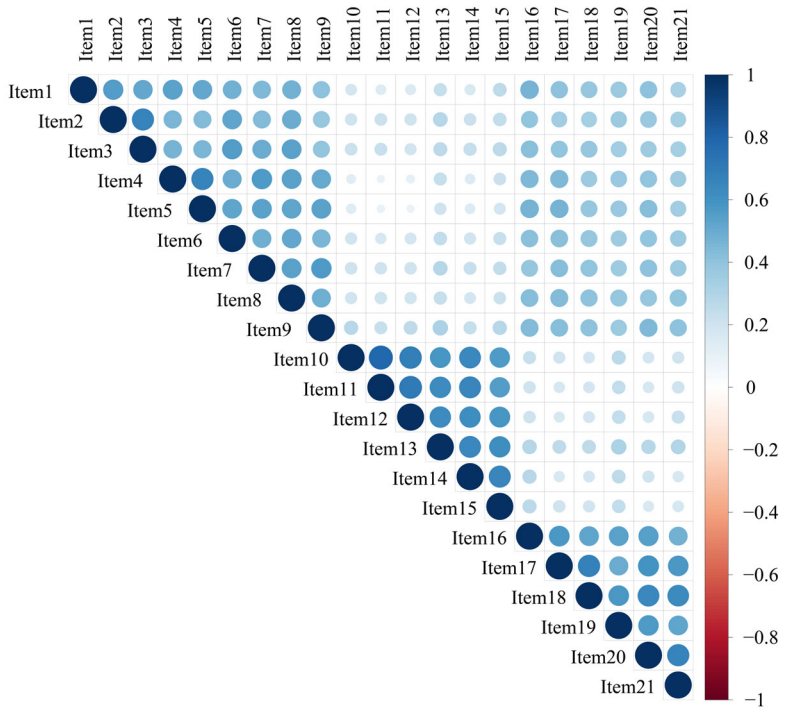
RESULTS

We conducted a series of psychometric analyses to assess the structure of the measure, including inter-item correlation analysis (using Pearson's *r*), reliability analysis (employing Cronbach's alpha and McDonald's omega), confirmatory factor analysis (CFA), and subsequent measurement invariance (MI) and validity analyses.

All statistical analyses were carried out with the R program (R Core Team, 2020) and RStudio (RStudio Team, 2015), with the main packages utilized listed alphabetically: corrplot (Wei & Simko, 2024), dplyr (Wickham et al., 2023), haven (Wickham et al., 2023), Hmisc (Harrell & Dupont, 2024), lavaan (Rosseel, 2012), mvnTest (Pya Arnqvist et al., 2016), PerformanceAnalytics (Peterson et al., 2020), psych (Revelle, 2024), RColorBrewer (Neuwirth, 2022), and semTools (Jorgensen et al., 2022). In the first step, we computed the correlation coefficients between the WUHI items (Figure 1).

Figure 1

Correlation Matrix for WUHI Items (N = 1,180)



The first step of the correlation analysis showed moderate levels of correlation between most coefficients. The items that deviated the most in terms of their correlations with the remaining ones were 10, 11, 12, 14, and 15.

In the second step, we tested the reliability of the WUHI subscales. The indices used were Cronbach's alpha (Cronbach, 1951) and McDonald's omega total coefficient (McDonald, 1999) (see Table 1).

Table 1

The Reliability Indices of the WUHI Subscales (N = 1,180)

Subscale	Cronbach's α	McDonald's ω
Perspective-taking humor	.90	.90
Aggressive humor	.91	.91
Avoidant humor	.89	.89

The goodness-of-fit criteria assumed in the reliability analysis were Cronbach's alpha > .80 (Nunnally & Bernstein, 1994) and McDonald's omega > .70 (McDonald, 1999). The reliability indices for all scales were found to be acceptable.

The subsequent stage of the analysis assessed the model fit of the WUHI. Various goodness-of-fit criteria were employed, including the significance of the chi-square test with the χ^2/df ratio, the root mean square error of approximation (RMSEA), the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the standardized root mean square residual (SRMR) (Table 2).

Table 2

Psychometric Indices of Three-Factor Classic WUHI Model (N = 1,180)

	χ^2	*df*	χ^2/df	*p*	RMSEA [LO90, UP90]	CFI	TLI	SRMR
Model CS	828.92	186	4.46	<.001	.066 [.061, .071]	.934	.925	.047

Note. Estimator: MLR.

