



STUDY OF BASIC EMOTIONS IN THE GENERAL POPULATION USING THE LIKERT SCALE

Nicolae Dumitru Nicoara¹, Daniela Varga^{1*}, Florica Voita-Mekeres², Larisa-Bianca Galea-Holhos², Gineta Andreescu², Lavinia Costas²

1. *Doctoral School of Biomedical Sciences, Faculty of Medicine and Pharmacy, University of Oradea, 410087 Oradea, Romania.*
2. *Department of Morphological Discipline, Faculty of Medicine and Pharmacy, University of Oradea, 410087 Oradea, Romania.*

ARTICLE INFO

Received:

25 Apr 2023

Received in revised form:

14 Jul 2023

Accepted:

20 Jul 2023

Available online:

28 Aug 2023

Keywords: Basic emotions, Happiness, Anger, Likert scale

ABSTRACT

Emotions are an important part of the human psyche that directs social behavior. Because of the complexity and limited understanding of the nature of these psychological elements, their practical study is often difficult. The use of the Likert scale together with the recall of emotional experiences over some time is considered to be an effective method of studying emotions. We analyzed the normal distribution of the basic emotions in a general population group and found that anger and sadness have a statistically normal distribution. Studying a larger group might show a statistically normal distribution for the rest of the fundamental emotions. Cronbach's Alpha value is 0.880 which translates into a high reliability level. The Likert scale is a practical tool for studying basic emotions. By recalling and evaluating emotions on a scale, it is possible to evaluate emotional experiences in the studied group. Happiness and sadness have a statistically normal distribution in the studied group. The practical assessment of emotions can be used in statistical correlations to evaluate different behaviors.

This is an open-access article distributed under the terms of the [Creative Commons Attribution-Non Commercial-Share Alike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, and build upon the work non commercially.

To Cite This Article: Nicoara ND, Varga D, Voita-Mekeres F, Galea-Holhos L-B, Andreescu G, Costas L. Study of Basic Emotions in the General Population Using the Likert Scale. *Pharmacophore*. 2023;14(4):14-21. <https://doi.org/10.51847/tjyOah1VwM>

Introduction

One of the most widely held theories about emotions assumes that there is a limited set of emotions. From a biological perspective, it is assumed that there is a physiological mechanism for them [1-3]. Basic emotions are also called fundamental. There is no agreement as to which emotions are fundamental. Some authors have proposed that there are only two basic emotions: pain and pleasure. Others have proposed happiness, sadness, anxiety, anger, and disgust. Frijda proposed in 1987 that there are 6 basic emotions. Ekman proposed that there are basic emotions: anger, disgust, fear, joy, sadness, and surprise, based on universal facial expressions.

Studying facial expressions to understand emotions dates back to Darwin. The movement of certain facial muscles is linked to the expression of certain emotions [4-6]. For example, the narrowing and tightening of the red edge of the lip, produced by the orbicularis oris, is only present in anger [7, 8]. Only one certain muscle is required to express disgust, this being the levator of the upper lip [9, 10]. Emotions can occur milliseconds after the triggering stimulus has occurred. Emotions do not last very long unless the stimulus that produced them reappears. Emotions do not last very long unless the stimulus produced them [11, 12].

Differential emotion theory explains that in the person-environment interaction, cognition emerges, which interacts with feeling-emotion, and motivation that forms an affective-cognitive structure in which there is a network of feelings, images, evaluation, thoughts, and goals [13, 14].

One model of understanding emotions suggests that for example happiness is seen as progress towards goals, sadness when a goal is lost. Anger when a plan is blocked. Fear when a conflict that threatens the goal or one's preservation arises. Disgust when the perception of rejection arises. And longing when something arises that requires addressing [15]. The influence of

emotions is strong in children and diminishes in adult life with social learning and cognitive development. Non-basic emotions are numerous and last longer [16].

In addition, some regions are associated with specific emotions, such as the amygdala for fear and the insula for disgust, and other regions are activated by multiple emotions [17]. Joy and disgust have been associated with increased metabolism in the basal ganglia. The medial part of the prefrontal cortex was associated with all emotions studied [18]. Basic emotions are considered innate, adaptive, and universal [19]. New theories suggest that emotions are linked to specific neural circuits rather than to distinct anatomical structures [20]. Disgust is an emotion that is given by a strong state of repulsion towards certain substances or situations. The insula is considered the anatomical area involved in the occurrence of disgust. Disgust is correlated with activity in subcortical areas such as the striatum and amygdala [21].

