Affective interpersonal touch in close relationships: a cross-cultural perspective

Reference:

Sorokowska, A., Saluja, S., Sorokowski, P., Frąckowiak, T., Karwowski, M., Aavik, T., Akello, G., Alm, C., Amjad, N., Anjum, A., Asao, K., Atama, C. S., Atamtürk Duyar, D., Ayebare, R., Batres, C., Bendixen, M., Bensafia, A., Bizumic, B., Boussena, M., … Croy, I. (2021). Affective Interpersonal Touch in Close Relationships: A Cross-Cultural Perspective. Personality and Social Psychology Bulletin, 47(12), 1705–1721. https://doi.org/10.1177/0146167220988373

Word count: 11295

Abstract

Interpersonal touch behavior differs across human cultures, yet no study to date has systematically tested for cultural variation in affective touch, nor examined the factors that might account for this variability. Here, over 14000 individuals from 45 countries were asked whether they embraced, stroked, kissed or hugged their partner, friends and youngest child during the week preceding the study. We then examined a range of hypothesized individual-level factors (sex, age, parasitic history, conservatism, religiosity and preferred interpersonal distance) and cultural-level factors (regional temperature, parasite stress, regional conservatism, collectivism and religiosity) in predicting these affective touching behaviors. Our results indicate that affective touch was most prevalent in relationships with partners and children, and its diversity was relatively higher in warmer, less conservative and religious countries, and among younger, female and liberal people. We suggest that in addition to individual-level factors, there exist two non-exclusive groups of factors affecting affective touch: biological (temperature-disease factors associated with behavioral immunology) and social (religion-conservatism factors related mostly with culture). This research allows for a broad and integrated view of the bases of cross-cultural variability in affective touch.

Keywords: touch behaviors; affective touch; interpersonal behaviors; cross-cultural psychology

Introduction

Interpersonal touch is an important element of human social life. Touch facilitates bonding, promotes well-being (Debrot, Schoebi, Perrez, & Horn, 2013) and conveys emotions and motivations (Hertenstein, Verkamp, Kerestes, & Holmes, 2006). During childhood, gentle parental touch is pivotal for socio-emotional development (for reviews see Hertenstein et al., 2006; Underdown, Barlow, & Stewart-Brown, 2010) and the amount of maternal touch predicts the development of infantile social brain areas (Brauer, Xiao, Poulain, Friederici, & Schirmer, 2016). As mammalian skin is densely innervated by specialized nerve fibers, which selectively react to light stroking stimulation (for an overview see McGlone, Wessberg, & Olausson, 2014), it has been proposed that the skin is "a social organ" (Morrison, Löken, & Olausson, 2010). Indeed, embracing, hugging, or kissing constitute a primary way in which people communicate affection, passion and intimacy in romantic relationships, and a higher frequency of touch is associated with feelings of greater intimacy during relationship development (Andersen, Guerrero, & Jones, 2006).

Everyday life observations suggest that humans use similar types of interpersonal touch behavior all over the world in order to express their affection. In addition, taboos are shared across different cultures such that people allow close family members to touch a greater proportion of body area than people with a more distant relation (Suvilehto, Glerean, Dunbar, Hari, & Nummenmaa, 2015). Cultural differences do, however, moderate public displays of physical affection (for a review see: Gallace & Spence, 2010; Knapp, Hall, & Horgan, 2014). For example, couples in the USA touch each other less frequently than do couples in Italy or the Czech Republic (Dibiase & Gunnoe, 2004), Greek and Italian dyads exhibit higher touch prevalence than English, French or Dutch dyads (Remland, Jones, & Brinkman, 1995), affective touch is more prevalent in couples of Latino origin than in those

of Asian origin (Regan, Jerry, Narvaez, & Johnson, 1999), and Mexican Americans report greater affective touch acceptability in public than do European Americans (Burleson, Roberts, Coon, & Soto, 2019). Based on such observations, it is suggested that cultures can be classified as high-contact or low-contact (Knapp et al., 2014). However, such suppositions are limited to observational evidence, with two key questions remaining unanswered in the current literature. First, it is unknown *how* interpersonal touch varies because existing studies do not provide enough quantifiable data to allow for conclusions regarding different types of interpersonal touch within and across intimate relationships. Second, it is not known *why* interpersonal touch behavior varies across cultures, and observational reports from a few (predominantly western) countries are not enough to predict global touch patterns, especially in places where interpersonal touch research has yet to be conducted.

