LIVERPOOL
JOHN MOORES
UNIVERSITY

LJMU Research Online

Trotter, PD, Belovol, E, McGlone, FP and Varlamov, A

Validation and psychometric properties of the Russian version of the Touch Experiences and Attitudes Questionnaire

http://researchonline.ljmu.ac.uk/9555/

Article

For more information please contact researchonline@ljmu.ac.uk

Validation and psychometric properties of the Russian version of the Touch Experiences and Attitudes Questionnaire

The Russian version of the Touch Experiences and Attitudes Questionnaire

Paula Trotter[1], Elena Belovol[2,3], Francis McGlone[1,4], and Anton Varlamov [2,5*]

[1] Natural Sciences and Psychology, Liverpool John Moores University, Liverpool, UK

[2] Center for Cognition and Communication, Pushkin State Russian Language Institute, Moscow, Russia

[3] Department of Psychology, Moscow State University of Education, Moscow, Russia

[4] Institute of Psychology, Health & Society, University of Liverpool, Liverpool, UK

[5] Laboratory of Psychophysiology, Institute of Higher Nervous Activity and Neurophysiology of RAS, Moscow, Russia

* Corresponding author

E-mail: antonvarlamov@gmail.com (AV)

Abstract

It has been demonstrated that nurturing and affiliative touch is essential for human emotional and physical well-being throughout our entire life. Within the last 30 years a system of low-threshold mechanosensitive C fibers innervating the hairy skin was discovered and described; this system is hypothesized to represent the neurobiological substrate for the affective and rewarding properties of touch. This discovery opens new perspectives for multidisciplinary research of the role of affiliative social touch in health and disease, and calls for establishing novel psychometric tools assessing individual differences in the domain of affective touch.

The main objective of the study was to construct and validate a Russian version of the Touch Experiences and Attitudes Questionnaire (TEAQ), a self-report measure recently developed to quantify individual experience and attitude to social and affective touch. A pool of 117 items was translated into Russian and all the items were assessed for appropriateness for Russian culture (232 participants). After exploring the factor structure (468 participants), we composed a 37-item questionnaire (TEAQ-37 Rus) characterized by good reliability and a clear 5-factor structure, covering the aspects of attitude to intimate touch, attitude to friendly touch, attitude to self-care, current intimate touch experiences, and childhood touch experiences. Confirmatory factor analysis (551 participants) has demonstrated good consistency and reliability of the 5-factor structure of the TEAQ-37 Rus. Cross-validation research demonstrated moderate positive correlations between predisposition to social touch and emotional intelligence; positive correlations with extraversion and openness facets of the Big Five personality model were also found. As predicted, participants with higher TEAQ scores rated all observed kinds of touch as more pleasant, with a particular preference for slow touch.

We anticipate that this questionnaire will be a valuable tool for researchers of social touch, touch perception abnormalities, and the importance of touch experiences for emotional and mental health.

Introduction

Affective touch throughout human life

Communication via the sense of touch has long been perceived as an important aspect of human social interaction. A large body of literature attests to its cultural, social, and emotional significance and it may seem natural to acknowledge the importance of gentle caring touch and the role it plays in our social and emotional well-being, but there was no general agreement about this amongst psychologists up until the mid 20th century. John B. Watson, an instigator of the School of Behaviorism and one of the most influential psychologists of early 20th century, stated that, in order to bring up their children properly, parents should "never hug and kiss them, never let them sit on your lap". An untouched child would "enter manhood so bulwarked with stable work and emotional habits that no adversity can quite overwhelm him" [1]. His approach was shared by Haarer [2], who authored one of the most popular German books on child care for several decades, with the last edition published as late as 1987 [3]. A similar point of view, if not as radical, is still popular in some cultures, and parents are often advised not to 'spoil' their children with excessive physical affection [4]. In the 1940's and 1950's revolutionary research carried out by Spitz in nurseries and infant hospitals [5] proved that a generous amount of nurturing touch is as vital as air and food, and that infants devoid of caring touch often die from a so-called 'hospitalism', a condition described in late 19th century referring to infants' failure to thrive and to stunningly high death rates [6]. Impressed by Spitz's work, Berne postulates that "a stroke may be used as the fundamental unit of social action" [7]. A mother's reassuring touch is linked to a more beneficial type of attachment in view of Bowlby's theory [8]: a securely attached infant both seeks and is comforted by physical contact with their mother [9]; a comprehensive review of the data linking touch and attachment is provided by Duhn [10]. The importance of touch for shaping the emotional brain is thoroughly supported by animal research data. A classical paper by Harlow [11] shows that infant monkeys who had been removed from their mothers prefer a surrogate mother made of soft cloth to one made of wire that provided food, pinpointing the importance of tactile perception in nurturing. The work of Meaney [12] provided further evidence that rat pups receiving high levels of licking and grooming touch in the early neonatal period have significantly lower stress responses, an effect which prevails to adulthood: adult offsprings with increased licking-grooming show lower responses to stress [13]. Recently this protecting

3

77   effect of maternal touch has been replicated in humans: a copious amount of maternal stroking can

78   reverse the potentially harmful epigenetic effects induced by prenatal maternal depression followed by

79   postnatal maternal depression [14].

80   Affective touch retains its key role for human emotional well-being throughout our entire life. Cochrane

81   [15] identified that a lack of social touch, either during childhood or at present, greatly increased one's

82   vulnerability to depression. Eaton et al. found that a simple touch on the shoulder before mealtime

83   resulted in an increase of nutritional intake in institutionalized elderly, preventing health risks related to

84   malnutrition [16]. Further evidence of the benefits of touch comes from research on the effects of

85   massage showing a reduction in salivary cortisol, an increase in urinary serotonin metabolite levels, and

86   reduction in depression and pain [17]. The popularity of massage in improving well-being is known in

87   many cultures, and there is a plethora of less founded 'alternative medicine' based therapies claiming

88   miracle "cures" as a consequence of the laying-on of hands. However, until recently, a neurobiological

89   explanation of these benefits has been lacking with most research in the area being carried out by

90   psychologists, ethologists and social care professionals.

91

C-tactile system: neural substrate mediating affective touch perception

94   Neurobiological research performed within the last 25 years has reinforced the earlier behavioral insights

95   into the importance of touch for child's development and revealed that there indeed is a specific neural

96   substrate for perceiving the emotional properties of gentle touch. Our current understanding is that the

97   human somatosensory system has in fact two tactile sub-modalities, one providing the well-recognized

98   discriminative touch input to the brain, and the second – the affective or emotional input. A system of

99   low-threshold mechanosensitive C-fibers innervating the hairy skin of the body (C-tactile or CT-

100 afferents) has been identified and characterized [18-20]; this system is hypothesized to represent the

101 neurobiological substrate for affective and rewarding properties of touch (for review see [21]). These

102 nerve fibers are slowly conducting and respond to low-force, innocuous touch; they were first discovered

103 by Vallbo et al. [18] using a technique called microneurography that allows electrophysiological

4

104 recording of the activity of single axons in a conscious participant [22]. Electrophysiological and

105 psychophysical research revealed that properties of CT fibers and the corresponding mechanoreceptors

106 are optimized for response to naturally occurring nurturing touch, i.e. to stroking stimuli with delivered

107 with velocity of ~5 cm/sec [20, 23] and at normal human skin temperature [24]. It has been shown that

108 pleasant touch delivered to hairy skin is processed primarily in limbic-related cortex [25-27, 20]. The CT

109 system, with its slow response to stimulation and lack of topographic specificity, is best equipped to

110 fulfill and affective rather than discriminative function, encoding the rewarding and affiliative properties

111 of close physical contact. It provides positive reinforcement to skin-to skin contacts with other people,

112 serves as a reward mechanism enhancing attachment, and helps to keep us 'in touch', both literally and

113 figuratively. The CT affective touch hypothesis is presented in authoritative review papers [28, 29] and in

114 major textbooks of neuroscience [30-34].

115

Assessing affective touch

117 The majority of papers revealing the link between CT system, social touch, and neurodevelopment were

118 published within the last three decades, and it is becoming clear that this area of research is crucial for

119 understanding neural mechanisms underlying different aspects of human somatosensory perception and

120 can be vital in research on a range of developmental, neurological, and behavioral disorders related to

121 tactile perception abnormalities.

122 The main factors affecting touch experience and attitudes can be grouped into two clusters: 1) physical

123 properties of a delivered stimulus (force, velocity, texture, temperature etc.), along with the properties or

124 conditions of the skin being touched, and 2) the factors related to social and cultural context. Probably the

125 most important social factor regulating permissibility of social touch and influencing touch-related

126 emotional experience is the strength of the social bond between the interacting people [33]. According to

127 the touch attitudes and behaviors prevailing in a given culture, a culture can be classified as contact or

128 non-contact [34]; the typical patterns may widely vary for people with different strength of the social

129 bond (partners, relatives, friends, strangers) or for different contexts related to age, gender, social roles

130 etc. It has also been demonstrated that social and cultural attitudes and expectations can mediate touch

5

131 perception through cognitive labelling [35] or even by feeding false information on the gender of a person

132 providing manual touch stimulation [36]. Exposure to everyday social touch also modulates pleasantness

133 ratings and hedonic discrimination ability [37].

134 To move further into the domain of translational research we have to be equipped with a range of

135 appropriate research tools, including neuroscience methods assessing physiological responses directly,

136 psychophysical protocols for controlled stimulus delivery, and psychometric tools and clinical scales

137 enabling us assess behavior, attitudes, and experiences, and to take into account social and cultural

138 factors.

139

Psychophysical protocols and stimulus databases

141 Robotic tactile stimulation technique (RTS) was developed to deliver stroking stimuli with maximum

142 precision and control over timing, force and velocity [23], and several studies have used a range of

143 experimental observation protocols using RTS [20, 23, 38, 39]. Manual stimulus delivery protocols were

144 also used in several research papers [40-42], and it was confirmed that pleasantness rating for strokes

145 delivered by robotic and manual stimulation correspond very closely [43]. Most of the data that laid the

146 foundation of CT affective touch hypothesis were obtained using RTS or manual touch delivery

147 protocols, microneurography, neuroimaging methods, and subjective rating scales (Likert type or visual

148 analogue scales). Another approach to assess perceived pleasantness of touch was recently suggested by

149 Walker et al. [44], who used a series of short (5 sec) video clips depicting slow and fast strokes and static

150 touch delivered by hand to different body sites. The clips were intentionally made as impersonal as

151 possible by choosing close up angles not revealing the faces of the actors; the somewhat artificial nature

152 of the interaction and a clear lack of social context helps the viewers to concentrate on purely sensory

153 aspects of touch. Subjective ratings of the perceived pleasantness of the touch were found to be very

154 consistent and confirm that people strongly prefer slow touch to fast or static touch. A different approach

155 was taken by Masson and Op de Beeck [45] who created and validated a set of short video clips depicting

156 socio-affective touch events naturally occurring at different typical social contexts; this video set is more

157 suitable for capturing the social aspects of emotional touch perception.

Social touch questionnaires

There is a range of scales and questionnaires assessing individual, social, and cultural differences in terms of experiences and attitudes to affiliative social touch in different situations and contexts.