Acceptable model fit was determined based on specific thresholds: $\chi^2/df <$ 3 (Kline, 2023), CFI and TLI values equal to or exceeding .90 (Browne & Cudeck, 1992; Hu & Bentler, 1999), and RMSEA and SRMR values below .08 (Hu & Bentler, 1999; Kline, 2023). Alternatively, indicators of good fit were to encompass a χ^2/df ratio lower than 2 (Kline, 2023), and CFI equal to or

greater than .95 (Hu & Bentler, 1999; Rutkowski & Svetina, 2014), as well as RMSEA and SRMR below .05.

Normality tests involved the Mardia's multivariate skewness and kurtosis tests (Mardia, 1970), the Henze–Zirkler Test (Henze & Zirkler, 1990), and the Doornik–Hansen Test (Doornik & Hansen, 2008). Following the outcomes of those tests, due to the absence of multivariate normality, as recommended by Muthen and Muthen (2012), parameter estimation was conducted using the maximum likelihood with robust standard errors method (MLR). It is a rescaling-based estimation technique suitable for non-normally distributed data, which furnishes standard errors and a chi-square test, distinguishing it from similar methods (Wang & Wang, 2020).

Based on the criteria for assessing model fit, the results obtained for model CS indicate generally acceptable fit to the data. The analysis demonstrated robust statistical power exceeding .90. The chi-square test yielded a significant result, suggesting a discrepancy between the observed data and the theoretical model. However, the ratio of chi-square to degrees of freedom (χ^2/df) was slightly above the recommended threshold of 3, indicating some model misfit. The RMSEA value with 90% confidence interval fell below the cutoff of .08071. Additionally, both CFI and TLI exceeded the threshold of .90, indicating good model fit. SRMR also fell below the .08 cutoff, indicating acceptable fit. Overall, while model CS demonstrated acceptable fit to the data according to most criteria, there was some evidence of misfit, suggesting a potential for further refinement of the model.

For the factor representing perspective-taking humor as a coping strategy, items 1 to 9 exhibited moderate to strong loadings, ranging from .67 to .75, suggesting that the items measure this aspect of humor effectively (see Table 3). Similarly, for the factor of aggressive humorous coping, items 10 to 15 demonstrated very strong loadings, ranging from .72 to .86, indicating a robust association between these items and the underlying construct. Lastly, for the factor of avoidant humorous coping, items 16 to 21 displayed moderate to strong loadings, ranging from .70 to .81, suggesting that these items also contribute significantly to assessing this dimension of humor. Overall, the findings provided support for the factorial validity of the WUHI model (Figure 2), indicating that the items effectively measure their intended constructs.

Table 3

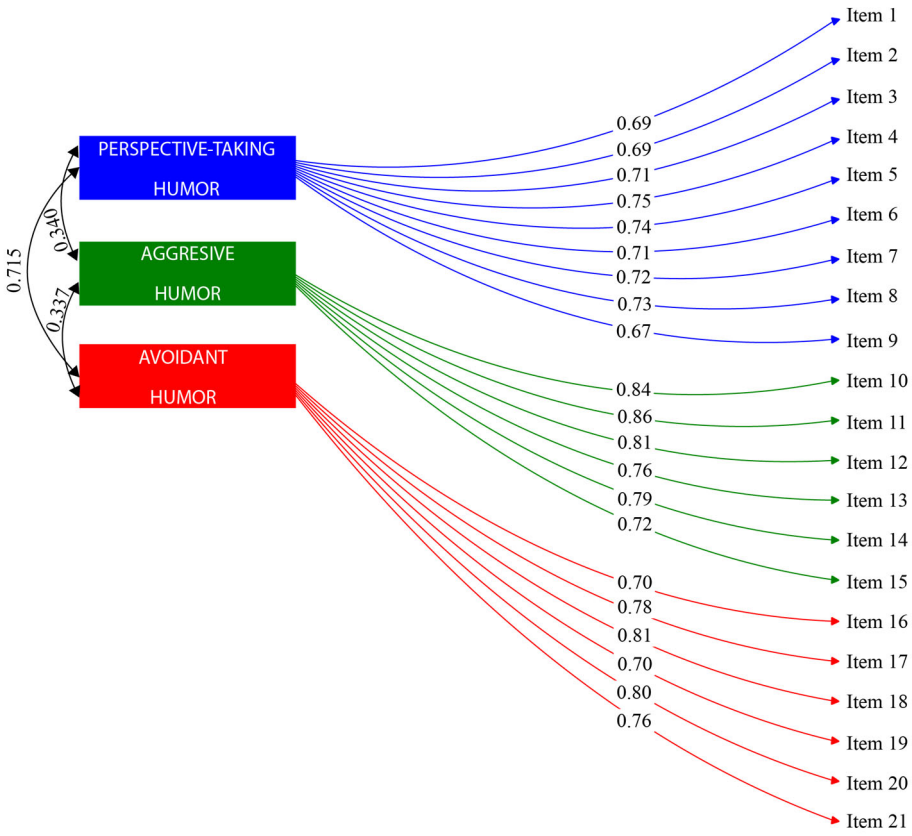
Standardized Factor Loadings for the WUHI Model (N = 1,180)