Some researchers say that emotions have two dimensions: the affective nucleus with a positive or negative valence and an excitatory dimension, which involves the activation or deactivation of the nervous system [22]. Research has made considerable progress mainly due to the growth of diffusion methods for the grounding of affective interference in direct and indirect relationships with physiological responses modulated by the autonomic nervous system [23, 24].

Facial expression recognition techniques analyze the shape and pattern of facial features as a result of emotional responses when individuals are exposed to external and internal stimuli [25, 26]. The difficulty in defining emotions is due to their delineation from other affective states such as preferences, attitudes, passions, and affect. The problem of defining emotions is still encountered today and has a major impact on the model of emotions. There are 3 major theories of emotions: basic emotions, dimensional emotions, and reward theory [27].

The role of emotions in the workplace has received a lot of attention over the last two decades. We all experience different emotions at work. In psychology, the functional and evolutionary perspective on emotions is relatively dominant. According to them, emotions are important for humans in survival and for appropriate adaptation to the environment. Each discrete emotion, such as fear and anger, serves a unique function [28].

Emotion is an important concept in art, literature, and everyday life and is part of the core of human experience. Traditionally, emotions are characterized as dichotomous, such as negative and positive, pleasant-unpleasant, and activated-deactivated. Ekman suggested that there are universal emotions proven by cross-cultural studies in terms of facial expressions. This claim is widely accepted by researchers studying emotions [29].

Researchers have found that reasoned messages do not influence the response of children between 7 and 10 years of age, but their response is shaped by music, color, and the emotions conveyed through advertisements. Measuring emotions in children is very difficult. However, even in adults, it poses many difficulties. The difficulty is due to a lack of introspection and retrospective skills or the individual's preference not to share emotional states with strangers [30].

Music generates varied emotions among listeners. The difference between emotions and feelings is that emotions emerged earlier in evolution and they reappear much faster under external influence. The basic emotions are the oldest and are the same in both humans and animals. Complex emotions are associated with human cognitive activity, education, national history, and membership in a particular socio-cultural group [31].

When we are angry (emotion) or grumpy (affective state) we feel bad, and when we are proud (emotion) and when we are cheerful (affective state) we feel good. The difference between these two structures is that an emotion lasts for seconds or minutes, while an emotional state lasts for hours or days. Emotion has a rapid and episodic onset, while affective mood has a gradual and continuous onset [32].

Affective states and emotions have a bidirectional relationship with food. On the one hand, they can influence the motivation to eat and induce changes in eating behavior, and on the other hand, food consumption can alter the affective state and emotions of individuals [33].

The study of emotions has also been carried out in the field of politics. Partisan identification has been defined as an affective orientation towards an important object in the group. Affective intelligence theory is an example of political science and suggests that methods of measuring affective response can be used in certain political doctrines. This theory suggests, for example, that an increase in anxiety leads to an orientation towards novelty and the initiation of interest in learning. Thus, anxiety is expected to be related to new information. Finally, this theory argues that increased aversion causes individuals to strengthen their attachment to their preferred politicians [34].

Materials and Methods

We studied a group of 50 people from Romania aged over 18 years with a relatively homogeneous distribution in terms of age and gender. For the study of emotions, we applied the theory of fundamental emotions that assumes the existence of 6 emotions respectively; happiness, sadness, fear, anger, surprise, and disgust. We used a Likert scale with 6 degrees of intensity scored from 0 to 5. Zero means that the emotion was not felt at all and 5 means that it was felt very intensely. The reference period was two weeks during which we asked subjects to recall whether they felt the underlying emotions and in what context. To make it easier to understand the context, we set out four elements that could generate a core emotion, namely; an object or animal, a person, an event, or an institution. The data collection method was a structured interview. We used SPSS 26 for data analysis.

Results and Discussion

Participants were aged between 18 and 74 years. With an average age of 36 years. In terms of gender distribution, 54% of the participants were female and 46% were male. And the background 36 of the participants are urban and 14 are rural. And in terms of education level that 24 of the participants are in higher education, 24 are in secondary education, and 2 are in primary education.