Most of the available measures are related to touch perception abnormalities in childhood (for review see [32]). For the purposes of our study the most closely related questionnaires are the touch avoidance measure (TAM) [46] measuring negative attitude to touch with the opposite or same sex; the familial touch orientation scale [47] assessing familial touch experience and linking it to attitude to and frequencies of sex-related social touch in public places; its modified version, Recollection of Early Childhood Touch scale [48]; the tactile type questionnaire (TACTYPE) [49] assessing 'tactile tendency' (attitudes to tactile interactions with same sex or different sex peers) in college-age students; the Questionnaire on Physical Contact Experience (QPCE) [15], a very brief 8-item measure assessing experiences of good, bad, and neutral touch, currently and in childhood along with current and childhood experience of love; and the Social Touch Questionnaire [50], a 20-item scale focused on being comfortable or having negative feelings in different situations related to social touch and devised to measure the impact of social anxiety on attitude to social touch. A recently developed questionnaire, the Touch Experiences and Attitudes Questionnaire (TEAQ) [51] is, probably, the first questionnaire assessing both attitudes and life experiences that has an established and validated factor structure. The original English (UK validated) version has 57 items and includes six subscales: Friends and Family Touch (FFT), Current Intimate Touch (CIT), Childhood Touch (ChT), Attitude to Self-Care (ASC), Attitude to Intimate Touch (AIT), and Attitude to Unfamiliar Touch (AUT). The original TEAQ and the scoring instructions are provided in Supporting information (S1 Table). The validation studies ascertained its good internal consistency, construct validity in terms of discriminant validity, known-group validity and convergent validity, and criterion-related validity in terms of predictive validity and concurrent validity. Good concurrent and predictive validity of the TEAQ compared to other physical touch measures (TAM, the Familial Touch Orientation (FTO) scale, the TACTYPE questionnaire, the Touch Test, the QPCE, the Physical Contact Assessment Questionnaire and the STQ) was identified.

185 As for the situation in Russia, we were unable to find in Russian any psychometric measure assessing

186 attitudes to and experiences of social touch, with a reported factor structure and psychometric properties.

187

Aim and general design of the study

189 Our general research aim was to construct and validate a Russian version of the Touch Experiences and

190 Attitudes Questionnaires (TEAQ). This measure would be able to assess attitudes to different kinds of

191 social touch occurring in different social contexts, and to report childhood and current touch experiences.

192 There are clear cultural differences in behaviors related to social touch within different cultures [52, 53],

193 leading to possible natural differences in factor structures of different national versions of multi-factor

194 psychometric tools. Our goal was to maximize the content validity for the Russian version, rather than

195 mechanistically reproducing the factor structure of the original English version of the TEAQ. This was to

196 be achieved by using a relatively wide initial pool of items (same as for the original English version of the

197 TEAQ) and by following the same steps as in the original English study to create an operational Russian

198 version. Such an approach may help to achieve higher content validity for each culture, similarly to the

199 approach suggested by the creators of International Personality Item Pool [54]. Such questionnaire should

200 also be well-suited for use with large and diverse samples of Russian-speaking respondents, including

201 clinical and vulnerable populations, therefore special attention should be paid to good cultural

202 admissibility of all the items. According to the aforementioned methodological considerations, the study

203 was performed in four stages:

204 **Study 1:** Assessing appropriateness of the items from the original English item pool for Russian culture.

205 **Study 2:** Exploratory factor analysis yielding an operational Russian version of the TEAQ (the TEAQ-

206 Rus) with acceptable consistency and reasonable factor structure.

207 **Study 3:** Confirming the factor structure with an independent sample of participants and reporting

208 general psychometric properties on the TEAQ-Rus.

209 **Study 4:** Identifying possible demographic differences in the TEAQ-Rus responses and cross-validating

210 the TEAQ-Rus against other personality constructs (Big Five traits and emotional intelligence) and other

211 touch assessment tools.

8

212 In the present study we tested the following hypotheses:

213   1) the resulting Russian version of the TEAQ would have a consistent factor structure reflecting attitudes

214 to social touch, and childhood and current experiences of social touch; the factor structures of English and

215 Russian versions of the TEAQ should be reasonably similar with possible minor differences due to

216 cultural specifics;

217 2) similarly to the original English version [51], the TEAQ-Rus subscale scores would be significantly

218 influenced by gender and cohabiting conditions and, to a much smaller degree, may be influenced by

219 education or age cohorts;

220 3) the subscales of the TEAQ-Rus would have good discriminant validity against other personality

221 measures, and would show positive correlations with emotional intelligence, reflecting the affiliative role

222 of affective touch;

223 4) participants with higher total TEAQ score would rate all kinds of observed touch as more pleasant, and

224 would show stronger preference for slow strokes.

225

Study 1

227 The aim of Study 1 was to pilot test the original pool of 117 TEAQ items, and to assess the appropriateness

228 of the items for Russian culture and their perceived connotations. As a result of Study 1, a subset of items

229 characterized by both adequate cultural appropriateness and reasonably high item-total correlations would

230 be selected for further analyses.

1.1. Methods

Participants

233 Participants were recruited through snowball sampling. To increase control over snowball sampling, the

234 number of the referrals was limited, all the referrals were instructed to try to collect the data from people

235 with different age, social, and educational background, and collected responses from no more than 10

236 participants per referral. All the referrals were qualified psychologists (at least a BA degree in psychology);

9

237   they were instructed to invite for participation people of diverse age and social backgrounds. All the

238   participants (N=232) freely agreed to answer a questionnaire and gave informed consent. Study 1, as with

239   all the other Studies reported in the present article, was approved by the Pushkin Institute research ethics

240   committee. Participants age varied between 16 and 79 years (M = 26.9, SD = 9.7), 149 participants were

241   female (64%) and 83 (36%) were male. Male and female samples did not differ significantly in terms of

242   age (p=0.670); mean age and SDs were also similar (Female: Mean = 26.68, SD = 9.25; Male: Mean =

243   27.25, SD = 9.27).

Materials

245   The original item pool was developed in English by Trotter et al. [55] and consisted of 117 statements

246   describing different kinds of positive affective touch (mostly hugs, kisses, skin-to-skin and hair-to-skin

247   contact, self-care, touching animals and different textures) occurring in appropriate social contexts with

248   partners, friends or relatives, and unfamiliar people, along with several general statements regarding social

249   touch.

250   Translation of the items into Russian was performed independently by three certified translators (one

251   holding PhD degree in Psychology, one in Neuroscience). A consensus version was composed collegially

252   by the translators and an impartial editor. Back-translation performed independently by two translators

253   unfamiliar to the original revealed no meaningful disagreement with the original version. The expert

254   committee has reviewed the translation and the general suitability of the item pool (how representative are

255   the items of Russian typical touch behaviors, how fully they cover different contexts typical for social

256   touch in Russian culture) and has assessed both as good. The items were used with a 5-point Likert scale

257   of agreement ('Disagree strongly' = 1, 'Disagree a little' = 2, 'Neither agree nor disagree' = 3, 'Agree a

258   little' = 4, 'Agree strongly' = 5), as was suggested by the authors of the original item pool. The complete

259   set of questions in English and in Russian is provided in Supporting information (S2 Table).

Procedure

261   The data were collected by the researchers via a paper and pencil questionnaire at a room at the university.

262   At the beginning, the participants were told that the aim of the study was to adapt for Russian-speaking

263   population a questionnaire originally composed in English. The participants were encouraged to make their

264   comments regarding the content of the items, their acceptability and admissibility for Russian culture. After

10

265 completion they were asked whether or not the questionnaire and individual items measures touch

266 experiences and their attitudes to social touch, in order to assess face validity of the questionnaire. It was

267 highlighted that there were no right or wrong answers for the items. The participants were assured that all

268 collected data would be confidential and anonymous and that no individual data would be analyzed.

269 **Qualitative and statistical analysis**

270 For Study 1 and for all other Studies responses for negatively phrased items were reverse scored so

271 that all item scores would reflect more positive attitude to touch or more frequent experiences. All

272 statistical analyses were performed using Statistica 10.0 software. More than 40% percent of the

273 participants expressed explicit complaints that the questionnaire was too long and incorporated

274 inappropriate or seemingly irrelevant questions. According to this feedback, two simple criteria were

275 formulated to exclude the items from the item pool used for exploratory factor analyses in Study 2:

276 1) Items deemed inappropriate by at least 20% of the participants were to be excluded.

277 2) Any items with very low item-total correlation (r <0.1) were to be excluded to further reduce the

278 volume of the item pool. This low threshold was selected as we could have expected the subscales within

279 the scale to be relatively independent from each other.

280 **1.2. Results**

281 Items containing explicit questions on intimate life were excluded as inappropriate, as 68% of participants

282 of the Study 1 sample considered them to be inadmissible for wide use in a questionnaire for Russian culture

283 (e.g., Q30, "I enjoy the physical intimacy of sexual foreplay"; Q57, "I enjoy having sex"). The inclusion of

284 explicitly sex-related items that are considered inappropriate by a large part of the respondents would affect

285 the respondents' experiences, causing possible vexation or embarrassment of the respondents and could

286 have compromised the integrity of respondents' answers to the other questions.

287 Cronbach's α as a measure of the TEAQ-117 internal consistency was 0.93, demonstrating a high level of

288 items' consistency. Despite that, 27 items had item-total correlations below 0.1; these items were also

289 excluded from further analyses. A pilot exploratory factor analysis confirmed that none of these items had

290 factor loadings higher than 0.4 on any of the factors for 5-factor or 6-factor models prompted by Cattell's

291 scree test [57]. Individual examination of items excluded due to low item-total correlations revealed that at

292 this stage all the items concerning touch other than interpersonal touch and self-care touch were excluded,

namely, touching or feeling different surfaces, "I don't like the feel of wool against my skin", r=-0.04), itching (Q1, "Having an itch scratched is very enjoyable", r=0.03) along with several general items that do not relate directly to touch, concerning emotional experiences (Q62, "I was alone a lot during my childhood", r=0.00), or skin quality (Q82, "I have dry skin", r=-0.04).

A pool of 85 retained items was selected for use in Study 2; each of the items was deemed appropriate for general Russian adult population.

Study 2

The goal of the second Study was to perform exploratory analysis for the reduced 85-item Russian TEAQ pool and to construct a reasonably brief questionnaire with good content and construct validity and a consistent factor structure to serve further as a suggested operational Russian version of the TEAQ.

2.1. Methods

Participants

A separate sample of 468 participants was recruited through a highly controlled version of snowball sampling, according to the procedure described in Participants section of Study 1. All the participants freely agreed to answer a questionnaire at this stage, 306 (65%) were female and 162 (35%) were male. Participants age varied between 16 and 79 years (M = 25.9, SD = 9.7). Male and female samples did not differ significantly in terms of age (p=0.119); mean age and SDs were also similar (Female: Mean = 25.40, SD = 9.73; Male: Mean = 26.87, SD = 9.56).

Materials and Procedure

The participants completed a questionnaire composed of 85 TEAQ items. Data were collected personally by the researchers via a paper and pencil questionnaire. At the beginning, the participants were told that the aim of the study was to adapt for Russian-speaking population a questionnaire originally composed in English. It was highlighted that there were no right or wrong answers for the items. The participants were assured that all collected data would be confidential and anonymous and that no individual data would be analyzed.

Statistical analysis and predictions

12

At this stage, the primary goal was to obtain the clearest and the most interpretable factor structure, therefore we used principal component analysis (PCA) as a factor extraction technique with varimax rotation [56]. All statistical analyses were performed using Statistica 10.0 software. After assessing the PCA component structure each individual item was to meet each of three preset criteria in order to be included into a brief operational Russian TEAQ version: 1) an item exclusion should lead to decrease of overall Cronbach's α; 2) an item should have the highest loading of at least 0.4 for any component [57]; 3) the two highest loadings of an item should not be too similar (a difference of at least 0.1 was required).

We expected that as a result of Study 2 we would compose a reasonably brief questionnaire of 30 to 60 items with an easily interpretable factor structure reflected in 3 to 7 subscales; the factor structure was expected to be reasonably similar to the factor structure of the original English version of the TEAQ, with one or more PCA components corresponding to each of the major domains of childhood touch, current touch, and attitudes to different touch-related behaviors.

2.2. Results and Discussion

Cronbach's alpha for the complete 85 item set was high (0.935) demonstrating high level of items' consistency, with an average inter-item correlation of 0.157. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy value was 0.901 with significance level for Bartlett's Test of Sphericity ≤ 0.001, therefore the dataset was considered fit for PCA.

