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The study of the Polish version of the Questionnaire for the Assessment of Disgust Sensitivity (QADS)

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Summary

Aim. Disgust is one of the principal emotions, typically triggered by a variety of biological and social stimuli. Several questionnaire tools have been used to assess disgust. The aim of the study was to assess psychometric properties of the Polish version of the Questionnaire for the Assessment of Disgust Sensitivity (QADS), adapted from the tool prepared by the German researchers.

Methods. Eight hundred twenty subjects (631, 77% females and 189, 23% males) aged 18-69 (mean – 28 years) participated in the study. There are 3 subscales in the questionnaire: Core Disgust, Animal Reminder and Contamination. The tool consists of 37 items, the intensity of feeling of disgust is assessed based on 5-point Likert scale.

The study was not sponsored

Results. Confirmatory factor analysis confirmed the adequacy of grouping of items in the three subscales: Core Disgust, Animal-Reminder, and Contamination-Interpersonal. In our sample, females had higher levels of disgust than males. Several other psychometric variables – high degree of correlations between the subscales, and high reliability – were in agreement with parameters of the original version. The Polish version compared favourably with the original, with Cronbach's alpha of 0.94 for the whole questionnaire and 0.85 – 0.90 for the subscales.

Conclusion. The psychometric properties of the Polish version of QADS are sufficient to recommend this tool for diagnostic and research use.

Key words: disgust, questionnaire, factorial validity, reliability

Introduction

Disgust is one of the primary emotions, and is present in all cultures [1]. Disgust sensitivity describes an individual's personality trait, a predisposition to react to specific materials with disgust [2]. It was initially thought to be triggered by oral stimuli. The first definition of disgust was proposed by Darwin. He described it as "something repulsive, first in terms of taste, which occurs under the influence of either the current observations or vivid ideas; secondly, everything that causes a similar feeling through other senses: smell, touch or even sight" [3]. Angyl, a psychoanalyst, in his paper from the year 1941 described disgust as an aversion related to a prospect of taking something horrid in the mouth [4]. Further analyses of disgust pointed that disgust may be triggered by other situations, including those caused by another person [5]. Based on a group of American studies, several classes of triggers of disgust have been identified: food, animals, bodily secretions and excretions, contact with dead body, some sexual behaviours, body injury, lack of hygiene, risk of infection on contact with other people, and some moral offenses [6, 7]. Disgust has also been analysed in an evolutionary context, taking into account personal and cultural development. From this standpoint, according to Rozin et al., it serves a protective role to both body and mind; it protects body and mind against infections and other illnesses, and against socially unacceptable behaviours or thinking about the human mortality [7].

Recent medical advances allowed for localisation of this emotion within the brain. Functional magnetic resonance imaging (fMRI) studies of the brain suggested activation of three distinct areas upon exposure to triggers of disgust: anterior insula, basal ganglia, and parts of prefrontal cortex [8, 9].

A tendency towards disgust is associated with a predisposition to several psychiatric conditions. Numerous studies have confirmed the role of disgust in anxiety disorders (especially phobias), and obsessive-compulsive disorder; disgust has also been associated with depression, eating disorders, and schizophrenia [10–14].

The first assessment tool used to evaluate disgust was the Disgust Scale (DS), published by Haidt et al. It consisted of 32 items, grouped in 8 categories based on the trigger of disgust. Its internal consistency was found to be low, with Cronbach's alpha of less than 0.63; based on that finding, the scale was modified to include

only 7 categories [15]. Subsequent research on this tool showed that only three categories – Core Disgust, Animal-Reminder, and Contamination-Interpersonal have stable psychometric properties. Core Disgust can be triggered by spoiled food, body fluids, rodents or vermin, and is thought of as a defensive reaction, preventing an illness or infection. Animal-Reminder pertains to these aspects of functioning that are shared between humans and animals – death, sexual activity, lack of hygiene, and bodily injury. The purpose of this aspect of disgust is to prevent the thoughts of death and mortality, and to realize the animal-like motives of actions.Contamination-Interpersonal disgust also serves a protective role, and it is related to contacts with other persons (with strangers and other undesirable contacts), and with objects that belong to these persons [7].