Table 1. Distribution of subjects regarding emotions

Happiness	level 1 (0-5)	12
	level 2 (6-10)	16
	Level 3 (11-15)	16
	level 4 (16-20)	6
Sadness	level 1 (0-5)	18
	level 2 (6-10)	20
	level 3 (11-15)	11
	level 4 (16-20)	1
Fear	level 1 (0-5)	29
	level 2 (6-10)	16
	level 3 (11-15)	4
	level 4 (16-20)	1
Disgust	level 1 (0-5)	24
	level 2 (6-10)	17
	level 3 (11-15)	7
	level 4 (16-20)	2
Anger	level 1 (0-5)	29
	level 2 (6-10)	16
	level 3 (11-15)	5
	level 4 (16-20)	0
Surprise	level 1 (0-5)	18
	level 2 (6-10)	16
	level 3 (11-15)	12
	level 4 (16-20)	4

Distribution of participants by level of happiness experienced in the last 2 weeks. It can be seen from the table that 12 are at level 1, 16 are at level 2, 16 are at level 3 and 6 are at level 4. Sadness felt in the last 2 weeks it can be seen that at level 1 there are 18 participants, at level 2 there are 20 participants, at level 3 there are 11 participants and at level 4 there is 1 participant. By level of fear experienced in the last 2 weeks we see that at level 1 there are 29 subjects, at level 2 there are 16 subjects, at level 3 there are 4 subjects and at level 4 there is one subject. In terms of disgust felt in the last 2 weeks we see that 24 of the subjects are at level 1, at level 2 there are 17 participants, at level 3 there are 7 participants and at level 4 there are 2 participants. Anger emotion felt in the last 2 weeks we can observe that at level 1 there are 29 participants, at level 2 there are 16 subjects, at level 3 there are 5 subjects and at level 4 there are no subjects. In terms of the emotion of surprise felt in the last 2 weeks it can be seen that at the first level, there are 18 participants, at the 2nd level of intensity there are 16 participants, at level 3 there are 12 participants and at level 4 there are 4 participants (**Table 1**).

Estimation of data distribution normal using standard deviation. We use the estimated value of the data distribution by calculating Mean plus twice the standard deviation respectively minus the same value. We obtain an estimated maximum value of 17.618 and a minimum value of 1.822. The estimated value is distributed in the range of the observed one so the data have a normal distribution. Skewness is in the range of -1 and 1 so it has a normal distribution of 0.022. Kurtosis has a value of -0.099 being in the range of -1 and 1 indicating a normal distribution. Calculating the critical value of skewness gives a value of 0.065 which is in the range of +/- 1.96 suggesting a normal distribution. Calculating the critical value of kurtosis is 0.149 which is in the range of +/- 1.96 suggesting a normal distribution of the data. The Shapiro-Wilk test shows a value of 0.760 which is above the p-value of 0.05 indicating a normal distribution of the data. There are no outliers in the data analysis.

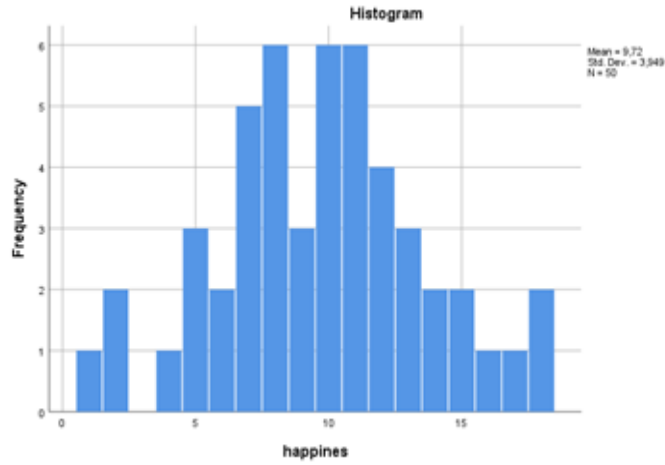


Figure 1. Histogram of happiness

The histogram shows an approximately normal distribution (Figure 1).