CRS Items	Specific Factors	
	Loading	SE
	perspective-taking humor	
Item 1	.69	.04
Item 2	.69	.04
Item 3	.71	.04
Item 4	.75	.04
Item 5	.74	.04
Item 6	.71	.04
Item 7	.72	.05
Item 8	.73	.04
Item 9	.67	.05
	aggressive humor	
Item 10	.84	.02
Item 11	.86	.02
Item 12	.81	.02
Item 13	.76	.03
Item 14	.79	.03
Item 15	.72	.03
	avoidant humor	
Item 16	.70	.03
Item 17	.78	.04
Item 18	.81	.04
Item 19	.70	.04
Item 20	.80	.04
Item 21	.76	.04

Having confirmed the factorial validity of the WUHI model, we proceeded to examine its measurement invariance across gender and age. This step ensured that the scale functioned consistently across different demographic categories, allowing for meaningful comparisons between groups.

Figure 2

Three-Factor Model for WUHI



In examining gender measurement invariance, we partitioned our sample into groups of males and females, while for age invariance we categorized participants into groups of emerging (Arnett, 2024; Siembida et al., 2023), early (Oh et al., 2020; Siembida et al., 2023; Straiton et al., 2024), and middle adulthood (Oh et al., 2020). The analyses for gender and age invariance were conducted independently. To evaluate the fit of the configural, metric, scalar, and strict models, we utilized the chi-squared test along with fit indices, including CFI, TLI, RMSEA, and SRMR. However, due to the chi-squared statistic's susceptibility to minor deviations from the model, we relied more on fit indices for assessing model fit. In the subsequent stages of the measurement invariance analyses, we considered acceptable model fit to be indicated by CFI and TLI values ≥ .90, and RMSEA and SRMR values < .08.

When examining metric invariance followed by scalar and strict invariances, we employed ΔCFI, ΔRMSEA, and ΔSRMR cutoff criteria. Given the unequal group sizes, we adopted Chen's (2007) criteria for unequal group ratios: ΔCFI ≤ .005, ΔRMSEA ≤ .01, and ΔSRMR ≤ .025 for metric invariance, and ΔCFI ≤ .005, ΔRMSEA ≤ .01, and ΔSRMR ≤ .005 for scalar and strict invariances. We proceeded under the premise that meeting at least two out of three criteria (ΔCFI, ΔRMSEA, ΔSRMR) was essential for establishing measurement invariance at each stage of the analysis.

To evaluate model fit in the gender measurement invariance analysis, we conducted the CFA separately for men and women. Subsequently, from the configural invariance point onward, a standard invariance measurement analysis was conducted for the entire sample (Brown, 2015; Browne & Cudeck, 1992; Chen, 2007; Cheung & Rensvold, 2002; Hu & Bentler, 1999; Kline, 2023; Putnick & Bornstein, 2016; Rutkowski & Svetina, 2014).

The WUHI model demonstrated satisfactory fit in both groups of males and females, with CFI and TLI values equal to or exceeding .90, and RMSEA and SRMR values equal to or below .08 (Table 4). All analyses demonstrated robust statistical power exceeding .90. Following the examination of gender measurement invariance, the configural, metric, scalar, and strict models also met the criteria of acceptable fit. Evaluation of the cutoff criteria, including ΔCFI, ΔRMSEA, and ΔSRMR, at each stage of the invariance analysis confirmed strict gender measurement invariance.