Principal component analysis

According to Cattell's scree test [57], five component decision was selected for detailed analysis. Eigenvalues for this solution are presented in Table 1. We can see that five components account for 41.8% of the variance with the largest eigenvalue for the first component (18.93). The latter components have very similar eigenvalues of 5.32 to 3.14.

13

Table 1. Eigenvalues and percentage of variance explained for the 5-factor solution (Stage 2).

	Eigenvalue	Total variance (%)	Cumulative eigenvalue	Cumulative total variance (%)
Factor 1	18.93	22.27	18.93	22.27
Factor 2	5.32	6.26	24.25	28.53
Factor 3	4.48	5.27	28.74	33.81
Factor 4	3.62	4.26	32.36	38.07
Factor 5	3.14	3.70	35.51	41.78

According to the content of items loading highest on each factor, the five component solution yielded an easily interpretable factor structure. Consistent to the predictions, there were separate components for childhood touch experiences (ChT subscale, e.g. "My parents regularly cuddled me as a child"; "As a child I would often hug family members") and for current touch. Only items related to intimate touch scored high on this component therefore the subscale was defined as Current Intimate Touch (CIT subscale, e.g. "Most days I get a hug or a kiss", "I can always find somebody to physically comfort me when I am upset"). Three components reflected attitudes to different kinds of affective touch events: attitude to intimate touch (AIT subscale, e.g. "I find a hug very comforting when I am upset"; "I like to stroke the skin of someone I know intimately"), general attitude to friendly social touch and to touch with friends and relatives (Attitude to Friendly Touch or AFT subscale, e.g. "I enjoy having my skin groomed by other people", "Physical contact with other people is important to me"), and attitude to self-care (ASC subscale, e.g. "I like using body lotions", "I like the feel of shower gels against my skin").

Analysis of individual item loadings and effects of their exclusion on Cronbach's α reveals that only 37 items matched all the three inclusion criteria. The 37-item version had very high consistency (Cronbach's α=0.9201) with average inter-item correlation of 0.24. Each subscale also had high consistency (all Cronbach's α above 0.82). The paper and pencil version of the TEAQ-37 Rus with scoring instructions is also provided in Supporting information (S3 Table). Copyright of the TEAQ-37 Rus remains with the authors.

14

365 For all the items of the TEAQ-37 Rus the factor loadings, item-total correlations, and Cronbach's α if

366 deleted are provided in Supporting information (S4 Table) for the Study 2 sample.

367 There were several groups of items that failed to integrate into this factor structure during Studies 1 and 2,

368 one of such groups including attitudes to touch interactions with unfamiliar or less familiar people. Very

369 few comparative studies of nonverbal behavior assessing Russians have been published in international

370 peer reviewed journals, but the existing data point that according to Hall's classification modern Russian

371 culture is predominantly non-contact [59, 60], with particular reservation towards physical contacts with

372 strangers; unfamiliar touch that occurred quite frequently during Soviet times in crowded places and public

373 traffic can be unwillingly tolerated but never sought [61]. Another possible culture-specific facet of item

374 selection may be related to items related to hugs occurring in different contexts: most items concerning

375 habitual use of hugs as an informal greeting were excluded (i.e. "I always greet my friends and family by

376 giving them a hug" or "I usually hug my family and friends when I am saying goodbye") but the majority

377 of items concerning hugs as emotionally meaningful interactions were retained and included into either

378 AIT subscale ("Hugging someone is a good way of consoling them", "Sometimes I just need to be hugged")

379 or into CIT subscale ("Most days I get a hug or a kiss"). In Russian culture hugs are reserved for closer

380 friends and are often used in a more intimate manner, not as a social greeting but as a genuine gesture of

381 affection or consolation [60]. Opposite is true for handshakes that are a very common formal or semi-formal

382 greeting, but normally used between men only (possibly by women but usually on very formal occasions);

383 this is reflected in the results of a post-hoc ANOVA for a handshake related item ("I often shake hands with

384 people") showing a very robust effect of gender (F = 119.40, p<0.001) with mean value for the item for

385 females of 2.52 (SD = 1.27, Mode = 1), and for males of 3.86 (SD = 1.26, Mode = 5). Overall, such gender

386 differences raised a concern that the unequal females to males ratio in our sample would possibly

387 compromise the item composition and the factor structure. Separate exploratory factor analyses were run

388 for males and females, and the differences were found to be very minor, reflecting no significant influence

389 on the item composition and the factor structure of the TEAQ-37 Rus due to the sample gender composition.

390 In summary, Study 2 led to the construction of a 37-item Russian version of the TEAQ (TEAQ-37 Rus)

391 which was characterized by high internal consistency and a clear five-factor structure (Attitude to Friendly

392 Touch (AFT), Childhood Touch (ChT), Attitude to Self-Care (ASC), Current Intimate Touch (CIT), and

393 Attitude to Intimate Touch (AIT)). The TEAQ-37 Rus was suggested as an operational version for Studies

15

394   3 and 4 (confirmatory factor analysis and validating the TEAQ-37 Rus against other psychometric

395   measures). Psychometric properties of the TEAQ-37 Rus will be reported in details according to the data

396   obtained from the confirmation sample (Study 3), to eliminate possible interference of the responses to the

397   items of the TEAQ-37 Rus with responses to the items excluded from further analyses during Study 2.
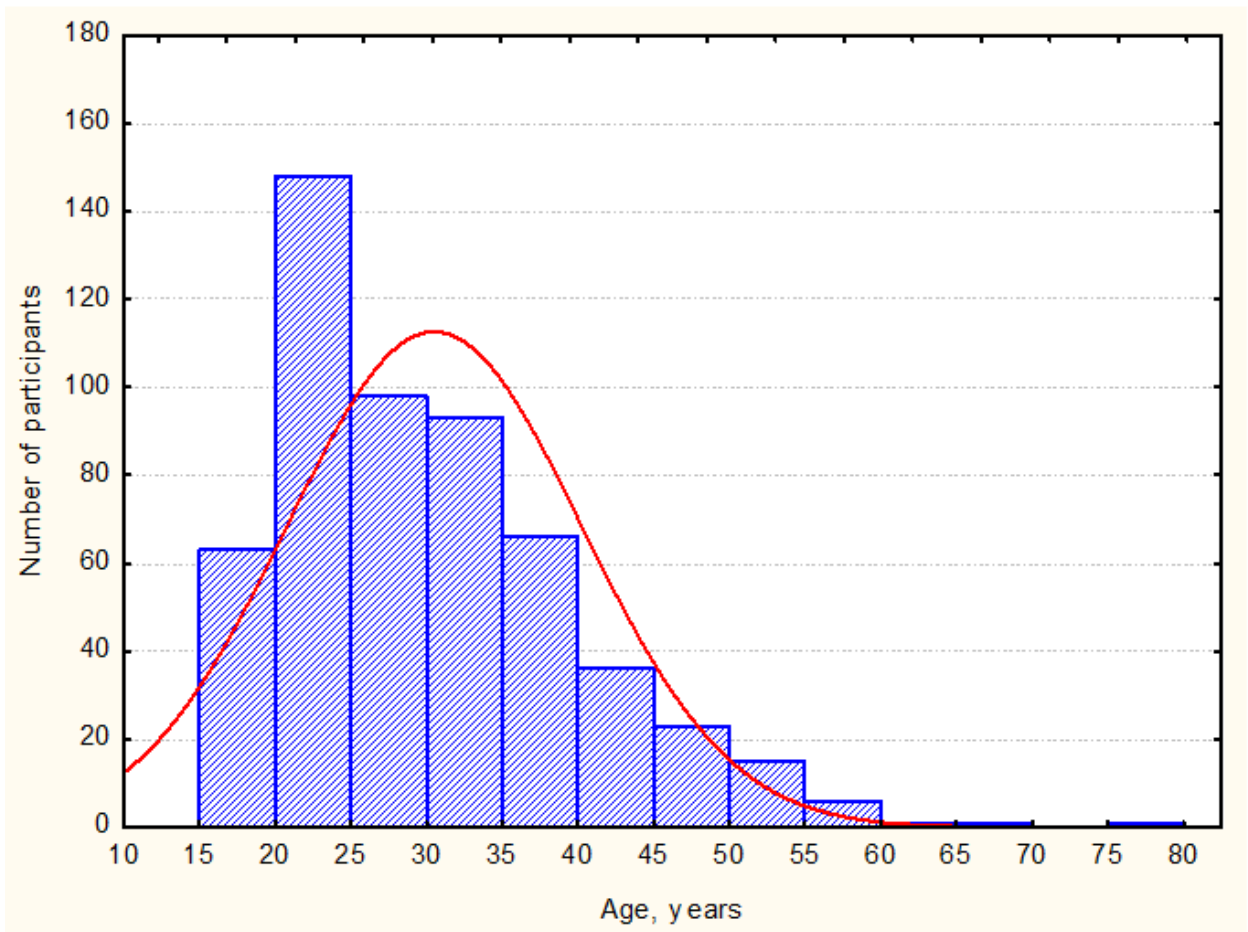
Study 3

399 At this stage of the research we aimed to confirm internal consistency and the validity of the previously

400 obtained factor structure of the 37-item version of Russian TEAQ (TEAQ-37 Rus) with confirmatory factor

401 analysis (CFA) using the data collected from the third sample of Russian speaking participants and to

402 describe general psychometric properties of this version of the questionnaire.

403 ## 3.1 Methods

404 ### Participants

405 To increase the ecological validity of the CFA sample the data collection was performed by two methods:

406 a) Group A: a highly controlled version of snowball sampling as described above, providing minimal

407 participation bias, 280 participants (167 female, 113 male); and b) Group B: data collected through an

408 internet survey to increase the coverage of different social and age groups, 271 participant (209 female, 62

409 male). For the purposes of Study 3 both samples were included in a general sample and analyzed together.

410 The total sample included 551 participants (376 female, 68%), with no missing TEAQ-37 Rus, age, or

411 gender data for any of the participants. Participants age varied between 16 and 79 years (M = 30.5, SD =

412 9.76), age distribution across the sample is reported in Fig 1. Male and female samples did not differ

413 significantly in terms of age (p=0.54); mean age and SDs were also similar (Female: Mean = 30.69, SD =

414 10.21; Male: Mean = 30.14, SD = 8.71).

415

416 **Fig 1. Age distribution for Study 3 sample.**

417

418

419

420

421

422

423

424

425

426 ## Materials and Procedure

427 All the data for the Study 3 were collected through online forms. The participants from Group A completed

428 the forms at a room at the university, the participants from Group A completed the forms at home. The

429 participants completed the TEAQ-37 Rus along with several other psychometric tools to assess construct

430   and concurrent validity of the TEAQ-37 Rus within Study 4, so the samples for studies 3 and 4 were the

431   same. For the details on other questionnaires and psychometric instruments used see Study 4, Methods. The

432   composition of the questionnaires for different subsamples was different in order to keep the assessment

433   time within reasonable limits. Total average assessment time did not exceed 30-35 minutes for any

434   subsample. The participants within each subgroup were randomly assigned to one of 4 questionnaire

435   sequences with counterbalanced order of questionnaires. According to the collected feedback, all the

436   questionnaires and the whole procedure was tolerated well.

Statistical analysis

438   CFA was performed in AMOS 21.0.0 software using method of maximal likelihood. The criteria used to

439   determine goodness of model fit were a Root Mean Square Error of Approximation (RMSEA), a

440   Comparative Fit Index (CFI), Relative chi-square (CMIN/DF), and Non-normed fit index NNFI (TLI) [62].

441   Re-assessment of the factor structure was also performed at this stage to report Cronbach's α and factor

442   loadings for all the items for the TEAQ-37 Rus for the validation sample. Factor analysis settings were

443   identical to Study 2 (PCA as factor extraction technique, Varimax rotation. Distribution assessments

444   (Kolmogorov-Smirnov test) and subscale cross-correlation analysis were performed to evaluate general

445   psychometric properties of the subscales.