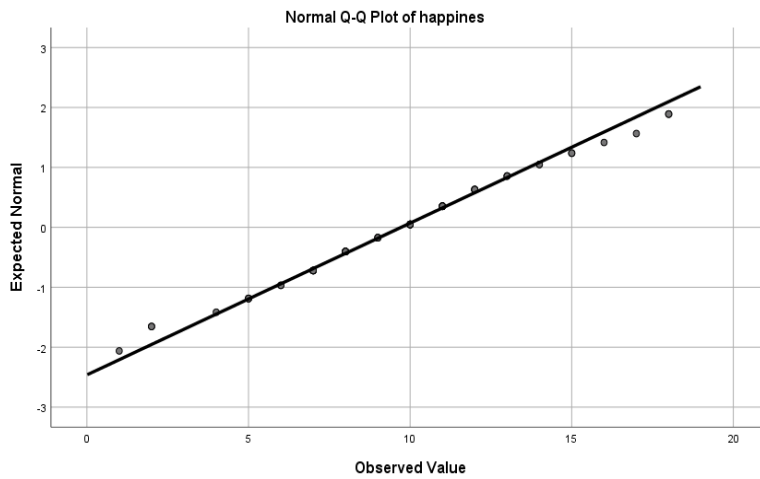


Figure 2. Normal Q-Q plot for happiness

The normal Q-Q plot shows a relatively normal distribution (Figure 2).

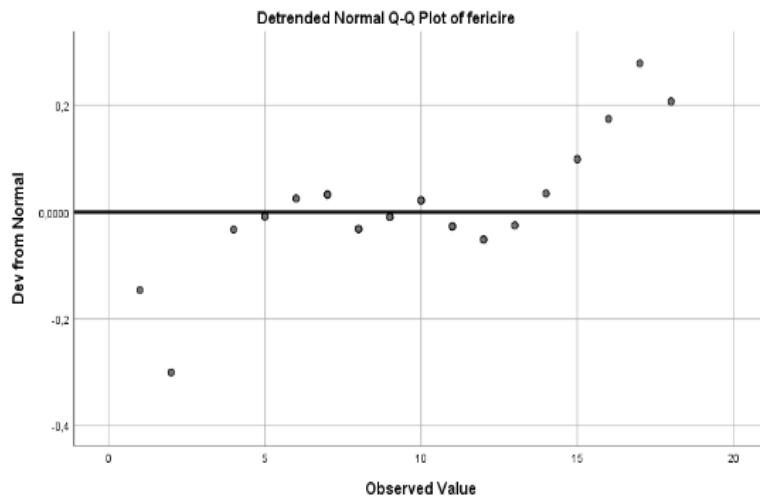


Figure 3. The detrend Q-Q plot for happiness

The detrend Q-Q plot shows a relatively random distribution around the central line which translates into a normal distribution (Figure 3).

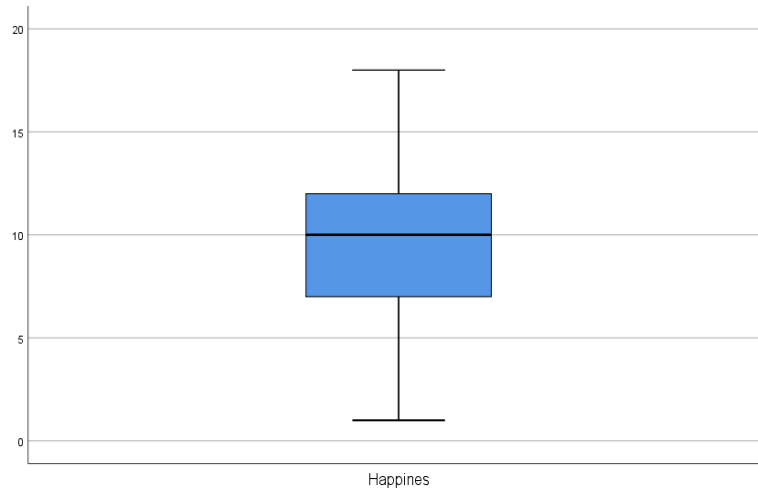


Figure 4. The box plot for happiness

The box plot shows a normal distribution of data with no outliers (Figure 4).