To meaningfully advance research on interpersonal touch, we examined whether there are reliable differences in interpersonal touch behaviors among a large number of diverse cultures and investigated potential moderating factors. We were interested in affective touch – interpersonal sensory touching that humans use to express their affection towards one another. As the literature on determinants of affective touch is scarce, especially regarding potential cultural factors shaping such behaviors, we focus on variables for which the theoretical background is strongest. These include a) cultural-level predictors, such as temperature, regional parasite stress, regional conservatism, collectivism and regional religiosity and b) individual-level predictors, such as sex, age, personal parasitic history, individual conservatism, individual religiosity and preferred interpersonal distance. Below, we briefly summarize the most important cues for including these particular factors to our models.

Culture level predictors

Temperature. The demands of a particular climate in relation with resources available in a culture affect a number of cultural tendencies (Fischer & Van de Vliert, 2011; Van de Vliert, 2013). Consistent with this, temperature is one of the variables underlying interpersonal distance preferences (Sorokowska et al., 2017). Moreover, climates with higher temperature predict more intense emotional expression (Sorokowski, Sorokowska, Onyishi, & Szarota, 2013), which is likely related to closer interpersonal contacts and enhanced affective touch behavior. The potential influence of temperature on touch is further supported by observational studies (e.g., Remland et al., 1995) and the reports that people living in "warm latitudes" touch each other more than their counterparts in "colder latitudes" (Andersen, 1988). In line with these studies, we hypothesize that temperature is a positive predictor of affective touch in social relationships.

Parasite History. The most dangerous parasites to a culture are highly-virulent new pathogens, transferred to members of groups from outsiders (Thornhill & Fincher, 2014, 2015). In line with the Behavioral-Immune System Theory (Murray & Schaller, 2016; Thornhill & Fincher, 2015), individuals in regions with higher exposure to parasite load (i.e., from outsiders), may have formed several behavioral and psychological defense mechanisms targeted at avoiding contagion risk (Murray & Schaller, 2016). Such behaviors may include avoiding touch and less intense interpersonal contact with other individuals, regardless of relationship type. Consequently, we predict that parasite history is negatively related to affective-touching.

Conservatism. The aforementioned out-group aversion in cultures with high pathogen load can manifest in high conservatism (Thornhill & Fincher, 2014, 2015). Indeed, a recent cross-cultural study (Tybur et al., 2016) involving 11,000 people from 30 countries showed

that national parasite stress consistently relates to different proxies of conservatism. An association between conservatism and disease incidence manifests also in a positive correlation with disgust sensitivity (Terrizzi, Shook, & Ventis, 2010), and preferences for cleanliness and order in conservative individuals (Carney, Jost, Gosling, & Potter, 2008). Research summarized by Carney and collaborators (Carney et al., 2008) indicates that conservatism relates to withdrawal and restrain in interpersonal interactions. Even in children, conservatism relates to lower emotional expressiveness (Block & Block, 2006). Consequently, consistent with our expectations related to parasite history, we predict that higher conservatism in a culture is negatively related to affective-touching behavior, even in close relationships, as analyzed in the current research.

Religion. Conservatism relates to religiosity (Carney et al., 2008; Malka, Lelkes, Srivastava, Cohen, & Miller, 2012), possibly also in the context of touch behaviors. Religious organizations can restrict sexuality (Burdette & Hill, 2009) by condemning promiscuity, premarital sex, the use of condoms and sexual intercourse out of the fertile phase (Endsjø, 2012). Furthermore, parental religiosity predicts the scope of affectionate, non-genital behaviors in subsequent adult relationships (Hatfield, 1986; Wallace, 1981). This holds true even if the individual no longer subscribes to her or his parents' beliefs (Hatfield, 1986). This suggests that intimate couples in more religious countries are less likely to touch each other than individuals in less religious countries. In line with this, previous research has found that religious service attendance, reduces the odds of casual sexual relations in college (Burdette, Ellison, Hill, & Glenn, 2009). These findings suggest that religiosity is negatively related to affective touch. This hypothesis is further strengthened by our theoretical predictions regarding conservatism and touch behaviors in close relationships.