Based on the improved reliability of the modified scale, Olatunji et al. revised the original version of the questionnaire by removing several items that reduce the reliability coefficients (Cronbach's alpha). The end result, the Disgust Scale – Revised (DS-R) contained 25 items with an improved Cronbach's alpha of > 0.7 [16].

The European adaptation of the original DS, containing 32 items in 7 categories was first performed by Schienle et al. [17]. Their validation trial showed poor psychometric properties of this tool. As a result, the authors altered the structure of the questionnaire by adding 28 new items (four items in each of the categories), and one new category (Deformation Disgust) with four items. The factor analysis of this modified tool yielded 5 groups of items which were defined as different types of disgust (Death/Deformation, Body Secretions, Spoilage, Poor Hygiene, and Oral Rejection). Further research led to the final version of the questionnaire that contains 37 items and has a new name – the Questionnaire for the Assessment of Disgust Sensitivity, QADS [17]. Initial validation of QADS showed satisfactory values of Cronbach's alpha (0.69 – 0.85) for all subscales. However, this study was performed on unrepresentative group of 220 patients. In addition, there was an insufficient verification of items and significant differences in the structure of factors among versions of the questionnaire [17]. The following study, performed by Petrowski et al. aimed to confirm the psychometric properties of the questionnaire in a large group of over 2000 participants, and to compare a five category model, proposed by the German researchers, with a three category one, prepared by the authors of DS-R. The three category model was found to be more adequate [18]. Table 1 shows a list of all versions of Disgust questionnaires.

No Polish language questionnaires to assess disgust are available. The purpose of this study was to translate the English version of QADS prepared by Petrowski et al., and to compare its psychometric values with the ones of the German version of the same questionnaire.

Table 1. **Questionnaires used to assess disgust**

Questionnaire (Year of publication)	Authors	Number of factors/ categories	Number of items	Severity scale
Disgust Scale – DS (1994)	Haidt J, McCauley C, Rozin P. [6]	8, 7 (modified)	32	0 – 1 0 – 0.5 – 1

table continued on the next page

Disgust Scale – Revision – DS-R (2007)	Olatunji BO, Williams NL, Tolin DF. et al. [16]	3	25	0 – 4
Ein Fragebogen zur Erfassung der Ekelempfindlichkeit – FEE (2002)	Schienle A, Walter B, Stark R, Vaitl D. [17]	5	37	5-point without specifying of the numeric values.
Questionnaire for the Assessment of Disgust Sensivity – QSAD (2011)	Petrowski K, Sören P, Schmutzer G. et al. [18]	3	37	0 – 4

Methods

The published English version of QADS was translated into Polish by two independent researchers [18]. Subsequently, a professional translator verified both translations and chose the most accurate statements, compiling them into the final version of the questionnaire.

The Questionnaire for the Assessment of Disgust Sensitivity consists of 37 statements which grade the severity of disgust in a 5 point Likert scale (from 1 to 5). There are three subscales within the QADS – Core Disgust (15 items), Animal-Reminder (9 items), and Contamination-Interpersonal (13 items).

The questionnaire is accompanied by a short instruction: "The following questionnaire assesses a sensation called disgust that you might experience in certain situations. Using the scale of 1 to 5 (1 – almost none at all, 5 – very much), please mark how unpleasant is each of the following situations for you."[1]. The maximal score in the first subscale is thus 75, in the second subscale – 45, and in the third subscale – 65. All items of the questionnaire are presented in Table 7.

Participants of this study filled in the demographic questionnaire and the Polish version of the QADS. The participants were surveyed either individually or in groups, and the instructions of questionnaire were presented prior to the session by the researcher.

Participants of the study

820 subjects (631 females, 76.8% and 189 males, 23.2%) were included in the study. All participants were adults aged 18-69 (mean = 28; standard deviation, SD = 8 years) with primary education (14 subjects; 2%), secondary education (458 subjects; 56%) and higher education (348 subjects; 42%). It should be noted that 92% of the studied population were people aged 18-40.

[1] In the original version, the scale was 0 to 4. We decided to use a 5 point scale of 1 to 5, as it is used more frequently in research questionnaires, and it is more "friendly" to the research subject. Such a change is unlikely to affect psychometric properties such as accuracy and reliability of the translated version.

The sampling was directed by convenience; wherever possible, efforts were made to diversify the group which included full-time students, part-time students intramural and employed persons.