Table 2. Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
happiness	,073	50	,200*	,985	50	,760
sadness	,106	50	,200*	,944	50	,019
fear	,141	50	,014	,909	50	,001
disgust	,218	50	,000	,875	50	,000
anger	,194	50	,000	,902	50	,001
surprised	,125	50	,048	,934	50	,008

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

a. Lilliefors Significance Correction

Table 3. Checking the normal distribution of data

Emotion	Standard deviation and mean	Skewness and Kurtosis	critical values to skewness and kurtosis	Shapiro-Wilk/ Kolmogorov-Smirnov ^a	Outliers	Histogram	Normal Q-Q plot and Detrend Q-Q plot	The box plot	Normal distribution
Happi ness	Yes	Yes/Yes	Yes/Yes	Yes/Yes	No	Yes	Yes/Yes	Yes	Yes
Sad ness	No	Yes/Yes	Yes/Yes	No/Yes	No	Yes	Yes	Yes	Yes
Fear	Yes	Yes/Yes	No/Yes	No/No	Yes	No	Yes/No	No	No
Disgust	No	Yes/No	Yes/Yes	No/No	No	No	No/Yes	No	No
Angry	No	Yes/Yes	Yes/Yes	No/No	No	No	Yes/Yes	No	No
Surprise	No	Yes/Yes	Yes/Yes	No/No	No	No	Yes/Yes	Yes	No

Checking the Normal Distribution of Data

The analysis of the descriptive statistical data results that two emotions, happiness, and sadness, have a normal distribution in the studied group (Table 2). The other fundamental emotions do not have a normal distribution. Taking into account these elements, statistical studies on correlations should be done using non-parametric tests (Table 3).

The Cronbach's Alpha value is 0.880 which translates into a high level of reliability [35]. In children, a low Cronbach alpha score using the Likert scale was associated with a lack of emotional awareness [36]. The Likert scale is the most widely used instrument for measuring affective components [37].

The use of both past and present tense is used with the Likert scale for both basic and complex emotions. Emotion intensity has been associated with athlete performance. The resolution of internal inconsistency of the questionnaire is solved by some authors by eliminating outliers [38].

The scientific study of emotions is thought to have been started by Darwin. Another method of measuring emotions is to use the International Affective Picture System [39, 40]. Emotions are also influenced by the mental health and associated acute pathologies of an individual [27, 41, 42]. The Likert scale is considered to be very effective for measuring social and behavioral sciences. A score between 0.86 and 0.89 is considered to have high reliability and internal consistency [43].

Some authors have shown that the use of even a three-item Likert scale did not significantly change the internal consistency [44, 45]. Measuring emotions is very complex and can be done from many perspectives from psychiatric disorders to theories of emotional intelligence and the big five theory [46].

Conclusion

The theory of basic emotions assumes the existence of 6 basic emotions, and from these emotions develop the other more complex emotions. The practical study of emotions is difficult, but useful in research. The Likert scale is a practical tool for studying basic emotions. By recalling and evaluating emotions on a scale, it is possible to evaluate emotional experiences in the studied group. Happiness and sadness have a statistically normal distribution in the studied group. The practical assessment of emotions can be used in statistical correlations to evaluate different behaviors.

Acknowledgments: None

Conflict of interest: None

Financial support: None

Ethics statement: Ethical approval for this research was obtained from Ethics Commission of University of Oradea, Romania (no. 26/31.03.2021).