Collectivism. People in individualistic cultures are more often highly independent and have stronger feelings of autonomy within the group (Hofstede, 2001) compared to people in collectivistic cultures (or those higher in in-group favoritism; Van de Vliert, 2011), who more often value and form close intra-group relationships. This leads to the prediction of increased affective touch in highly collectivist cultures, as affective touch is hypothesized to aid maintenance of close relationships (Gallace & Spence, 2010). Controversially, collectivism can be associated with parasite exposure: the parasite stress theory argues that tight social groups are formed in areas with higher risks of pathogens because collectivism functions to protect individuals within the group from infections from members outside of the group (Fincher & Thornhill, 2012). Because the dependent variable in our study is touch behavior in close, intragroup-relationships, we predict that collectivism, despite its theoretical link to pathogen prevalence, positively predicts affective touch.

Individual level predictors

In addition to cultural factors, individual-level variables can also be associated with differences in affective touch behaviors. Here we examine the effects of ***personal parasitic history, individual conservatism*** and ***individual religiosity*****.** As mentioned above, we predict that lower scores on these variables are associated with higher levels of our affective touch indices. In addition, we expect the individual level factors of ***sex, age***, and ***interpersonal distance preferences*** to predict affective touch behavior, as explained below.

Sex**.** Previous studies on interpersonal touch consistently show sex differences (for an overview see Knapp et al., 2014). Women touch more frequently and are touched more frequently than men (Jones, 1986). Further, men in the US receive less affectionate touch from birth onwards than do women (Hewitt & Feltham, 1982; Juni & Brannon, 1981). Women generally prefer touch from persons whom they know very well while men prefer to

be touched by women and less so by other men (Heslin, Nguyen, & Nguyen, 1983). One older theory proposes the explanation that touching is a privilege of a person of higher status or power, and men are more often than women in the position of power (Henley, 1973; however see Jones, 1986 for a controversial discussion). In line with the previous findings, we predict that women should exhibit more diverse affective touch behaviors than should men.

Age. Younger people are more likely to engage in physical contact with others (Rands & Levinger, 1979) and age is positively associated with interpersonal distances during interactions with other people (Aiello, 1987; Burgess, 1983; Gérin-Lajoie, Richards, & McFadyen, 2006; Ozdemir, 2008; Sorokowska et al., 2017; Webb & Weber, 2003). Therefore, we predict that younger individuals will display more diverse affective touch than older adults.

Interpersonal distance preferences. Finally, we hypothesize that personal distance preferences are negatively associated with diversity of affective touch behavior, as people who prefer to maintain larger interpersonal distances may be more likely to avoid all types of affective touch. Conversely, low preferred interpersonal distance may foster diverse interpersonal touch behaviors.

In summary, we hypothesize that affective touch differs between cultures and individuals, and that this variance is at least partially driven by cultural and individual-level variables (all hypotheses pertaining to Cultural and Individual variables are detailed in Supplementary Table S1[1]). As it has been observed that touch comfort varies as a function of

[1] The supplementary materials available online include (1) A brief summary of the hypotheses, (2) Description of the Sample, (3) Description of the Affective Touch Measures, (4) Detailed results of our Analyses, (5) Figures illustrating the outcomes, (6) Reliability and Internal Consistency Analyses; and (7) Post-hoc analyses related to our study.

the type of relationship (for instance, people are less comfortable being touched by a friend than by their partner; Suvilehto et al., 2015), we performed separate analyses for relationship types (partner, male friend, female friend, and own child). In order to test our predictions, we conducted a cross-cultural study involving a large and representative sample of men and women from 45 diverse countries.

Materials and Methods

Participants

We surveyed 14,478 participants from 45 countries (compare Conroy-Beam et al., 2019). The global study protocol was approved by the Ethics Committee of the Institute of Psychology, University of Wroclaw and local collaborators obtained additional permits when this was legally required. All participants provided informed consent prior to their inclusion in the study. We conducted the data collection among both community members and university students (max 50% per sample per country), to create as diverse sample of inhabitants as possible for each study site. The participants were required to be literate and between 15 and 75 years of age.