Results

Descriptive statistics of the Polish version of QADS

Table 2 presents the data on the means and distribution patterns of each subscale of the Polish version of QADS.

Table 2. **Descriptive statistics of the Polish version of QADS**

Subscale	Sample	Statistical measure			
		M	SD	Skewness	Kurtosis
Core Disgust 15 items; (possible range: 15-75)	Total	47.69	11.75	-0.01	-0.61
	Females	49.60	11.54	-0.09	-0.64
	Males	41.32	10.09	0.07	-0.38
Animal-Reminder 9 items; (possible range: 9-45)	Total	21.06	9.12	0.62	-0.65
	Females	22.42	9.33	0.43	-0.88
	Males	16.50	6.58	1.25	1.31
Contamination-Interpersonal 13 items; (possible range: 13-65)	Total	33.85	9.68	0.23	-0.48
	Females	35.11	9.75	0.17	-0.55
	Males	29.65	8.16	0.15	-0.58
Total score 37 items; (possible range: 37-185)	Total	102.60	27.29	0.27	-0.49
	Females	107.13	27.30	0.17	-0.62
	Males	87.47	21.15	0.24	0.01

Total (N = 820); Females (N = 631); Males (N = 189)

Since the Polish and the original versions of the QADS use different scales, it is not possible to directly compare the mean values of the responses. At the same time, the analysis of distribution of responses indicates that the responses were somewhat skewed towards to higher end of the scale in the original verison, while there were skewed towards the lower end of the scale in the Polish version of QADS (Table 3). This may suggest lower intensity of disgust in the Polish population than in the population studied in Germany.

Table 3. **Percentage of respondents chosing the reponses – comparison of the original QADS (scale of 0–4) and the Polish version of QADS (KOWW) (scale of 1–5)**

	Response				
	QADS: 0 KOWW: 1	QADS: 1 KOWW: 2	QADS: 2 KOWW: 3	QADS: 3 KOWW: 4	QADS: 4 KOWW: 5
Percentage of responders in QADS	9	14	24	26	28
Percentage of responders in the Polish version of QADS (KOWW)	23	23	22	17	15

The coefficients of skewness for the total scores and for the majority of the subscales do not exceed the absolute value of 1, what shows the maintaining of the relative symmetry of their distribution (Table 2.). Kurtosis values of most subscales slightly deviate from zero assuming negative values indicating weaker concentration of the results around the mean. These results are similar to those obtained during the validation of the original version of QADS [17]. The exception is the subscale Animal-Reminder analyzed in a group of men in whom low results dominated (A = 1.25), and the results are concentrated around the mean more than in the case of normal distribution (K = 1.31).

Normality of distribution was tested using a Kolmogorov-Smirnov test. As shown in Table 4, in the whole group Core Disgust has normal distribution. Whereas the distribution of the results in the subscale Animal-Remander and Contamination-Interpersonal is not normal (though in the latter the hypothesis of existing the weak concordence with normal distribution may be considered).

Table 4. **Normality of distribution of responses to three subscales (N = 820)**

	Core Disgust	Animal-Reminder	Contamination-Interpersonal
Mean	32.69	12.06	20.85
Standard deviation (SD)	11.75	9.12	9.68
Z value (Kolomogorov-Smirnov)	1.14	3.35	1.35
Asymptotic significance (two-tailed)	0.151	0.000	0.053

Differences between results of men and women

Then the results of the Polish version of QADS and its subscales of male and female subjects were compared. The results are presented in Table 5.

Table 5. **Differences in the total and subscale scores of the Polish version of QADS between male and female subjects**

	Mean value		Mann-Whitney test for independent groups
	Females	Males	
Core Disgust	49.60	41.32	U = 35719.000; Z = -8.352

table continued on the next page

Animal-Reminder	22.42	16.50	U = 37156.500; Z = -7.852
Contamination-Interpersonal	35.11	29.65	U = 40772.500; Z = -6.581
Total	107.13	87.47	U = 35052.500; Z = -8.584

Z and U values are presented in the table; asymptotic significance (two-tailed); $p < 0.0001$

Similarly to the findings in the original validation sample, women had significantly higher scores in all subscales and the whole questionnaire than men.