Subsequently, we conducted measurement invariance analyses across emerging, early and middle adulthood. This step was crucial in assessing whether the underlying structure and interpretation of the measures remained consistent or varied significantly across distinct stages of adult lifespan (Table 5).

The WUHI model showed adequate fit across emerging, early, and middle adulthood, indicated by CFI and TLI values of .90 or higher, and RMSEA and SRMR values of .08 or lower. All analyses demonstrated robust statistical power exceeding .90. The configural, metric, scalar, and strict models met the criteria for satisfactory fit. The cutoff criteria, ΔCFI, ΔRMSEA, and ΔSRMR confirmed strict measurement invariance for age. The last stage of the analysis was devoted to convergent and discriminant construct validity. We used the HSQ subscales to test convergent validity, and the C-15 subscales to test discriminant validity (Table 6).

Table 4

Psychometric Indicators for Gender Measurement Invariance Analysis (N = 1,180)

Model	χ^2	*df*	χ^2/df	*p*	RMSEA	CFI	TLI	SRMR	Model comparison	$\Delta\chi^2$	Δ *df*	Pr (>χ^2)	ΔRMSEA	ΔCFI	ΔTLI	ΔSRMR	Decision
Female	602.87	186	3.24	<.001	.071	.930	.920	.053									
Male	422.00	186	2.27	<.001	.058	.940	.933	.045									
(1) Configural	1023.58	372	2.75	<.001	.066	.934	.925	.049									
(2) Metric	1063.02	390	2.73	<.001	.064	.933	.928	.052	(1)–(2)	39.44	18	.038	–.001	–.001	.003	.003	accept
(3) Scalar	1122.39	408	2.75	<.001	.064	.930	.928	.054	(2)–(3)	59.37	18	<.001	0	–.003	0	.002	accept
(4) Strict	1182.61	429	2.76	<.001	.065	.926	.927	.054	(3)–(4)	60.22	21	<.001	0	–.004	–.001	0	accept

Note. Estimator: MLR. $\Delta\chi^2$, Δdf, Pr (>χ^2), ΔRMSEA, ΔCFI, ΔTLI, and ΔSRMR denote the change in χ^2, degrees of freedom, significance of these changes, changes in RMSEA, CFI, TLI, and SRMR respectively.

Table 5

Age Measurement Invariance for WUHI (n = 1,148)

Model	χ^2	*df*	χ^2/df	*p*	RMSEA	CFI	TLI	SRMR	Model comparison	$\Delta\chi^2$	Δ *df*	Pr ($>\chi^2$)	ΔRMSEA	ΔCFI	ΔTLI	ΔSRMR	Decision
Emerging adulthood	609.71	186	3.28	<.001	.074	.913	.902	.059									
Early adulthood	374.32	186	2.01	<.001	.076	.912	.901	.058									
Middle adulthood	323.41	186	1.74	<.001	.058	.951	.944	.046									
(1) Configural	1290.34	558	2.31	<.001	.070	.924	.915	.055									
(2) Metric	1356.45	594	2.28	<.001	.069	.924	.919	.057	(1)–(2)	66.12	36	.051	–.002	–.001	.004	.002	Accept
(3) Scalar	1473.21	630	2.34	<.001	.069	.917	.917	.059	(2)–(3)	116.76	36	<.001	.001	–.007	–.002	.002	Accept
(4) Strict	1567.78	672	2.33	<.001	.070	.911	.916	.060	(3)–(4)	94.57	42	<.001	0	–.006	0	.001	Accept

Note. Estimator: MLR.