For further analysis on affective touch behavior, we only included data from participants who reported having interacted at least once with an intimate partner, male friend, female friend, or their own child in the week preceding data collection. Therefore, participants were first asked whether they had a partner, a female friend, a male friend and a child (we asked about the "youngest child" in case a participant had more than one child), and second whether they met a representative of each category in the week preceding the study. In order to preserve a stable base for country level analysis, countries with less than 30 participants per interaction partner were removed from the respective analysis. The final analyses on affective touch towards the partner/female friend/male friend/child comprised

7300/9480/9932/3108 participants from 38/39/40/29 countries, respectively (see Supplementary Table S2).

Affective touch Questionnaire

Affective touch was measured by a questionnaire designed specifically for the needs of this study, with attention paid to its cross-cultural applicability, practicability, understandability and brevity. It was first tested in a pilot study conducted among 145 participants the results of which revealed a sufficient test-retest reliability over the course of 4 weeks (r = .63; see Supplementary File section S6.1. for details on this study).

The participants were presented with icons displaying four different types of affective touch: embrace, caress, kiss and hug, as guided by Hall (1963). The icon format was chosen to enhance comprehension across different cultures; interpretation was further aided by the verbal descriptor for each icon. For each touch type, we asked, "have you performed this type of touch in the last week?" with "your youngest child", "your partner", "a female friend", "a male friend", "a male stranger" and "a female stranger" (for English version see Stimulus Materials). Because this study focused on close interaction partners, "stranger" data were not included in the current paper, however for transparency these results are summarized in Supplementary Information S7.2). We decided to use a simple, "yes-no" answering format because of its simplicity, cross-cultural understandability and salience in memory.

Affective Touch Indices

Three indices of Affective Touch were computed and analyzed separately for each relationship type as detailed below and summarized with an example in Supplementary Table S4.

Affective Touch Prevalence. First, Affective Touch Prevalence assessed if an individual performed *any* of the four touch behaviors in a given relationship (partner/female

friend/male friend/child). On an individual level this variable had only two values – "yes", meaning that a person performed any of the analyzed affective touch behaviors, or "no", meaning that a person performed none of the analyzed affective touch behaviors in a given relationship. To be able to further compute a culture-level index of this variable, these values were re-coded to percentages. Thus, an individual could either have an Affective Touch Prevalence of 0% (performed no touch behavior) or 100% (performed any of the touch behaviors in a given relationship).

Affective Touch-type-specific Prevalence. Second, we analyzed affective touch prevalence for *each* affective touch behavior (i.e., stroking, kissing, hugging, embracing) in each relationship. Again, we observed whether an individual performed a certain kind of affective touch in each analyzed relationship type (i.e., yes or no for each touch type within each relationship), and we computed an Individual Touch-Specific-Prevalence value of either 0% (touch not performed) or 100% (touch performed) for stroke, kiss, hug and embrace separately in each relationship.

Affective Touch Diversity. Third, to determine the variety of Affective Touch performed by each individual, an individual's percentage of touch behaviors was computed. Thus, values for this index are 0% (no touch in the last week within the respective relationship type), 25%, 50%, 75% (one, two, or three types of touch, respectively) to 100% (all types of touch in the last week within the respective relationship type).

Individual affective touch indices were then averaged for all participants residing in each country to create a ***Country Affective Touch Prevalence Score*** and a ***Country Affective Touch Diversity Score***. The index of *Country Affective Touch Diversity* was selected as the main dependent variable as it reflects affective touch richness and has a higher resolution of possible values per person (0, 25,50,75,100%) than the *Prevalence Score* (0 vs 100%). In addition, *Country Affective Touch Diversity* proved to be less prone to ceiling effects

(compare Table 1). *Country Affective Touch Diversity* can additionally tap into the formalization of affective touch behaviors, given that free and unrestricted expression of affection through touch generates a higher range of touch behaviors.

Individual Level Predictors of Affective Touch

***Parasite-History*.** Parasite-History, was measured using Murray and Schaller's (Murray & Schaller, 2010) validated Parasite-history scale. This scale examines whether a person had ever suffered from a variety of contagious and pathogenic diseases, like tuberculosis, or typhoid fever. Scores range from 9 (no parasite-history) to 27 (had all Parasites more than once).