Intercorrelations

The relationships between the different triggers of disgust, as measured by different subscales, were analyzed. In all studied subjects, the coefficients of correlation were high (Contamination-Interpersonal vs. Core Disgust) or moderately high (Core Disgust vs. Animal-Reminder and Animal-Reminder vs. Contamination-Interpersonal) which indicated close association of the content in three types of disgust (Table 6). Similar, high correlations have been reported in the original version of QADS.

Table 6. **Intercorrelations between the subscales of the Polish version of QADS**

	Total (N = 820)		Females (N = 631)		Males (N = 189)	
	Animal--Reminder	Contamination –Interpersonal	Animal--Reminder	Contamination –Interpersonal	Animal--Reminder	Contamination –Interpersonal
Core Disgust	0.68**	0.81**	0.67**	0.81**	0.54**	0.75**
Animal-Reminder		0.57**		0.57**		0.38**

**. p=0.01 (two-tailed).

The comparison of results obtained in men and women with the Fisher's z test for independent coefficients of correlations shows that relationships among these scales are stronger in women than in men. The significance of differences between the studied correlations among coefficients in women and men are $z = 2.48$, $p = 0.007$ for subscales Core Disgust and Animal-Reminder, $z = 2.96$, $p = 0.002$ for subscales Animal-Reminder and Contamination-Interpersonal and $z = 1.85$, $p = 0.03$ for subscales Core Disgust and Contamination-Interpersonal.

Factor validity – Confirmatory Factor Analysis

The Kolmogorov-Smirnov test for normality determined that the distribution of all 37 items of the QADS differ significantly from normality ($Z > 4.27$; $p < 0.001$). Moreover, the absolute values of kurtosis of 16 items exceed 1. Due to these properties the robust maximum likelihood method of estimation (bootstrap method) was used in the course of confirmatory factor analysis. Due to the large number of observed variables in relation to latent variables, we expected that some fit indices do not reach

values indicating a good fit ($\chi^2/df < 5$, RMSEA < 0.05, GFI > 0.9, CFI > 0.9, TLI > 0.9), however, it should be at the level providing a moderate model fit (RMSEA < 0.08, GFI > 0.8, CFI > 0.8, TLI > 0.8) [19]. In the original version of the questionnaire the following values were obtained: $\chi^2/df = 4.00$, $p < 0.001$, RMSEA = 0.67, CFI = 0.82, TLI = 0.81 [17].

In the first step, the 3-factor solution used in the German version of the QADS was tested, because it was the basis of the Polish version. Similarly to the research by Petrowski et al. [18] no cross-loadings between items were allowed so each item refers to only one factor. However, five correlations between the residues were introduced, that is justified in the modification indices, as well as a close resemblance of content of particular items, for example: "*You touch a dead body*" (item 13) and "*You touch a dead person's head"* (item 24). In the second step, the 3-factor model was compared to the alternative 1-factor solution, where all the items of the questionnaire form one scale (while maintaining the same relationship between residues). The 1-factor structure could substantiate the existence of a high correlations between subscales (intercorrelations).

All standardized factor loadings for the 3-factor model are significant ($p < 0.001$). For the first factor (Core Disgust) factor loadings vary between 0.40 and 0.69 with the approximate standard errors from 0.02 to 0.03, for the second factor (Animal-Reminder Disgust) take the values between 0.45 and 0.83 with the errors from 0.02 to 0.03, and for the third factor (Contamination Disgust) between 0.37 and 0.70 with the errors from 0.02 to 0.03. Table 7 gives an overview of the range of the factor loadings taking into account the confidence intervals estimated by bootstrap method. Coefficients of determination indicate that specific items explain from 16 to 48% of the variance of the first factor, from 20 to 69% of the second one, and from 14 to 48% of the variance of the third factor, respectively.

The overall fit statistics indicate acceptable, moderate fit for the 3-factor model, $\chi^2 = 3100.216$; $p < 0.001$; $df = 621$; $\chi^2/df = 4.992$; RMSEA = 0.070; GFI = 0.810; CFI = 0.831; TLI = 0.819, whereas the 1-factor model fits the data poorly, $\chi^2 = 4231.587$; $p < 0.001$; $df = 624$; $\chi^2/df = 6.781$; RMSEA = 0.084; GFI = 0.712; CFI = 0.754; TLI = 0.738. The model comparison fit indices also suggest better fit (lower values of indices) for the 3-factor, BCC = 3272.196; AIC = 3264.216; CAIC = 3732.379, than for the 1-factor solution, BCC = 4397.274; AIC = 4389.587; CAIC = 4840.622. The present findings are consistent with the results of CFA of the German version of the QADS [18].