Table 6

Correlation Matrix for Convergent (HSQ) and Discriminant (C-15) Validity of WUHI (N = 1,180)

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
WUHI_Perspective-taking	–												
WUHI_Aggressive	.33***	–											
WUHI_Avoidant	.65***	.32***	–										
HSQ_Affiliative	.47***	.04	.38***	–									
HSQ_Self-enhancing	.48***	.08**	.60***	.40***	–								
HSQ_Aggressive	.08**	.67***	.09**	–.03	–.01	–							
HSQ_Self-defeating	.32***	.17***	.37***	.01	.37***	.11***	–						
C15_Centrality	–.03	–.23***	.03	–.06*	.12***	–.27***	.13***	–					
C15_ Interest	.02	–.16***	.06	–.07*	.17***	–.18***	.20***	.82***	–				
C15_Beliefs	–.01	–.26***	.03	–.003	.11***	–.30***	.10***	.90***	.66***	–			
C15_Practices	–.04	–.24***	.01	–.01	.08**	–.28***	.06*	.94***	.68***	.83***	–		
C15_Experience	–.03	–.15***	.06*	–.11***	.12***	–.20***	.17***	.89***	.71***	.78***	.79***	–	
C15_Participation	–.05*	–.21***	.01	–.07*	.08**	–.26***	.08**	.92***	.71***	.76***	.87***	.76***	–

Note. WUHI_Perspective-taking = perspective-taking humor; WUHI_Aggressive = aggressive humor; WUHI_Avoidant = avoidant humor; HSQ_Affiliative = affiliative humor; HSQ_Self-enhancing = self-enhancing humor; HSQ_Aggressive = aggressive humor; HSQ_SD = self-defeating humor; C15_Centrality = centrality of religiosity; C15_Interest = religious interest; C15_Beliefs = religious beliefs; C15_Practices = religious practices; C15_Experience = religious experience; C15_Participation = participation in religious services.

***$p < .001$, **$p < .01$, *$p < .05$.

The results indicated that the perspective-taking humor subscale of the WUHI was significantly correlated with the affiliative humor, self-enhancing humor, and self-defeating humor dimensions of the HSQ, demonstrating robust convergent validity. The avoidant humor subscale showed significant correlations with the self-enhancing humor and self-defeating humor dimensions of the HSQ but did not correlate significantly with the affiliative humor dimension. The aggressive humor subscale showed a strong correlation with the aggressive humor dimension of the HSQ, supporting its convergent validity, but lacked significant associations with affiliative or self-enhancing humor.

For discriminant validity, the perspective-taking humor and avoidant humor subscales showed negligible or insignificant correlations with all dimensions of the CRS, including religious beliefs, practices, experiences, and participation in religious services. In contrast, the aggressive humor subscale showed a significant negative correlation with several dimensions of the CRS, such as religious beliefs, practices, and participation in religious services.

DISCUSSION

Humor, recognized as a vital aspect of a healthy personality, serves as a coping strategy in dealing with various stressors (Deshpande, 2012; Pérez-Aranda et al., 2019; Semmer, 2006). Some theories suggest that aggressive humor helps restore mastery and self-esteem in response to external threats, but it can increase anger and hostility in uncontrollable situations (Crawford & Gressley, 1991; Lefcourt & Martin, 1986; Levine et al., 1976). More recent theoretical perspectives, such as the Benign Violation Theory, propose that humor emerges when an event violates norms in a way that is perceived as non-threatening, offering an alternative framework for understanding humor's psychological effects (McGraw & Warren, 2010). Humor can also help to distract from stressors, though it may inadvertently strengthen anxiety-provoking thoughts (Dionigi et al., 2021; Wegner, 1994). Additionally, humor promotes social support and cohesion when stress is experienced, enhancing interpersonal connectedness (Lefcourt, 2001; Ward et al., 2024). Thomas (2000) contributed to this discourse by identifying three distinct forms of humor: perspective-taking humor, aggressive humor, and avoidant humor, each serving as a different coping strategy. Perspective-taking humor promotes cheerfulness and cognitive flexibility, aggressive humor is associated with wit and less friendliness, and avoidant humor helps to escape reality but is less effective for action-oriented stress responses. Our study aimed to confirm the existence

of these three humor functions by adapting and validating the Waterloo Uses of Humor Inventory (WUHI) for the Polish language and cultural context.

The adaptation of the WUHI involved rigorous psychometric analyses, including confirmatory factor analysis, measurement invariance testing for both gender and age, as well as the assessment of convergent and discriminant validity. The findings revealed robust fit of the adapted WUHI model to the Polish context, supported by strong factor loadings and satisfactory psychometric indices. The three humor coping styles—perspective-taking, aggressive, and avoidant—were well-represented by the WUHI items, indicating their effectiveness in assessing the use of humor in coping with stress.