446

3.2. Results and discussion

448   **CFA.** Initial analysis was performed for a five factor model where each item loaded for only one factor,

449   with no consideration for possible loadings for two factors and variances of errors for individual items. This

450   model demonstrated nearly satisfactory fit (see Model 1 in Table 2). A modified Model 2 considering

451   covariances of errors for items with similar content (item pairs 33-25, 33-37, 36-27, 3-2, 7-34, 28-9, 35-21,

452   26-12, 19-16, 8-4, 4-5) demonstrated satisfactory fit (Table 2) [62]. The path diagram for the CFA is

453   provided at Fig 2.

454

455 **Table 2. CFA fit indices of assessed models (Stage 3).** CMIN/DF - Relative chi-square; CFI -

456 comparative fix index; NNFI (TLI) - non-normed fit index; RMSEA - root mean square error of

457 approximation.

458

Model	CMIN/DF	CFI	NNFI (TLI)	RMSEA
1	3.809	.817	.803	.071
2	2.922	.877	.865	.059

459

460

461

20

462 **Fig 2. CFA Path diagram for Model 2 of the TEAQ-37 Rus.**

463 Rectangles indicate measured variables and large ellipses represent TEAQ-37 Rus subscales. Covariances
464 of errors between items with similar content are shown.

465

466

467
468
469
470
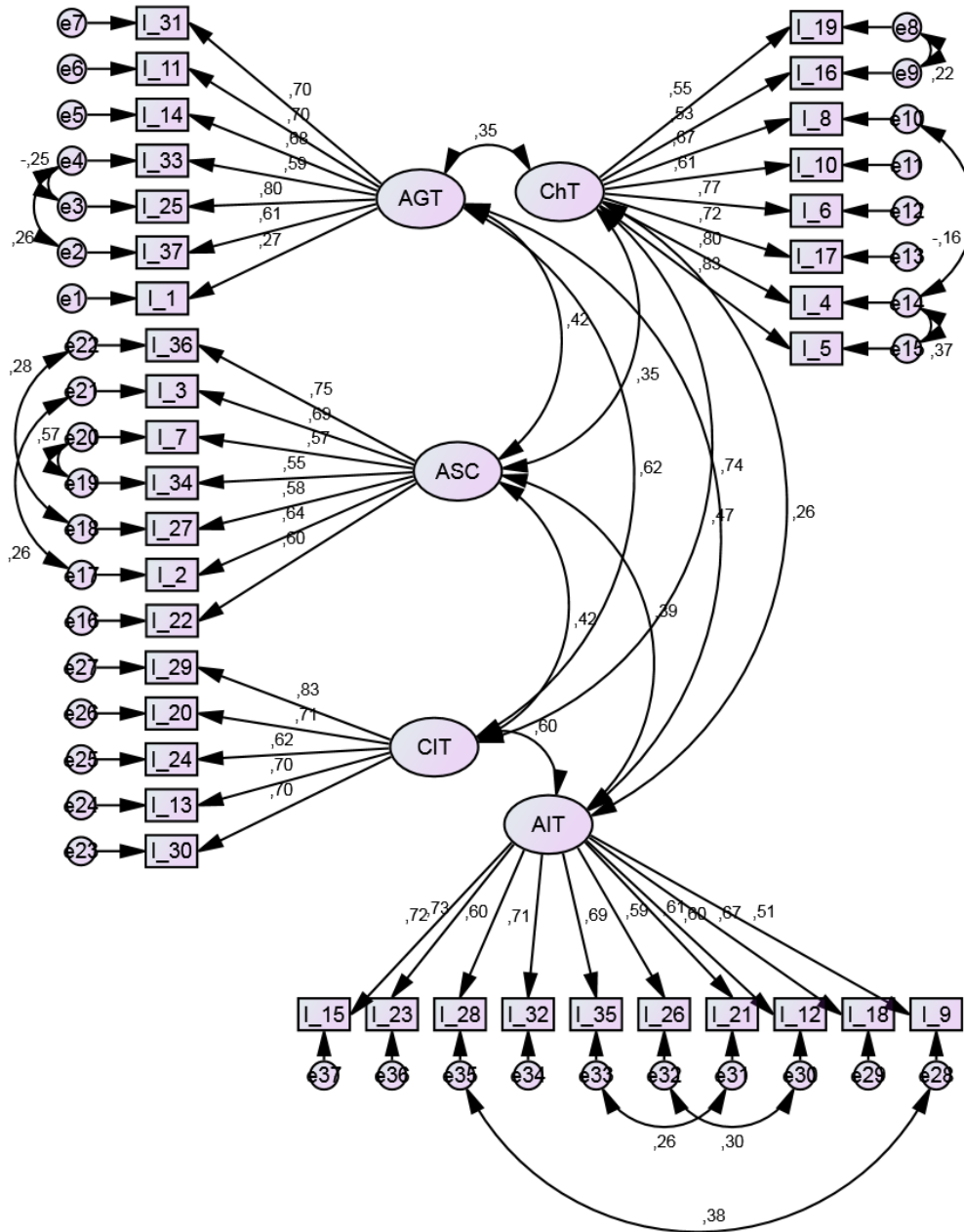
21

Replication of the original factor structure and reporting general psychometric properties

The principal component analysis repeated for Study 3 sample corresponded very closely to the results of the CFA; the same five components were observed as for Study 2 sample: Attitude to Friendly Touch (AFT), Childhood Touch (ChT), Attitude to Self-Care (ASC), Current Intimate Touch (CIT), and Attitude to Intimate Touch (AIT). The 5-factor model explained 54% of the total variance. The item loads were very good to moderate, the worst load being 0.427 and the next worst being 0.499. General scale reliability and factor reliabilities were high (total Cronbach's $\alpha = 0.920$, Cronbach's α for the factors ranging from 0.88 to 0.83). The factor loads for all the items, Cronbach's α, and percentage variance explained for all the subscales are shown in Table 3.

22

483 **Table 3: TEAQ-37 Rus Factor Structure.** Factor loading of each item are shown. (R) after item

484 numbers denotes reverse scored items. At the bottom of the table Cronbach's α and percentage variance

485 explained by each factor are given.

Items of the TEAQ-37 Rus, with numbers	AFT	ChT	ASC	CIT	AIT
31. I enjoy having my skin groomed by other people	*0.72*	0.04	0.08	0.25	0.16
11. Physical contact with other people is important to me.	*0.66*	0.12	0.15	0.12	0.28
14. I enjoy grooming other people's skin.	*0.66*	0.07	0.06	0.18	0.23
33. I am on huggable terms with quite a few people	*0.63*	0.14	0.11	0.09	0.18
25. In general, I would describe myself as a physically affectionate person.	*0.51*	0.12	0.12	0.36	0.42
37. I like it when my friends and family greet me by giving me a hug.	*0.50*	0.21	0.27	0.04	0.42
1 (R). I dislike people being very physically affectionate towards me.	*0.43*	-0.01	-0.09	0.06	0.04
5. My parents regularly cuddled me as a child	0.08	*0.85*	0.02	0.14	-0.00
4. There was a lot of physical affection during my childhood	0.06	*0.79*	0.10	0.20	-0.04
17. As a child my parents always comforted me when I was upset	-0.04	*0.78*	0.02	0.11	0.02
6. As a child I would often hug family members	0.22	*0.73*	0.08	0.13	0.09
10. As a child my parents would tuck me up in bed every night and give me a hug and a kiss goodnight	0.03	*0.69*	0.07	-0.01	0.09
8. As a child I found a hug from my parents when I was upset made me feel much happier	0.17	*0.64*	0.18	0.09	0.19
16. My mother regularly bathed me as a child	-0.05	*0.61*	0.22	0.03	0.11
19. As a child my parents would often hold my hand when I was walking along with them.	0.04	*0.60*	0.13	0.12	0.17
36. I like to use face masks on my skin	0.13	0.11	*0.78*	0.12	0.06

Item					
3. I like using body lotions	0.14	0.14	*0.70*	0.11	0.01
7. I like to use bath essence when having a bath	0.00	0.11	*0.68*	0.05	0.18
34. I like having a bath with lots of bubble bath.	-0.01	0.06	*0.67*	0.10	0.15
27. I like exfoliating my skin	0.13	0.05	*0.66*	0.14	-0.02
2. I like using moisturisers on my skin	0.08	0.14	*0.65*	0.07	0.13
22. I like the feel of shower gels against my skin.	0.09	0.06	*0.63*	0.07	0.17
29. I often have my skin stroked.	0.26	0.22	0.11	*0.78*	0.09
20. Most days I get a hug or a kiss.	0.15	0.16	0.15	*0.70*	0.12
24. I often share a romantic kiss	-0.07	0.12	0.10	*0.67*	0.38
13. I can always find somebody to physically comfort me when I am upset	0.13	0.29	0.10	*0.64*	0.16
30. I often hold hands with someone I am fond of.	0.35	0.12	0.15	*0.57*	0.28
15. I enjoy being cuddled by someone I am fond of	0.24	0.09	0.01	0.04	*0.73*
23. I enjoy holding hands with someone I am fond of	0.13	-0.02	0.17	0.26	*0.69*
28. Kissing is an enjoyable part of expressing romantic feeling	-0.08	0.07	0.04	0.35	*0.67*
32. I like to stroke the skin of someone I know intimately	0.14	0.01	0.05	0.36	*0.64*
35. I find a hug very comforting when I am upset	0.34	0.10	0.25	0.08	*0.63*
26. It's good to console people you know well with strokes and hugs	0.21	0.08	0.03	0.07	*0.63*
21. Sometimes I just need to be hugged	0.27	-0.02	0.20	-0.04	*0.63*
12. Hugging someone is a good way of consoling them.	0.36	0.12	0.10	-0.01	*0.59*
18. I enjoy the feeling of my skin against someone else's if I know them intimately	0.22	0.04	0.03	0.27	*0.58*
9. Kissing is a great way of expressing physical attraction.	-0.02	0.15	0.04	0.26	*0.56*
Total variance explained	*0.54*	0.09	0.12	0.10	0.09	0.14
Cronbach's α	*0.92*	0.84	0.85	0.84	0.83	0.88

486

487

488

24

489   The confirmatory analyses yielded results proving adequate face validity and internal consistency of the

490   37-item version of the questionnaire (TEAQ-37 Rus). This version is therefore treated as an operational

491   Russian version of the TEAQ in this manuscript and all the further statistical analyses in Study 3 and

492   Study 4 are performed for the TEAQ-37 Rus. All the resulting subscales are scored and named according

493   to the initial factor analysis and CFA results: Attitude to Friendly Touch (AFT), Childhood Touch (ChT),

494   Attitude to Self-Care (ASC), Current Intimate Touch (CIT), Attitude to Intimate Touch (AIT). The total

495   TEAQ-37 Rus score is calculated as the sum of the subscale scores.

496   Mean TEAQ-37 Rus score for the sample was 122.33 (SD = 22.15), there were no participants who got

497   highest or lowest possible score (185 or 37), so no floor or ceiling effect was observed. The total TEAQ-

498   37 Rus score distribution for the Study 3 data sample was assessed as not differing significantly from

499   normality (K-S test, p>0.1). The distributions of all the subscales was also normal or close to normal

500   (p>0.001 for all the subscales). No prominent ceiling or floor effects was observed for any subscale. The

501   most prominent skewness and the largest ceiling effects (7.63%) were observed for AIT subscale, indicating

502   that gentle touch between close people is generally perceived as very pleasant by the majority of our

503   participants.