Table 7. **Items of the Polish version of the QADS and the corresponding range of the factor loadings of the individual items of the 3-factor model using CFA with robust maximum likelihood estimations (N = 820).**

Item		Factor		
		1	2	3
Factor 1 – Core Disgust				
2.	You are biting into a grilled grasshopper.	0.35-0.46	—	—

3.	You smell vomit.	0.56-0.64	—	—
5.	Someone profusely smelling of sweat takes the bus seat next to you.	0.62-0.69	—	—
8.	You try to eat monkey meat.	0.43-0.53	—	—
12.	You see someone vomit.	0.56-0.64	—	—
17.	While eating soup, your tongue comes in contact with a piece of hair.	0.60-0.67	—	—
18.	You smell spoiled food.	0.65-0.72	—	—
22.	A bad odor reaches your nose. You look down and see that you have stepped into dog feces.	0.45-0.54	—	—
23.	You enter a heavily soiled gas-station restroom.	0.63-0.70	—	—
25.	Someone with terribly bad breath speaks to you.	0.66-0.73	—	—
28.	You are about to drink a glass of milk when you smell that it's spoiled.	0.47-0.57	—	—
29.	You see maggots on a piece of meat in an outdoor garbage pail.	0.55-0.63	—	—
31.	While you are walking through a tunnel under a railroad track, you smell urine.	0.66-0.72	—	—
33.	You are hungry. In front of you there is a bowl of your favorite soup that had been stirred with a used but thoroughly washed flyswatter.	0.55-0.63	—	—
37.	You take raw egg-white into your mouth.	0.44-0.53	—	—
Factor 2 – Animal-Reminder-Disgust				
6.	You enter a crypt, where there are coffins.	—	0.66-0.74	—
13.	You touch a dead body.	—	0.77-0.84	—
16.	You are to ride in a hearse.	—	0.69-0.76	—
20.	During a walk in the woods, you see a decomposing animal.	—	0.63-0.71	—
21.	While assisting in a medical emergency, you are to press against a heavily bleeding wound.	—	0.64-0.73	—
24.	You touch a dead person's head.	—	0.80-0.86	—
26.	You have touched the stump of someone's amputated limb.	—	0.68-0.75	—
30.	You are walking barefoot on concrete and you step on an eart-hworm.	—	0.39-0.50	—
32.	You accidentally touch the ashes of a person who has been cremated.	—	0.77-0.82	—
Factor 3 – Contamination Disgust				
1.	Someone doesn't clean his/her hands after using the restroom.	—	—	0.38-0.49
4.	You have to remove a hairy dead spider from your room.	—	—	0.32-0.43
7.	You are eating a steak and find that it is still rare on the inside.	—	—	0.40-0.50
9.	A friend tells you he generally doesn't use a deodorant.	—	—	0.57-0.65
10.	You see a cockroach in someone's house.	—	—	0.47-0.57

table continued on the next page

11.	You hear the mucus rattle as someone is clearing his/her throat.		—	0.57-0.65
14.	You accidentally touch the toilet seat in a public restroom.		—	0.58-0.65
15.	You visit your favorite restaurant, and the cook has a cold.		—	0.45-0.55
19.	Someone with dirty fingernails hands you a book.	—	—	0.66-0.73
27.	You see someone put ketchup on vanilla ice cream and eat it.		—	0.39-0.50
34.	You see a person with greasy hair.	—	—	0.64-0.72
35.	In a restaurant, you see someone eat his food messily with his fingers.	—	—	0.59-0.67
36.	You discover that a friend of yours changes his/her underwear only once a week.	—	—	0.62-0.70

Reliability and discriminative power

Next step was to analyse the reliability of the Polish version of QADS. The internal consistency of the original version of QADS was measured using the Cronbach's alpha coefficient. It was 0.95 for the whole questionnaire and 0.90 for each of the subscales. The Polish version compared favourably with the original, with similar values (Cronbach's alpha of 0.94) for the whole questionnaire and for the subscales, which proves the high consistency of this tool.