The findings of this study provide strong support for the validity of the WUHI as a comprehensive tool for assessing humor-based coping strategies within the Polish cultural context. The significant correlations between the WUHI subscales and dimensions of the HSQ (Martin et al., 2003) underscored the inventory's convergent validity, confirming its alignment with the established measures of humor. For example, perspective-taking humor aligned well with adaptive styles such as affiliative and self-enhancing humor, emphasizing its role in fostering cognitive flexibility and social bonding (Páez et al., 2013). Similarly, avoidant humor's links with self-enhancing and self-defeating humor highlighted its function in emotion regulation through distraction. The strong correlation between aggressive humor and its counterpart in the HSQ further highlighted their conceptual overlap, demonstrating the coping mechanism of humor. Additionally, the results asserted the WUHI's discriminant validity, as evidenced by negligible or non-significant correlations between perspective-taking and avoidant humor subscales and the dimensions of religiosity, such as beliefs, practices, and participation in religious services (Huber & Huber, 2012). This indicated that these humor styles are distinct from religiosity-related constructs, confirming that the WUHI measures humor-based coping strategies without an overlap with unrelated psychological traits. However, negative correlations observed between aggressive humor and dimensions of religiosity suggest a notable exception. These findings pointed to a potential value-based conflict, where interpersonal tension and ridicule inherent in aggressive humor contrast with prosocial and community-oriented principles often associated with religiosity.

The integration of the HSQ and religiosity measures in the validation process underscores the nuanced understanding of humor provided by the WUHI. Like the HSQ, which categorizes humor styles by their impact on psychological well-being (Martin et al., 2003), the WUHI captures a broader application

of humor as a resilience-enhancing and stress-inducing mechanism (Cann & Collette, 2014; Doosje et al., 2010; Kuiper, 2012). Moreover, the negative relationship between aggressive humor and religiosity echoes previous findings stating that humor styles are shaped by cultural and interpersonal values (Attardo, 2014; Krauss, 2023).

Despite the strengths of the presented study, several limitations must be acknowledged. First, the sample, although diverse in gender and age, may not have fully represented the demographic diversity of the Polish population. For instance, recruitment through online channels may have excluded individuals with limited access to the internet, potentially introducing a sampling bias. Future studies should aim to include more representative samples to enhance generalizability, incorporating participants from diverse socioeconomic backgrounds (Heen et al., 2014). Second, the study relied on self-report measures, which are susceptible to response biases, such as social desirability or self-enhancement. These biases could have affected the accuracy of responses, particularly in items related to socially sensitive constructs like aggressive humor. Incorporating multi-method approaches, such as observational data or peer assessments, may address this limitation and provide a more nuanced understanding of humor styles (Podsakoff et al., 2003). Third, while the WUHI demonstrated strong psychometric properties in this study, the cross-sectional design limited the ability to draw causal inferences about the relationships between humor styles, religiosity, and coping mechanisms. Longitudinal studies would be valuable in examining how humor coping strategies evolve over time and their long-term effects on psychological well-being (Fox et al., 2016). Fourth, the cultural specificity of humor poses another limitation. Although this study adapted the WUHI to the Polish context, humor is deeply embedded in cultural norms and practices, which may influence how humor is used and interpreted (Martin & Ford, 2018). Cross-cultural validation of the WUHI in other linguistic and cultural contexts is necessary to confirm its broader applicability and identify potential cultural differences in humor coping strategies. Finally, the study did not explore the potential moderating effects of personality traits, such as openness to experience or extraversion, on the use of humor. Previous research suggests that personality traits significantly influence humor styles and coping mechanisms (Cann & Collette, 2014; Kuiper, 2012). Future studies should investigate these interactions to better understand individual differences in humor-based coping.

In conclusion, the adaptation and validation of the Waterloo Uses of Humor Inventory to the Polish language and cultural context provides a valuable in-

strument for researchers and practitioners to evaluate humor-based coping strategies in stress management. The findings contribute to a better understanding of the role of humor in coping with stress among Polish individuals, emphasizing the importance of considering cultural and individual differences in the use of humor. The adapted WUHI holds promise for advancing research and clinical practice in psychology and related fields, facilitating the development of tailored interventions to promote psychological well-being among Polish individuals.