504   All the subscales significantly correlated with each other (all $p < 0.0001$), with low to moderate strength of

505   the observed correlations (see Table 4). Attitude to personal grooming correlated least with other

506   components and current social touch correlated most. The strongest correlation was between AFT and AIT

507   ($r = 0.62$). The weakest correlation was between ChT and AIT ($r = 0.25$).

508

25

509 **Table 4. TEAQ-37 Rus subscale data.** Mean and standard deviations are provided for subscale score
510 sums, and correlation coefficient values are given for correlations between the subscales.

	Means	SD	AFT	ChT	ASC	CIT	AIT
AFT	22.63	5.765	-	0.30	0.33	0.49	0.62
ChT	25.05	7.423	0.30	-	0.30	0.40	0.25
ASC	18.68	5.671	0.33	0.30	-	0.33	0.33
CIT	15.80	5.164	0.49	0.40	0.33	-	0.53
AIT	40.35	7.099	0.62	0.25	0.33	0.53	-

511
512

514

516
517

519

520

521

26

Study 4

At this stage of the research we aimed to test experimental hypotheses 2, 3, and 4, by identifying possible demographic differences in TEAQ-37 Rus responses and by assessing construct and criterion validity of the TEAQ-37 Rus. For general details of the sample composition and the experimental procedure see Study 3, Methods.

At the beginning of Study 4, after obtaining and validating the factor structure of the TEAQ-37 Rus, and after assessing the data on the English version of the TEAQ [51], it was possible to formulate and to put to test more specific experimental hypotheses to further expand previously formulated general experimental hypotheses 2 and 3 (see Introduction):

2.1) Female participants would have higher general TEAQ-37 Rus score, and particularly higher score at ASC TEAQ-37 Rus subscale;

2.2) The correlation between age and attitudes toward social touch would be insignificant or relatively small, though for experience-related subscales there may be a difference between different age groups, particularly for childhood experience, due to gradually improving attitude to nurturing family touch from 1970-1980s to 1990-2000s [4, 62]; education would have little to no effect on TEAQ-37 Rus score;

2.3) People living alone would score lowest on current intimate touch, and people living with partners would score highest;

3.1) In terms of convergent and discriminant validity measured against the Big Five factors, the TEAQ-37 Rus subscales would have insignificant to low strength correlations with the Big Five factors, except for Extraversion and Openness factors that would have low to moderate strength positive correlations with the TEAQ-37 Rus subscales;

3.2) There would be weak to moderate positive correlation with emotional intelligence for the TEAQ-37 Rus subscales.

4.1. Participants and methods

27

Demographics

Age and gender effects were assessed for all of the Study 4 sample participants (n=551). For the majority of the participants data were collected for education (n = 399); most participants had higher education (n = 276), 77 participants had unfinished higher education, and 46 participants had general school or vocational school education. Cohabiting status was assessed for 325 participants (243 female, 82 male), response options were "Living alone" (n = 56), "With a spouse/partner" (n = 151), and "With relatives other than a spouse/partner, or with friends/peers" (n = 147).

Psychometric measures

The TEAQ-37 Rus and demographic assessment questions preceded several other psychometric tools to assess construct and concurrent validity of the TEAQ-37 Rus. Different combinations of psychometric instruments were used for different population subsamples to provide a range of measures to validate against, keeping in mind that total assessment time should not exceed 30-35 minutes for any participant. To the best of our knowledge, the TEAQ-37 Rus is the only psychometric measure in Russian that assesses attitudes to and experiences of social touch, with reported factor structure and psychometric properties, therefore it was not possible to validate it against established touch-related self-report questionnaires. To assess the discriminant validity of the TEAQ-37 Rus, we have collected data on personality traits according to the Big Five model, and on EmIn measure of emotional intelligence. To assess the criterion validity of the TEAQ-37 Rus and to further assert the link between the psychometric measures of touch and the C-tactile system, the TEAQ-37 Rus was also validated against the Affective Touch Video clips. A sample of 325 participants (243 female, 82 male) completed the TEAQ-37 Rus, NEO-FFI, and viewed Affective Touch Video clips (always in this particular sequence); a smaller sample of 74 participants completed the TEAQ-37 Rus and EmIn.

Big Five personality trait assessment

Big Five personality model [63] was used for cross-validation as one of the most widely used personality models focusing on personality traits related to social performance. There are several questionnaires in Russian assessing the Big Five personality traits developed for adults [64]. The most popular and better

28

573 validated versions are adaptations of the NEO-PI-R and the NEO-FFI [65], an adaptation of Goldberg's

574 100-item IPIP scale [66], and yet another Russian version of the NEO-FFI [67, 68]. The latter Russian

575 version of NEO-FFI was selected for the purposes of the study as it is reasonably brief and its factor

576 structure has been extensively replicated on different samples [69, 70].

EmIn questionnaire

578 EmIn questionnaire was selected to measure emotional intelligence as it the most widely used and

579 thoroughly validated Russian questionnaire for self-assessment of emotional intelligence [71-75]. It is

580 composed of 46 items and provides general score for self-assessed emotional intelligence, and subscale

581 scores for Emotion Recognition (ability to recognize emotions in self and others), Emotion Management

582 (ability to manage the emotional state of self and others), Interpersonal Emotional Intelligence (ability to

583 recognize and manage emotions of others), and Self-directed Emotional Intelligence (ability to recognize

584 and manage own emotions).

Affective Touch Video clips

586 To test the experimental hypothesis 4 and to assess criterion validity of the TEAQ-37 Rus, for a population

587 subsample we administered short video clips depicting actors being touched by another person at different

588 velocities and at different body sites. Subjective ratings of perceived pleasantness of the touch (325

589 participants; 243 female, 82 male) were recorded. The video set used for the present study were similar to

590 the set developed earlier by Walker and colleagues (2017) but was significantly expanded: there were two

591 actor pairs (a male touching a female and a female touching a male), three velocities (static touch, slow

592 strokes with a velocity of 5 cm/s, and fast strokes with a velocity of 30 cm/s), and eight different body skin

593 sites being touched (palm, hand, dorsal and ventral forearm, upper arm, back, side of the face, and back of

594 the head), 48 videos total. All the videos were 6 s long, had original quality of Full HD (1920×1080 pixels)

595 at 25 fps rate, and were presented at 240 p YouTube quality. Close up angles were used in order not to

596 reveal the faces of the actors, to make the videos less personal. Examples of the videos in YouTube quality

597 are provided in Supporting information (S4 – S6 videos), and the whole video set is available on request.

598 The videos were presented in four randomly assigned counterbalanced sequences. After watching each

599 video clip the participants rated the perceived pleasantness of the touch for the person being touched, on a

29

Likert scale from 1 (very unpleasant) to 7 (extremely pleasant). It has been previously demonstrated that videos depicting slow strokes are consistently rated as the most pleasant kind of touch for hairy skin sites (Walker et al., 2017).

Statistical analysis

According to the results of distribution tests (see Study 3) and taking into account large sample sizes, the distributions were close enough to normality to justify the use of parametric statistics for correlations and between-group comparisons for total TEAQ-37 Rus scores and subscale scores, therefore Pearson's correlation coefficients (r) were used. Bonferroni correction was applied as appropriate for all multiple comparisons where specific predictions had not been formulated.

One way between group ANOVAs were used to assess the effects of gender (Gender Group (2)), cohabiting status (Cohab Group (3)) and education (Education Group (3)) on the TEAQ-37 Rus subscale scores for each subscale. To evaluate the relationship between TEAQ-37 Rus scores and perceived pleasantness of touch in touch video clips we had divided the sample into two groups based on TEAQ-37 Rus total scores, median split: TEAQ-37 Rus < 122 (n = 167) and TEAQ-37 Rus ≥ 122 (n = 170). Omnibus repeated measures ANOVA (TEAQ Group (2) * Velocity (3) * Site (8) * Actor Pair (2)) was used to evaluate relations between TEAQ-37 Rus score and perceived pleasantness of touch depicted in video clips. Greenhouse-Geisser sphericity corrections were used where appropriate (corrected p values are provided). Scheffé's post hoc tests were used as both within-group and between-group comparisons were of interest.

4.2. Results

Demographic group effects

Means and SDs for all the TEAQ-37 Rus subscales for gender, education and cohabiting status groups are provided in Table 5.

30

623   **Table 5. Demographic group data for Study 4.**

	Gender				Cohabiting Status						Education					
	Female (N=376)		Male (N=175)		Single (N=58)		With Relatives/Friends (N=128)		With a Partner (N=151)		School (N=46)		Unfinished Higher (N=77)		Higher (N=276)	
Subscale	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
AFT	23.13	5.84	21.58	5.46	21.47	7.10	22.59	6.17	22.77	6.09	21.96	6.63	21.62	6.17	23.17	6.17
ChT	25.45	7.85	24.18	6.36	23.60	6.49	23.41	7.70	23.97	7.74	23.92	8.28	25.22	8.20	24.22	7.30
ASC	20.26	5.15	15.28	5.24	16.95	4.63	18.62	5.57	17.81	5.81	18.35	5.73	18.25	5.30	18.23	5.86
CIT	16.38	5.11	14.57	5.08	12.14	4.83	13.70	5.31	17.64	4.53	14.53	6.07	15.32	5.54	15.92	5.25
AIT	41.15	6.89	38.63	7.25	39.53	6.91	40.42	8.17	41.56	6.20	40.86	7.63	40.03	7.98	41.22	6.86

624

625

626   **Gender.** According to the ANOVAs for the TEAQ-37 Rus subscales, female participants scored

627   significantly more for Attitude to Self-Care ($p_{corr} < 0.001$), Attitude to Friendly Touch ($p_{corr} = 0.016$),

628   Attitude to Intimate Touch ($p_{corr} < 0.001$), and Current Intimate Touch ($p_{corr} < 0.001$) subscales; there were

629   no relations between Gender and Childhood touch ($p_{corr} = 0.21$). The most robust Gender effect, consistent

630   with the predictions, was observed for Attitude to Self-Care (see Table 5).

631   **Age.** A correlation of low strength but of relatively high significance due to large sample size ($r = -0.16$,

632     $p_{corr} = 0.001$) was observed for Childhood Touch subscale reflecting that participants of older cohorts tended

633   to receive slightly less affective touch in their childhood. No significant correlations with Age were

634   observed for any other TEAQ-37 Rus subscale (all rs < 0.06, all $p_{suncorr} > 0.15$).

635   **Cohabiting status.** Between group ANOVAs revealed that the effect of Cohabiting status was significant

636   only for Current Intimate Touch subscale ($F_{(2, 322)} = 35.19$, $p_{corr} = 0.001$, $\eta_p^2 = 0.18$), pointing that, as

637   expected, participants living with spouses or partners had the highest amount of tactile interactions with

638   close people, and participants living alone had the lowest CIT score (see Table 5). No significant effects

639   were observed for any other TEAQ-37 Rus subscale (all $p_{suncorr} > 0.10$).

640   **Education.** Between group ANOVAs revealed no significant effect of education level on any TEAQ-37

641   Rus subscale (all $p_{suncorr} > 0.1$).

642   **Validation of TEAQ-37 Rus against other psychometric measures**

643 **Big Five personality factors.** The correlations of the TEAQ-37 Rus subscales with the Big Five personality

644 factors are given in Table 6. Consistent with the predictions, the strongest correlations were observed for

645 Extraversion (r values ranging from 0.47 for AFT subscale to 0.20 for ASC subscale). Weak but significant

646 correlations with all the TEAQ-37 Rus subscales were observed for Openness (r ranging from 0.25 to 0.18).

647 For Agreeableness weak significant correlations were observed for AFT, ChT, CIT, and AIT (r ranging

648 from 0.30 to 0.18) but not for ASC. Conscientiousness correlated with CIT only, and Neuroticism correlated

649 with AFT only. All the significant correlations with the Big Five personality factors were positive for all

650 the TEAQ-37 Rus subscales.