References

1. Çakar S, Özeyer K, Azizoğlu O. The mediating role of emotional labor in the impact of organizational climate on burnout. *J Organ Behav Res.* 2022;7(1):1-3.
2. Nguyen TH, Nguyen VH, Vo HH, Le NT, Nguyen TTP, Vo HK. Emotional intelligence and teamwork results of Vietnamese students. *J Organ Behav Res.* 2022;7(2):171-87.
3. Csep A, Vaida LL, Negruțiu BM, Todor BI, Judea-Pusta CT, Buhaș C, et al. Research on demographic, clinical and paraclinical aspects in pregnant women infected with *Toxoplasma gondii*. *Exp Ther Med.* 2022;23(2):1-7.
4. Özüdoğru S, Tosun G. Evaluation of microleakage and fatigue behaviour of several fiber application techniques in composite restorations. *Ann Dent Spec.* 2022;10(2):60-6.
5. Dumitru M, Berghi ON, Taciuc IA, Vrinceanu D, Manole F, Costache A. Could artificial intelligence prevent intraoperative anaphylaxis? Reference review and proof of concept. *Medicina.* 2022;58(11):1530.
6. Chidambaranathan AS, Culathur T. A prospective clinical study to evaluate the effectiveness of acupuncture treatment for temporomandibular joint muscular disorder. *Ann Dent Spec.* 2022;10(1):34-8.
7. Nabavi SS, Gholizadeh B. Evaluation of the quality of life of the patients with heart failure in Ahvaz teaching hospitals. *Entomol Appl Sci Lett.* 2022;9(1):26-30.
8. Tabas MY, Momeni F, Bakhshani NM, Pourshahbaz A, Rezaei O. Psychological intervention for bipolar disorder in Iran: A systematic review. *Entomol Appl Sci Lett.* 2023;10(1):53-64.
9. Ortony A, Turner TJ. What's basic about basic emotions? *Psychol Rev.* 1990;97(3):315-31.
10. Mekeres GM, Voiță-Mekereș F, Tudoran C, Buhaș CL, Tudoran M, Racoviță M, et al. Predictors for estimating scars' internalization in victims with post-traumatic scars versus patients with postsurgical scars. In *Healthcare 2022 Mar 16* (Vol. 10, No. 3, p. 550). MDPI.
11. Ekman P. Are there basic emotions? *Psychol Rev.* 1992;99(3):550-3.
12. Davidescu L, Ursol G, Korzh O, Deshmukh V, Kuryk L, Nortje MM, et al. Efficacy and safety of masitinib in corticosteroid-dependent severe asthma: a randomized placebo-controlled trial. *J Asthma Allergy.* 2022;15:737-47. doi:10.2147/JAA.S337284
13. Ekman P. An argument for basic emotions. *Cogn Emot.* 1992;6(3-4):169-200.
14. Mekereș GM, Buhaș CL, Tudoran C, Csep AN, Tudoran M, Manole F, et al. The practical utility of psychometric scales for the assessment of the impact of posttraumatic scars on mental health. *Front Public Health.* 2023;11:1103714.