CRediT Author Statement

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APPENDIX A

Inwentarz Zastosowań Humoru Waterloo (IZHW)

Humorystyczne radzenie sobie z uwzględnieniem perspektywy czasowej (HRSUPC)

1.	*Opowiadam zabawne historie o sytuacjach, które w przeszłości mnie denerwowały.*	**NIGDY** 1 2 3 4 5 **ZAWSZE**
2.	*Dzielę się historiami o moich raczej krępujących chwilach, aby rozśmieszyć ludzi.*	**NIGDY** 1 2 3 4 5 **ZAWSZE**
3.	*Czuję się lepiej, gdy ludzie śmieją się z opowieści o moich raczej krępujących doświadczeniach.*	**NIGDY** 1 2 3 4 5 **ZAWSZE**
4.	*Śmieję się do siebie z błędów z przeszłości, chociaż nie sądziłem/łam, że były zabawne wtedy, gdy się wydarzyły.*	**NIGDY** 1 2 3 4 5 **ZAWSZE**
5.	*Potrafię dostrzec humor w wydarzeniach, które kiedyś postrzegałem/łam jako dość przygnębiające.*	**NIGDY** 1 2 3 4 5 **ZAWSZE**
6.	*Czuję się lepiej, kiedy opowiadam historie o moich kłopotach z przeszłości.*	**NIGDY** 1 2 3 4 5 **ZAWSZE**
7.	*Śmieję się do siebie, kiedy myślę o krępujących rzeczach, które zrobiłem/łam w przeszłości.*	**NIGDY** 1 2 3 4 5 **ZAWSZE**
8.	*Kiedy inni śmieją się, reagując na historie, które opowiadam o moich żenujących doświadczeniach, zdaję sobie sprawę, jak głupio było denerwować się z ich powodu.*	**NIGDY** 1 2 3 4 5 **ZAWSZE**
9.	*Prywatnie śmieję się z siebie, kiedy popełniam błędy lub robię coś wstydliwego.*	**NIGDY** 1 2 3 4 5 **ZAWSZE**

Agresywne humorystyczne radzenie sobie (AHRS)

10. Prywatnie naśmiewam się z ludzi, kiedy odczuwam, że mnie źle traktują.	**NIGDY** 1 2 3 4 5 **ZAWSZE**
11. Prywatnie naśmiewam się z ludzi, kiedy odczuwam, że mi przeszkadzają.	**NIGDY** 1 2 3 4 5 **ZAWSZE**
12. Kiedy ktoś jest na mnie zły, nie śmieję się głośno, ale prywatnie naśmiewam się z jego/ jej zachowania.	**NIGDY** 1 2 3 4 5 **ZAWSZE**
13. Kiedy ktoś naśmiewa się z moich niedociągnięć, odpowiadam, robiąc sobie z tych osób żarty.	**NIGDY** 1 2 3 4 5 **ZAWSZE**
14. Wyśmiewam osoby, które mnie obrażają lub są dla mnie niemiłe w obecności innych.	**NIGDY** 1 2 3 4 5 **ZAWSZE**
15. *Naśmiewam się z irytujących ludzi w moim życiu, kiedy jestem z przyjaciółmi.*	**NIGDY** 1 2 3 4 5 **ZAWSZE**

Unikające humorystyczne radzenie sobie (UHRS)

16. Opowiadam dowcipy, żeby rozśmieszyć innych ludzi, kiedy czuję, że sytuacja jest zbyt napięta.	**NIGDY** 1 2 3 4 5 **ZAWSZE**
17. Próbuję myśleć o czymś zabawnym, żeby oderwać się od własnych lęków lub zmartwień.	**NIGDY** 1 2 3 4 5 **ZAWSZE**
18. W chwilach kryzysu staram się zmienić swój nastrój, wyobrażając sobie śmieszne rzeczy.	**NIGDY** 1 2 3 4 5 **ZAWSZE**
19. Radzę sobie z osobami, które są na mnie złe lub zdenerwowane, próbując je rozśmieszyć.	**NIGDY** 1 2 3 4 5 **ZAWSZE**
20. Próbuję znaleźć coś do śmiechu, kiedy czuję się zdenerwowany/a.	**NIGDY** 1 2 3 4 5 **ZAWSZE**
21. *Próbuję zmusić się do myślenia o zabawnych rzeczach, kiedy stwierdzam, że mój umysł jest wypełniony niepokojącymi myślami.*	**NIGDY** 1 2 3 4 5 **ZAWSZE**