651

652 **Table 6. Correlations of the TEAQ-37 Rus subscales with the Big Five personality factors (r values).**

	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness
AFT	0.01	**0.47**	**0.25**	**0.30**	-0.02
ChT	-0.07	**0.27**	**0.17**	**0.18**	0.00
ASC	**0.21**	**0.20**	**0.20**	0.09	0.05
CIT	-0.05	**0.44**	**0.22**	**0.18**	**0.15**
AIT	0.06	**0.38**	**0.23**	**0.23**	0.03
TEAQ-37 Rus Total	0.04	**0.49**	**0.30**	**0.28**	0.05

653

654

655

Emotional intelligence (EmIn). The correlations of the TEAQ-37 Rus subscales with different facets of emotional intelligence, as measured by EmIn, are given in Table 7. All the significant correlations with the EmIn subscales were positive for all the TEAQ-37 Rus subscales. Consistent with the predictions, there was a significant correlation of moderate strength ($r = 0.33$) between total TEAQ-37 Rus score and total EmIn score. While all the TEAQ-37 Rus subscales had positive significant correlations with Interpersonal Emotional Intelligence (r ranging from 0.30 to 0.54) and with Emotion Recognition (r ranging from 0.30 to 0.45), no significant correlations were found for Self-directed Emotional Intelligence, and for Emotion Management the only significant correlation was observed with CIT TEAQ-37 Rus subscale.

664

Table 7. Correlations of the TEAQ-37 Rus subscales with the EmIn subscales (r values).

	Interpersonal EI	Self-directed EI	Emotion Recognition	Emotion Management	EmIn Total
AFT	**0.39**	0.06	**0.34**	0.16	**0.28**
ChT	**0.41**	0.04	**0.31**	0.18	**0.28**
ASC	**0.30**	-0.11	**0.30**	-0.07	0.12
CIT	**0.54**	0.11	**0.45**	**0.26**	**0.40**
AIT	**0.31**	0.04	**0.32**	0.05	0.21
TEAQ-37 Rus Total	**0.50**	0.03	**0.44**	0.14	**0.33**

666

667

668   **Affective touch video.** In terms of general effects an extremely robust effect of Velocity was observed

669    $(F(2, 646)=419.77, p_{corr}<0.001,$ partial eta-squared $\eta^2=0.56)$ along with highly significant effect of skin site

670    $(F(7, 2261) = 55.24, p_{corr}<0.001, \eta_p^2 = 0.14)$ and interaction Velocity*Site $(F(14, 4522) = 33.50, p_{corr}<0.001,$

671    $\eta_p^2=0.09)$ revealing that, according to the expectations, there was a very strong preference of slow strokes

672   compared to fast strokes, and a somewhat smaller but still a very significant preference for slow strokes

673   over static touch for all the sites with hairy skin (for all post hoc comparisons p<.001). In terms of TEAQ-

674   37 Rus group-related effects there was a highly significant effect of Group $(F(1, 323)=27.08, p_{corr} <0.001,$

675    $\eta^2=0.08)$ and an interaction Group*Velocity $(F(2, 646)=8.68, p_{corr}=0.001, \eta^2=0.03).$ Post-hoc comparisons

676   (Fig 3) indicate that, as predicted, participants with higher TEAQ-37 Rus scores rated all the kinds of touch

677   as more pleasant, with a particularly stronger preference for slow, CT-optimal touch.

678   **Fig 3. Perceived pleasantness ratings of touch videos for participants with low and high total TEAQ-**

679   **37 Rus scores.**

680   Stars indicate significance levels in post hoc tests (*: p<.05, **: p<.01, ***: p<.001).

681

682

683
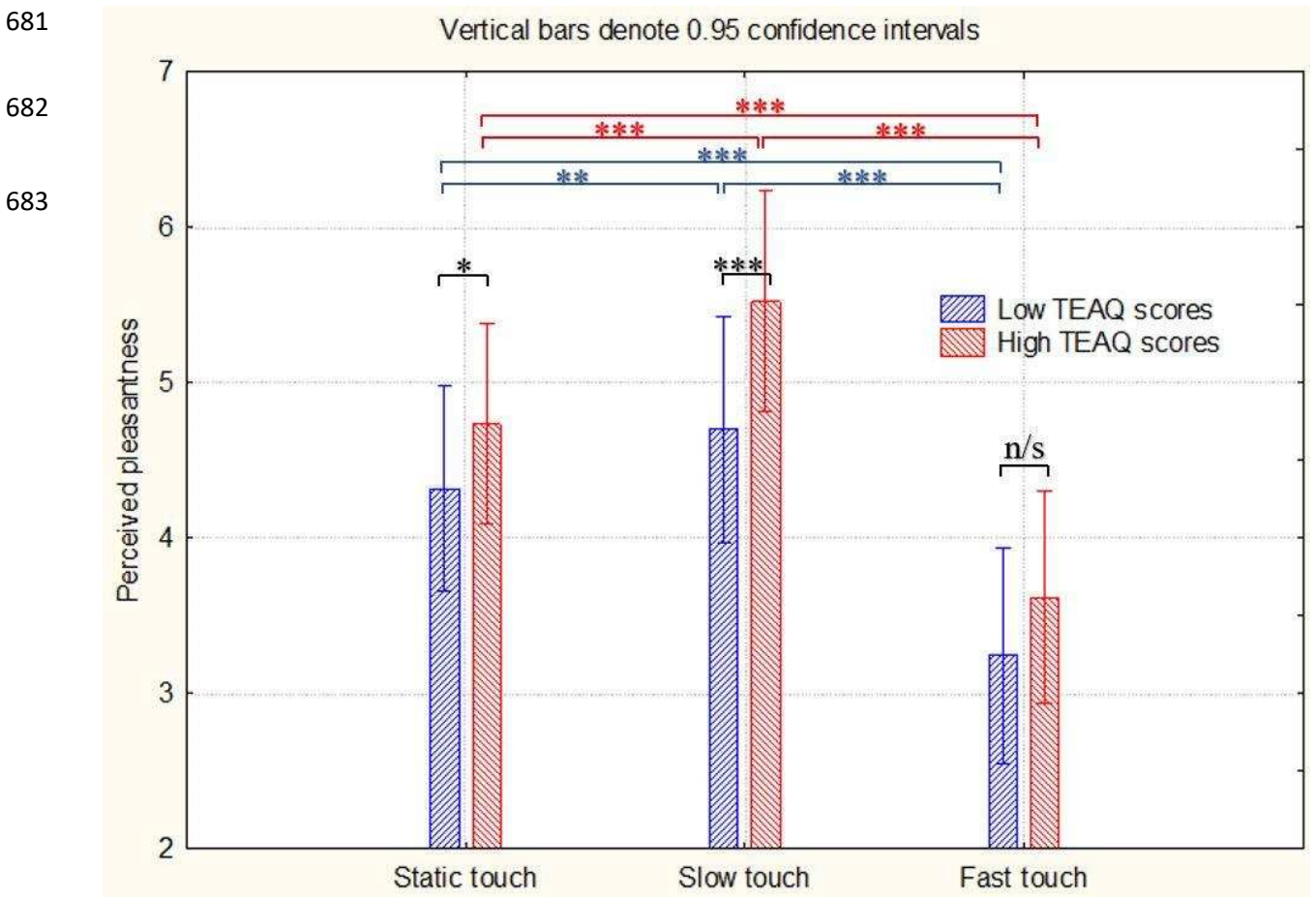
General Discussion

Culture-specific and biologically determined aspects of emotional touch

The aim of this study was to construct a Russian version of the TEAQ questionnaire originally designed in English to assess attitudes to and experience of affective touch and validated on a British population sample [51, 55], and to test the first evidence of its validity and reliability. A large initial pool of 117 touch-related items, after being subject to cultural appropriateness examination and principal component analysis, was reduced to a reasonably compact 37-item questionnaire characterized by good face validity and clear five-factor structure. The factors related to Attitude to Friendly Touch subscale (AFT), Childhood Touch subscale (ChT), Attitude to Self-Care subscale (ASC), Current Intimate Touch subscale (CIT), and Attitude to Intimate Touch subscale (AIT). Very high Cronbach's α for the whole scale and high Cronbach's α for all the subscales suggested good reliability. The reliability of the 5-factor structure of the TEAQ-37 Rus was confirmed using CFA with a satisfactory model fit on a separate sample; high values for Cronbach's α were also replicated. The cohort for this study was characterized by reasonably good age coverage. Due to the nature of the recruitment process the validation sample was somewhat skewed towards university students and people with higher education but there were no noticeable effects of education on TEAQ-37 Rus scores indicating that the TEAQ-37 Rus would yield similar results for people with different social backgrounds within a given culture; further research is needed to provide better estimates for influence of social and subcultural backgrounds on touch-related attitudes and behaviors.

The British version of the TEAQ was constructed and validated on similar samples (618 participants for exploratory factor analysis sample at the item reduction stage, 71.2 % female, mean age 26.9; 704 participants for CFA sample, 73.7% female, mean age 27.4), and has a very similar factor structure. There are 57 items yielding 6 factors, with five factors being very closely equivalent to the factors of the TEAQ-37 Rus (childhood touch, friendly touch, attitude to self-care, attitude to intimate touch and current intimate touch). The only factor present in the original English version that has not been reproduced on the Russian samples is 'Attitude to Unfamiliar Touch'; we would presume that this is probably a consequence of a very reserved attitude towards physical contacts with unfamiliar people and of low incidence of voluntary

35

711 physical contacts with strangers in Russian culture. If it is indeed the case, tolerance to touch with strangers

712 in Russian-speaking populations may be better accounted not by general attitude to the positive aspects of

713 touch but by other personality traits and attitudes, including attitude to personal boundaries. This

714 explanation is supported by the results from a large cross-cultural study assessing attitudes to acceptability

715 of social touch [31] revealing that Russians use touch in more conservative patterns compared to all the

716 other countries participating in the study (UK, Italy, France and Finland). The factor structure of the TEAQ

717 versions has also confirmed the importance of emotional bond strength revealing that distinct patterns of

718 tactile behavior and attitudes are naturally observed for interactions with emotionally close people, with

719 friends, and with strangers, though preferred and admissible patterns may vary from culture to culture. In

720 general, the data for the British and the Russian samples support our hypothesis 1 that general factor

721 structure of the TEAQ would be similar for different cultures. The nature of the item selection process

722 implemented in the study helps to ensure that each national version is characterized by good content validity

723 for each given language and culture but it may also slightly decrease compatibility of national versions due

724 to larger differences in item content within each subscale. Analysis of this discrepancy supported by further

725 research of touch lexicon (see e.g. [74]) and of possible culture-specific differences of social touch

726 perception and touch-related behaviors would lead to better understanding of culture-related aspects of

727 affective touch. Such understanding would also benefit from research on particularly 'contact' (i.e.

728 Southern European or Latin countries) or 'noncontact' (some Eastern Asian countries or Native Americans)

729 cultures [53].

730 Other avenues of research investigating relationships between culture-dependent and biologically

731 determined aspects of emotional touch would be using questionnaire-based measures along with tools

732 providing more direct assessment of physiological and emotional response to touch in settings where the

733 influence of cultural and social context is minimized or manipulated. In the present study we have used a

734 similar approach to assess the construct validity of the TEAQ-37 Rus and to see how TEAQ score is related

735 to perceived pleasantness of person-to person touch depicted in videos with a relatively impersonal and

736 socially neutral context. Participants with higher TEAQ-37 Rus scores rated all kinds of touch as more

737 pleasant, and, according to our initial predictions stemming from a hypothesis of the mediating role of CT-

738 system in affective touch perception [21], had a stronger preference for slow strokes over fast strokes and

36

739   static touch, fully supporting experimental hypothesis 4. In view of this, the TEAQ-37 Rus seems to be a

740   good screening tool for pre-selecting possible participants with different predisposition towards social touch

741   for further psychophysiological studies of affective touch.