Table 8. **Measures of reliability of the Polish version of QADS.**

Subscale	Nmber of items	Cronbach's alpha			Guttman's index		
		Total	Females	Males	Total	Females	Males
Core Disgust	15	0.88	0.88	0.84	0.87	0.86	0.82
Animal-Reminder	9	0.90	0.90	0.86	0.89	0.89	0.84
Contamination- Interpersonal	13	0.85	0.85	0.80	0.78	0.79	0.75
Total	37	0.94	0.94	0.91	0.91	0.91	0.88

Total ($N = 820$); Female subjects ($N = 631$); Male subjects ($N = 189$).

Discriminative power of specific items of the questionnaire was evaluated by calculating the coefficients of correlation between individual responses to the item, and the result of the subscale to which it belonged. Coefficients of correlation of all items belonging to Core Disgust, Animal-Reminder, and Contamination-Interpersonal subscales ranged from $r = 0.41$ to $r = 0.65$, from $r = 0.40$ to $r = 0.82$, and from $r = 0.34$ to $r = 0.62$, respectively. Exclusion of individual items within each subscale led to lowering of the Cronbach's alpha coefficient, thus proving that all items were necessary to maintain high reliability and accuracy. Two items (#4 and #30) did not fulfil the condition of discrimination and had the lowest coefficients of correlation.

Discussion

This is the first study adapting a questionnaire to evaluate disgust sensitivity in the Polish population. An unquestionable value of QADS is its comprehensive list of triggers of disgust. In this way, the questionnaire reflects the current thinking about disgust and its stimuli – oral, those related to the animal nature, and those associated with interpersonal contacts.

Our research on the Polish version of QADS, though performed on a smaller group of subjects, confirmed the psychometric parameters of the original version [18]. Similarly to the German version, the Polish version of QADS was found to be internally consistent, with high intercorrelations between subscales, and high reliability indices. This confirms that all aspects of disgust are strongly related. Our factor analyses confirmed the merit of calculating both the total and the subscale scores separately, which may be useful in examining specific groups of subjects or specific problems (see below).

The comparison of results of Polish and German subjects confirms higher levels of disgust sensitivity among women, compared to men [18]. A possible explanation of this phenomenon lies in the biological determinants of disgust: it protects against the factors that threaten the biological existence of the organism. Buss et al. indicates that pregnant women feel aversion to certain foods to protect their unborn child from infection [20]. This can also be interpreted in a broader perspective, in a context of evolutionary theories and primitive allotment of duties between men and women; women were involved in care of other members of the family and preparation of food, and thus were at higher risk of noxious exposures (infections, poisonings). Higher disgust sensitivity improved their chances of preserving good health and life.

The main limitation of our study was a non-random sampling of the subjects included. As a result, our sample has an overrepresentation of women, and few subjects with low education levels. It is recommended to supplement this research by including men and subjects with low education background in the future. In spite of this limitation, we believe that the Polish version of QADS meets the psychometric criteria that make it a reliable diagnostic and research tool.

Although there is an abundance of evidence that disgust may be associated with various psychiatric conditions, there are other entities, where its role is yet to be defined. It seems like disgust may be associated with sensitivity to certain flavours and foods and may lead to a selective diet, either as a part of selective eating disorders (a new diagnostic category in DSM-V) or as a symptom of global developmental disorder. Suicidal behaviour and self-mutilation may also be entities, where disgust (especially that measured by Animal-Reminder subscale) may play a role. Low levels of disgust sensitivity (sensitivity to skin injury, sight of blood, potential mortality related to one's actions) may lead to low protective effects and injuries.

Outside of the psychiatry arena, dietary preferences may be an interesting field for assessment of disgust. Do vegetarians have different disgust sensitivity than people

who eat meat? Does disgust affect our dietary choices related to the smells produced by foods? Another interesting area of exploration might be the influence of disgust on career choices. Do physicians and nurses have lower Animal-Reminder disgust sensitivity than members of other professions? If the disgust sensitivity affects our everyday functioning, then maybe high disgust sensitivity results in refraining from some activities, such as resuscitation of an accident victim, or dressing of a wound.

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