15. Izard CE. Basic emotions, relations among emotions, and emotion-cognition relations. *Psychol Rev.* 1992;99(3):561-5.
16. Davidescu L, Jurca R, Ulmeanu R. Value of adding behavioral-cognitive therapy to standard treatment in smoking cessation programs: Results of smoking cessation center oradea on 7 years. *Eur Respir J.* 2014;44(Suppl 58).
17. Johnson-laird PN, Oatley K. Basic emotions, rationality, and folk theory. *Cogn Emot.* 1992;6(3-4):201-23.
18. Izard CE. Basic emotions, natural kinds, emotion schemas, and a new paradigm. *Perspect Psychol Sci.* 2007;2(3):260-80.
19. Saarimäki H, Gotsopoulos A, Jääskeläinen IP, Lampinen J, Vuilleumier P, Hari R, et al. Discrete neural signatures of basic emotions. *Cereb Cortex.* 2015;26(6):2563-73.
20. Celeghin A, Diano M, Bagnis A, Viola M, Tamietto M. Basic emotions in human neuroscience: Neuroimaging and beyond. *Front Psychol.* 2017;8. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5573709/>
21. Siedlecka E, Denson TF. Experimental methods for inducing basic emotions: A qualitative review. *Emot Rev.* 2018;11(1):87-97.
22. Diano M, Tamietto M, Celeghin A, Weiskrantz L, Tatu MK, Bagnis A, et al. Dynamic changes in amygdala psychophysiological connectivity reveal distinct neural networks for facial expressions of basic emotions. *Sci Rep.* 2017;7(1):45260.
23. Oşvar FN, Raţiu AC, Voiţă-Mekereş F, Voiţă GF, Bonţea MG, Racoviţă M, et al. Cardiac axis evaluation as a screening method for detecting cardiac abnormalities in the first trimester of pregnancy. *Rom J Morphol Embryol.* 2020;61(1):137.
24. Gu S, Wang F, Cao C, Wu E, Tang YY, Huang JH. An integrative way for studying neural basis of basic emotions with fMRI. *Front Neurosci.* 2019;13:628.
25. Voiţă-Mekeres F, Buhaş CL, Mekeres GM, Tudoran C, Racovita M, Faur CI, et al. Mekeres' psychosocial internalization scale: a scale for the evaluation of aesthetic prejudice in victims of accidents and violence. In *Healthcare 2021 Oct 26* (Vol. 9, No. 11, p. 1440). MDPI.
26. Jaeger SR, Cardello AV, Schutz HG. Emotion questionnaires: A consumer-centric perspective. *Food Qual Prefer.* 2013;30(2):229-41.
27. Betella A, Verschure PFMJ. The Affective Slider: A digital self-assessment scale for the measurement of human emotions. Tran US, editor. *Plos One.* 2016;11(2):e0148037.
28. González-Rodríguez MR, Díaz-Fernández MC, Gómez CP. Facial-expression recognition: An emergent approach to the measurement of tourist satisfaction through emotions. *Telemat Inform.* 2020;51:101404.
29. Coppin G, Sander D. Theoretical approaches to emotion and its measurement. In *Emotion measurement 2021 Jan 1* (pp. 3-37). Woodhead Publishing.
30. Wang Y, Peng KZ, Mao Y, Lan J. Development of a Chinese measure on twelve basic emotions and a preliminary test on a two-dimensional model on emotions-job outcome relationship. *Asia Pac J Manag.* 2017;35(2):529-64.
31. An S, Ji LJ, Marks M, Zhang Z. Two sides of emotion: Exploring positivity and negativity in six basic emotions across cultures. *Front Psychol.* 2017;8:610.
32. Vanhamme J, Chiu CK. Measuring different emotions in children with a pictorial scale. *J Advert Res.* 2018;59(3):370-80.
33. Sapozhnikova K, Hussein S, Baksheeva I, Taymanov R. Application of neural networks in the instrument for measuring expected listener's emotions. *J Phys Conf Ser.* 2018;1065:072041.
34. Desmet PMA, Romero N, Vastenburg MH. Mood measurement with Pick-A-Mood: review of current methods and design of a pictorial self-report scale. *J Des Res.* 2016;14(3):241-79.
35. Jaeger SR, Lee SM, Kim KO, Chheang SL, Jin D, Ares G. Measurement of product emotions using emoji surveys: Case studies with tasted foods and beverages. *Food Qual Prefer.* 2017;62:46-59.
36. Marcus GE, Neuman WR, MacKuen MB. Measuring emotional response: Comparing alternative approaches to measurement. *Political Sci Res Methods.* 2015;5(4):733-54.
37. Peat JK, Barton B. *Medical statistics: A guide to SPSS, data analysis, and critical appraisal.* Chichester, West Sussex; Hoboken, Nj: Wiley Blackwell/Bmj Books; 2014.
38. Penza-Clyve S, Zeman J. Initial Validation of the Emotion Expression Scale for Children (EESC). *J Clin Child Adolesc Psychol.* 2002;31(4):540-7.
39. Nemoto T, Beglar D. Developing likert-scale questionnaires. In *JALT 2013 conference proceedings 2014* (pp. 1-8). Available from: https://jalt-publications.org/sites/default/files/pdf-article/jalt2013_001.pdf
40. Cerin E. Anxiety versus fundamental emotions as predictors of perceived functionality of pre-competitive emotional states, threat, and challenge in individual sports. *J Appl Sport Psychol.* 2003;15(3):223-38.
41. Tudoran M, Tudoran C, Ciocarlie T, Giurgi-Onu C. Aspects of diastolic dysfunction in patients with new and recurrent depression. *Plos One.* 2020;15(1):e0228449. doi:10.1371/journal.pone.0228449
42. Tudoran M, Tudoran C. High-risk pulmonary embolism in a patient with acute dissecting aortic aneurysm. *Niger J Clin Pract.* 2016;19(6):831-3. doi:10.4103/1119-3077.181355
43. Adeniran AO. Application of Likert scale's type and Cronbach's alpha analysis in an airport perception study. *Sch J Appl Sci Res.* 2019;2(4):1-5.
44. Jacoby J, Matell MS. Three-point likert scales are good enough. *J Mark Res.* 1971;8(4):495.

45. Csep A, Vaida L, Bungau S, Todor BI. Clinical and biological correlations in toxoplasma gondii infection in HIV immune suppressed persons. Iran J Public Health. 2015;44(7):1012.
46. Killian KD. Development and validation of the emotional self-awareness questionnaire: A measure of emotional intelligence. J Marital Fam Ther. 2011;38(3):502-14.