742   Social touch, demographic differences, and personality traits

743   The results of Study 4 fully confirmed our experimental hypothesis 2 and revealed pronounced gender

744   effects and an influence of cohabiting status on current experience of intimate touch. Gender effects should

745   be taken into account when interpreting TEAQ-37 Rus scores, particularly for the Self-Care subscale.

746   The TEAQ-37 Rus has revealed good discriminative validity when compared against the Big Five

747   personality traits measured with a Russian version of the NEO-FFI. Consistent with our predictions, low to

748   moderate positive correlations were observed between TEAQ-37 Rus subscales, and Extraversion and

749   Openness subscales, thus supporting our experimental hypothesis 3. A somewhat unexpected positive

750   correlation was found between Neuroticism and Attitude to Self-Care (ASC) subscale. A post-hoc

751   explanation can be provided for this correlation, linking higher neuroticism to elevated need for physical

752   acceptance and reassurance which is provided by self-induced activation of the C-tactile system. Indeed,

753   primate behavioral data reveal that inhibition of the endogenous opioid reward system leads to increased

754   need for grooming behavior [75]. Individuals with higher neuroticism and social anxiety may resort to self-

755   grooming as to an easy option: when you feel bad, pamper yourself. Further research on populations with

756   clinical or subclinical levels of anxiety would shed more light on this link.

757   According to our current understanding of the role of affective touch and CT system in shaping the

758   emotional brain, it was predicted that TEAQ scores would correlate with emotional intelligence. The study

759   confirmed these predictions, yielding robust positive correlations between all the TEAQ-37 Rus subscales

760   (including Childhood Touch), and Emotion Recognition and Interpersonal Emotional Intelligence EmIn

761   subscales (r values between 0.30 and 0.54), pointing to a strong link between social touch and empathy.

762   This effect is even more impressive if we take into account that TEAQ-37 Rus contains no items directly

763   related to social competences, and EmIn contains no touch-related items. The number of participants who

764   completed EmIn questionnaire was relatively low though (74 subjects), so these results should be treated

37

765 as preliminary, and the strength of the link between emotional intelligence and social touch should be

766 confirmed on larger samples.

Use of the TEAQ-37 Rus for clinical and subclinical populations

768 The TEAQ-37 Rus was developed with an intent to use it with other psychometric tools and neurobiological

769 measures in order to investigate the role of touch in human emotional well-being, for different clinical and

770 non-clinical populations, including conditions like depression, eating disorders, autism etc. Assessment of

771 the skewness of the subscales revealed that there is no floor-effect for any subscale; it is possible to presume

772 therefore that the TEAQ-37 Rus can be used for clinical and subclinical populations characterized by

773 decreased tolerance for social touch, as with anorexia patients or high functioning autists. Although the

774 TEAQ-37 Rus was initially targeting adult population, inspection of the items' content reveals no objection

775 to using the TEAQ-37 Rus for teenagers. Further research on more diverse samples is sought but at the

776 moment the TEAQ-37 Rus seems to be a good and flexible enough tool for enhancing our knowledge of

777 importance of nurturing and affiliative touch in both health and disease.

Other considerations and limitations

779 The current Russian version of the TEAQ has good overall psychometric properties but some prospects for

780 further refinement can be outlined. The number of questionnaire items for each subscale of the TEAQ-37

781 Rus is unequal, ranging from 5 to 10 items as a result of following criteria for item retentions that were set

782 prior to discovering the actual factor structure of the TEAQ-Rus. This can be combated by creating a shorter

783 version of the questionnaire as the next step of the research; elimination of the items loading high on several

784 factors and the items with low factor loading may also improve both the factor structure and the model fit.

785 Another aim would be to construct a measure of social touch equally suitable for use in different cultures;

786 this can be achieved at later stages of research after collecting more data for different 'contact' and 'non-

787 contact' cultures.

Conclusions

38

789   The Touch Experiences and Attitudes Questionnaire is a self-report measure assessing experiences and

790   attitudes in the domain of affective touch. The Russian version constructed in the present study, the TEAQ-

791   37 Rus, has distinct and reliable 5-factor structure, and covers the aspects of general attitude to social touch,

792   attitude to intimate touch, attitude to self-care, current experiences of intimate touch, and memories of touch

793   experiences in childhood. To our best knowledge, the TEAQ is the first available self-report-measure

794   suitable for assessment of affective touch experiences and attitudes for which the factor structure has been

795   determined and validated. We anticipate that this questionnaire will be a valuable tool for researchers of

796   social touch, nonverbal communication, touch perception abnormalities, and the importance of childhood

797   touch experiences for human emotional well-being.

798

Acknowledgements

Supporting information

S1 Table. Original 57-item version of the TEAQ with scoring instructions.

S2 Table. The complete set of questions in English and in Russian for the initial 117-item TEAQ pool.

S3. The TEAQ-37 Rus with scoring instructions (in Russian with English translation provided).

S4 Table. TEAQ-37 Rus item data for the Study 2 sample (factor loadings, item-total correlations, and Cronbach's α if deleted).

S5-S7 Videos. Examples of the videos depicting touch interactions (different velocities and skin sites).

S8 Table. Stage 1 TEAQ-117 dataset (all the cases),

S8 Table. Stage 2 TEAQ-85 dataset (all the cases). Russian text labels are provided for better data traceability.

S9 Table. Stage 3-4 sample (the TEAQ-37 Rus, NEO-FFI, EmIn, Affective Touch Video, and subsample source data, all the cases, Russian text labels are provided for better data traceability).

References

1. Watson JB. Psychological Care of the Infant and Child. New York: Norton; 1928.

2. Haarer J. Die deutsche Mutter und ihr erstes Kind. München: Lehmanns; 1934 (German)

3. Brisch Karl Heinz. Bindungsstörungen: von der Bindungstheorie zur Therapie. Stuttgart: Klett-Cotta, 2009. (German)

4. Avdeeva NN. [Child-Parent Relationship Therapy]. Journal of Modern Foreign Psychology. 2017; 6(2): 7—14. Russian. doi: 10.17759/jmfp. 2017060201

40

823   5. Spitz RA. Hospitalism; an Inquiry Into the Genesis of Psychiatric Conditions in Early Childhood.

824   Psychoanalytic Study of the Child. 1945; 1: 53-74. PubMed PMID:21004303.

825   6. Crandall FM. Hospitalism (Editorial). Archives of Pediatrics. 1897 June;14(6):448-54. Available

826   from: http://www.neonatology.org/classics/crandall.html

827   7.   Berne E. Games people play: The psychology of human relationships. Vol. 2768. London: Penguin;

828   1968.

829   8. Bowlby J. Attachment and Loss: Vol 1 Attachment. New York: Basic Books Incorporated; 1969.

830   9. Ainsworth MDS, Blehar MC, Waters E, Wall S. Patterns of Attachment: A Psychological Study of

831   the Strange Situation. Hillsdale, New Jercey: Lawrence Erlbaum Associates; 1978. doi:

832   10.4324/9780203758045.

833   10. Duhn L. The importance of touch in the development of attachment. Adv Neonatal Care. 2010 Dec;

834   10(6):294-300. doi: 10.1097/ANC.0b013e3181fd2263.

835   11. Harlow HF, Zimmermann RR. The development of affective responsiveness in infant monkeys.

836   Proceedings of the American Philosophical Society. 1958 ;102: 501–9.

837   12. Meaney MJ, Szyf M. Environmental programming of stress responses through DNA methylation:

838   life at the interface between a dynamic environment and a fixed genome. Dialogues Clin Neurosci.

839   2005; 7: 103–23. PubMed PMID: 16262207.

840   13. Hellstrom IC, Dhir SK, Diorio JC, Meaney MJ. Maternal licking regulates hippocampal

841   glucocorticoid receptor transcription through a thyroid hormone-serotonin-NGFI-A signalling

842   cascade. Philos Trans R Soc Lond B Biol Sci. 2012;367: 2495–510. doi: 10.1098/rstb.2012.0223.

843   14. Murgatroyd C, Quinn JP, Sharp HM, Pickles A, Hill J. Effects of prenatal and postnatal depression,

844   and maternal stroking, at the glucocorticoid receptor gene. Translational psychiatry. 2015;5(5): e560.

845   PubMed PMID:25942041.

846   15. Cochrane N. Physical contact experience and depression. Acta Psychiatrica Scandinavica

847   Supplementum. 1990;357: 1–91. PubMed PMID: 2088015.

848   16. Eaton M, Mitchell-Bonair I, Friedmann E. The Effect of Touch on Nutritional Intake of Chronic

849   Organic Brain Syndrome Patients. Journal of Gerontology. 1986;41(5): 611–16. PubMed

850   PMID:3528273.

851   17. Field T. American adolescents touch each other less and are more aggressive toward their peers as

852   compared with French adolescents. Adolescence. 1999;34(136): 753-758. PubMed

853   PMID:10730699.

854   18. Vallbo AB, Johansson RS. Properties of cutaneous mechanoreceptors in the human hand related to

855   touch sensation. Hum Neurobiol. 1984;3,: 3–14. PubMed PMID:6330008.

856   19. Vallbo, AB, Olsson KA, Westberg, K.G., and Clark, F.J. Microstimulation of single tactile

857   afferents from the human hand. Sensory attributes related to unit type and properties of receptive

858   fields. Brain. 1984;107: 727–749. PubMed PMID: 6478176.

859   20. Löken LS, Wessberg J, Morrison I, McGlone F, Olausson H. Coding of pleasant touch by

860   unmyelinated afferents in humans, Nature Neuroscience 2009;12(5):547. PubMed PMID:

861   19363489.

862   21. McGlone F, Wessberg J, Olausson H. Discriminative and Affective Touch: Sensing and Feeling.

863   Neuron. 2014;82(4): 737–55. doi: 10.1016/j.neuron.2014.05.001

864   22. Vallbo ÅB, Hagbarth KE, Wallin BG. Microneurography: how the technique developed and its role

865   in the investigation of the sympathetic nervous system. Journal of Applied Physiology. 2004;96(4):

866   1262-9. doi: 10.1152/japplphysiol.00470.2003.

867   23. Essick GK, McGlone F, Dancer C, Fabricant D, Ragin Y, Phillips N, et al. Quantitative assessment

868   of pleasant touch. Neuroscience & Biobehavioral Reviews. 2010;34(2): 192-203. PubMed PMID:

869   19896001.

870   24. Ackerley R, Backlund Wasling H, Liljencrantz J, Olausson H, Johnson RD, Wessberg J. Human C-

871   tactile afferents are tuned to the temperature of a skin-stroking caress. J Neurosci 2014;34: 2879–83.

872   doi: 10.1523/JNEUROSCI.2847-13.2014.

873   25. Björnsdotter M, Löken L, Olausson H, Vallbo Å, Wessberg J. Somatotopic organization of gentle

874   touch   processing   in   the   posterior   insular   cortex.   J   Neurosci.   2009;29:   9314–20.

875   doi:10.1523/JNEUROSCI.0400-09.2009.

876   26. Francis S, Rolls ET, Bowtell R, McGlone F, O'Doherty J, Browning A, et al. The representation of

877   pleasant touch in the brain and its relationship with taste and olfactory areas. Neuroreport. 1999;10:

878   453–9. PubMed PMID: 10208571.

42

879   27. Morrison I, Löken LS, Olausson H. The skin as a social organ. Exp Brain Res. 2010;204: 305–14.

880   doi: 10.1007/s00221-009-2007-y.

881   28. Abraira VE, Ginty DD. The sensory neurons of touch. Neuron. 2013;79(4): 618-39. PubMed PMID:

882   3972592.

883   29. Lumpkin EA, Caterina MJ. Mechanisms of sensory transduction in the skin. Nature. 2007;445

884   (7130): 858-865. doi: 10.1038/nature05662.

885   30. Craig AD. Interoception and emotion. In: Lewis M, Haviland-Jones JM, Barrett LF, editors.

886   Handbook of Emotions. 3rd ed. New York: Guilford Publications; 2008 p. 272–88.

887   31. Kandel ER, Schwartz JH, Jessell TM, Siegelbaum SA, Hudspeth AJ. Principles of Neural Science.

888   New York: McGraw-Hill; 2013.

889   32. Hertenstein MJ, Weiss SJ, editors. The handbook of touch: Neuroscience, behavioral, and health

890   perspectives. New York: Springer Publishing Company; 2011.

891   33. Suvilehto, J. T., Glerean, E., Dunbar, R. I., Hari, R., & Nummenmaa, L. Topography of social

892   touching depends on emotional bonds between humans. Proceedings of the National Academy of

893   Sciences. 2015; 112(45), 13811-13816. doi: 10.1073/pnas.1519231112

894   34. Mazur, A. Interpersonal spacing on public benches in "contact" vs. "noncontact" cultures. The

895   Journal of Social Psychology. 1977; 101(1), 53-58.

896   35. McCabe C, Rolls ET, Bilderbeck A, McGlone F. Cognitive influences on the affective representation

897   of touch and the sight of touch in the human brain. Social Cognitive and Affective

898   Neuroscience. 2008;3(2): 97-108. doi: 10.1016/j.bbr.2016.11.046.

899   36. Scheele D, Kendrick KM, Khouri C, Kretzer E, Schläpfer TE, Stoffel-Wagner B, et al. An

900   oxytocin-induced facilitation of neural and emotional responses to social touch correlates inversely

901   with autism traits. Neuropsychopharmacology. 2014;39(9): 2078-85. PubMed PMID:24694924.

902   37. Sailer U, Ackerley R. Exposure shapes the perception of affective touch. Developmental cognitive

903   neuroscience 2017; pii: S1878-9293(17)30032-4. Epub 2017 Aug. 09. PubMed PMID:28818429.

904   38. Loken LS, Evert M, Wessberg J. Pleasantness of touch in human glabrous and hairy skin: order

905   effects on affective ratings. Brain Res. 2011;1417: 9–15. doi: 10.1016/j.brainres.2011.08.011.

43

906   39. McGlone F, Olausson H, Boyle JA, Jones-Gotman M, Dancer C, Guest S, et al. Touching and feeling:

907   differences in pleasant touch processing between glabrous and hairy skin in humans. Eur J Neurosci.

908   2012;35: 1782–8. doi: 10.1111/j.1460-9568.2012.08092.x.

909   40. Olausson H, Lamarre, Y, Backlund H, Morin C, Wallin BG, Starck G, et al. Unmyelinated tactile

910   afferents signal touch and project to insular cortex. Nat Neurosci. 2002;5: 900–4. doi:10.1038/nn896.

911   41. Olausson HW, Cole J, Vallbo A, McGlone F, Elam M, Kramer HH, et al. Unmyelinated tactile

912   afferents have opposite effects on insular and somatosensory cortical processing. Neurosci Lett.

913   2008;436: 128–32. doi: 10.1016/j.neulet.2008.03.015.

914   42. Morrison I, Loken LS, Minde J, Wessberg J, Perini I, Nennesmo I, et al. Reduced C-afferent fiber

915   density affects perceived pleasantness and empathy for touch. Brain J Neurol. 2011;134(4): 1116–

916   26. doi:10.1093/brain/awr011.

917   43. Triscoli C, Olausson H, Sailer U, Ignell H, Croy I. CT-optimized skin stroking delivered by hand or

918   robot is comparable. Frontiers Behav Neurosci. 2013;7^ 208. doi: 10.3389/fnbeh.2013.00208.

919   44. Walker SC, Trotter PD, Woods A, McGlone F. Vicarious ratings of social touch reflect the

920   anatomical distribution & velocity tuning of C-tactile afferents: A hedonic homunculus? Behavioural

921   brain research. 2017;320: 91-96. doi: 10.1016/j.bbr.2016.11.046.

922   45. Lee Masson H, Op de Beeck H. Socio-affective touch expression database. PLoS One. 2018 Jan 24;

923   13(1) :e0190921. doi: 10.1371/journal.pone.0190921

924   46. Andersen PA, Leibowitz K. The development and nature of the construct touch avoidance. Journal

925   of nonverbal behavior. 1978;3(2): 89-106. doi: 10.1007/BF01135607.

926   47. Gladney K, Barker L. The effects of tactile history on attitudes toward and frequency of touching

927   behavior. Sign Language Studies. 1979; 24(1): 231-52. doi: 10.1353/sls.1979.0013.

928   48. Jones SE, Brown BC. Touch attitudes and behaviors, recollections of early childhood touch, and

929   social self-confidence. Journal of Nonverbal Behavior.1996;20(3): 147-63. doi:

930   10.1007/BF02281953

931   49. Deethardt JF, Hines DG. Tactile communication and personality differences. Journal of Nonverbal

932   Behavior. 1983;8(2): 143-156. doi: 10.1007/BF00987000

44

933   50. Wilhelm FH, Kochar AS, Roth WT, Gross JJ. Social anxiety and response to touch: incongruence

934   between self-evaluative and physiological reactions. Biological psychology. 2001;58(3): 181-202.

935   PubMed PMID: 11698114.

936   51. Trotter PD, McGlone, F, Reniers RLEP. et al. Construction and Validation of the Touch Experiences

937   and Attitudes Questionnaire (TEAQ): A Self-report Measure to Determine Attitudes Toward and

938   Experiences of Positive Touch. J Nonverbal Behav. 2018. https://doi.org/10.1007/s10919-018-0281-

939   8

940   52. Hall ET. The hidden dimension. 2nd ed. Garden City, New York: Doubleday and Company Ink;

941   1966.

942   53. Remland MS, Jones TS, Brinkman H. Interpersonal distance, body orientation, and touch: Effects of

943   culture, gender, and age. Journal of Social Psychology. 1995;135(3): 281–97. doi:

944   10.1080/00224545.1995.9713958.

945   54. Goldberg LR, Johnson JA, Eber HW, Hogan R, Ashton MC, Cloninger CR, et al. The international

946   personality item pool and the future of public-domain personality measures. Journal of Research in

947   personality. 2006;40(1): 84-96. doi: 10.1016/j.jrp.2005.08.007.

948   55. Trotter P. Neurobiological mechanisms of affective touch and their role in depression [PhD Thesis].

949   The University of Manchester; 2011. Available from:

950   https://www.research.manchester.ac.uk/portal/en/theses/neurobiological-mechanisms-of-affective-

951   touch-and-their-role-in-depression(5d69f96f-5c9c-458b-99cd-67ba0f150e61).html

952   56. Tabachnick BG, Fidell LS. Using Multivariate Statistics. 6th Edition. London: Pearson Education;

953   2013.

954   57. Stevens, J. P. Applied Multivariate Statistics for the Social Sciences (2nd Edition). 1992. NJ:

955   Erlbaum: Hillsdale.

956   58. Cattell RB. The Scree Test For The Number Of Factors. Multivariate Behavioral Research.

957   1966;1(2): 245 - 76. doi: 10.1207/s15327906mbr0102_10

958   59. Hall JA, Veccia EM. More" touching" observations: New insights on men, women, and interpersonal

959   touch. Journal of Personality and Social Psychology. 1990;59(6): 1155. doi: 10.1037/0022-

960   3514.59.6.1155.

45

961   60. Lomranz J. Cultural variations in personal space. Journal of Social Psychology, 1976, 99(1): 21-7.

962   doi: 10.1080/00224545.1976.9924743.

963   61. Burkova VN, Fedenok YN, Butovskaya ML. [Spatial Behavior of Children and Adolescents (the

964   Cases of Russians and Ossetians)]. Etnograficheskoe Obozrenie. 2010;3: 77-91. Russian.

965   62. Bolshakov VP. [General specifics and dynamics of everyday culture in Soviet Union]. In: Science

966   and modern society. Ufa: AETERNA. 2015. p. 150-157. Russian.

967   63. McDonald RP, Ho MH. Principles and practice in reporting structural equation analyses.

968   Psychological Methods. 2002;7: 64-82. PubMed PMID:11928891.

969   64. Goldberg LR. The structure of phenotypic personality traits. American Psychologist. 1993;48: 26–

970   34. doi:10.1037/0003-066x.48.1.26.

971   65. Sergeeva AS, Kirillov BA, Dzhumagulova AF. [Translation and adaptation of short five factor

972   personality questionnaire (TIPI-RU): convergent validity, internal consistency and test-retest

973   reliability   evaluation].   Experimental   Psychology.   2016;9(3):   138-154.   Russian.   doi:

974   10.17759/exppsy.2016090311.

975   66. Martin TA, Costa PT, Oryol VE, Rukavishnikov AA, Senin IG. Applications of the Russian NEO-

976   PI-R. In: The five-factor model of personality across cultures. Boston: Springer;2002. p. 261-77.

977   67. Knyazev GG, Mitrofanova LG, Bocharov AV. [Validization of Russian version of Goldberg's "Big

978   five factor markers" inventory]. Psychologicheskiy Zhurnal. 2010;31(5): 100-110. Russian.

979   68. Bodunov MV, & Biryukov SD. [Big 5: Five-Factor Inventory. Adapted and reproduced by special

980   permission   of   the   Publisher.   Psychological   Assessment   Resources   from   the   NEO   Five   Factor

981   Inventory by P. Costa, R. McCrae. Form S.] Moscow: Institute of Psychology RAS; 1989. Russian.

982   69. Biryukov SD, Vasilev OP. [Psychogenetic study of the temperament properties and personality

983   characteristics: analysis of the structure of the studied variables]. Works of the RAS Institute of

984   Psychology. Moscow: IP RAS Publ; 1997, vol 2: 23—51. Russian.

985   70. Novikova IA, Novikov AL, Gridunova MV, Zamaldinova GN. Intercultural competence profiles in

986   Russian university students. RUDN Journal of Psychology and Pedagogics. 2017;14(3): 326-338.

987   doi: 10.22363/2313-1683-2017-14-3-326-338.

988   71. Novikova IA, Novikov AL, Obidina NV, Shlyakhta DA. Psychological Predictors of Managerial

989   Performance in the Conditions of Instability of the Russian Economy. International Journal of

990   Environmental & Science Education. 2016;11(18): 10863-74.

991   72. Lyusin DV. [A new tool to measure emotional intelligence: EmIn

992   Questionnaire]. Psychologicheskaya Diagnostika. 2006;4: 3-22. Russian.

993   73. Lyusin DV. [An Emotional Intelligence questionnaire EmIn: new psychometric data]. In Ushakov

994   DV, Lyusin DV, editors. Social and emotional intelligence: from models to measurements. Moscow:

995   IP RAS: 2009. p. 264-278. Russian.

996   74. Andreeva G, Gorbunov V, Lyusin D. [Emotional intelligence and psychological status were related

997   with white coat effect end mean ambulatory blood pressure levels in patients with arterial

998   hypertension]. Journal of Hypertension. 2015;33: e38. Russian. doi:

999   10.1097/01.hjh.0000467450.61235.85.

1000   75. Guest S, Dessirier JM, Mehrabyan A, McGlone F, Essick G, Gescheider G, et al. The development

1001   and validation of sensory and emotional scales of touch perception. Attention, Perception, and

1002   Psychophysics. 2011;73(2): p. 531–50. PubMed PMID: 21264727.

1003   76. Meller RE, Keverne EB, Herbert J. Behavioural and endocrine effects of naltrexone in male talapoin

1004   monkeys. Pharmacology, Biochemistry, and Behavior. 1980;13(5): 663–672. PubMed

1005   PMID:7192404.