***Conservatism*.** 10-items from Henningham's 12-item Conservatism Scale (Henningham, 1996) were used to measure individual level of conservatism (Death Penalty, Multiculturalism, Stiffer Jail Terms, Voluntary Euthanasia, Gay Rights, Premarital Sex, New Immigration, Church Authority, Legalized Abortion, and Legalized Prostitution; "Bible truth" item was removed given different religions of our participants, and we did not ask about perception of condom vending machines, as they are very rare or absent in many of our study sites). Total scores ranged from 10 to 20, with higher scores indicating greater Conservatism. As presented in more detail in Supplementary Information S6.2, the internal consistency of the Henningham's Conservatism Scale was satisfactory for our sample.

***Religiosity*.** As guided by (Benson et al., 1980), the single question "*How much do you agree with the following statement: I am very religious"* was used with a Likert answer format, ranging from 1 (strongly disagree) to 5 (strongly agree).

Preferred Interpersonal Distance was assessed with a pictorial task (Sorokowska et al., 2017, see Supplementary Stimulus Materials) in which participants were asked to indicate how close they might get to various interaction partners while still feeling comfortable. Those partners were a female and male stranger, a female and male acquaintance, and a close

female and male friend (or relative), using six lines representing the range from 0 to 220 cm. As the Interpersonal Distance scale (Sorokowska et al., 2017) included different members of the social network than the Affective Touch Questionnaire, we examined internal consistency of the Interpersonal Distance Questionnaire for males and females to test whether an aggregated index for each sex may be created. As shown in Supplementary Information S6.3, there was high internal consistency for each country and across the sample in both interpersonal-distance measures (i.e., distance to females and males), justifying the aggregation of the preferred distances data. The interpersonal distances were, therefore, averaged across all relationships (stranger, acquaintance, close friend/relative). This resulted in single consistent scores for Preferred-Interpersonal Distance to Females and for Preferred-Interpersonal Distance to Males that were used in further analyses.

Demographics. Participants reported their age and sex.

Cultural Level Predictors of Affective Touch

Individual level scores of ***Parasite-History, Conservatism*** and ***Religiosity*** were aggregated at the Country-level to form an index for each country [see Supplementary Table S2 for descriptive statistics and country-level values and Supplementary Table S3 for intercorrelations between the Country-level factors].

Temperature. Annual average temperatures reported on http://www.weatherbase.com (retrieved 10.01.2017), provided Temperature data for each Country.

Collectivism. The 178-nation index of Collectivism (called In-Group Favoritism) from Van de Vliert (2011) provided a Collectivism-score for each Country.

Procedure

In order to minimize potential reactance to the questionnaire, all coauthors received the questionnaire before the study began and reported any major problems related to the

questionnaires (e.g., cultural taboos related to particular questions). The final included measures were accepted by all collaborating research groups and were the same across all sampled countries.

The questionnaires were completed in the participants' native language. The local authors conducted a translation/back-translation procedure, involving the primary collaborator translating the measures into the native language and the second collaborator translating the measures back into English. Differences between the original English scale and back-translation were to be discussed and mutual agreements were to be made on the most appropriate translation. If there were two or more groups collecting data in one country, they arranged translation and back translation between groups and then used the same version of the questionnaire.

For data collection, great care was exercised to ensure similar recruitment methods across all study sites. This was achieved by detailed protocols including a) a standardized instruction to conduct the data collection face to face via paper-and-pencil or electronic survey, b) standardized study information (i.e., desired sample size and composition [see *Participants* section], description of study aims, hypotheses, methodology, predicted data collection time), c) detailed scoring instruction and standardized scoring sheets. Data collection was conducted simultaneously across all locations in years 2017-2018. This study was a part of a larger project, comprising several different studies, unrelated to affective touch.

Data analysis

First, we computed all *Affective Touch Indices* and descriptively analyzed the *Affective Touch Prevalence* per interaction partner and country. Second, we tested whether *Touch-type*

Specific Prevalence differed between touch types and between interaction partners. Therefore, a repeated measures ANOVA was conducted with the country-level *Touch-Specific-Prevalence Scores* as dependent variable and the touch type and interaction partner as within subject factors. A full model was calculated with Bonferroni corrected post-hoc analysis. Effect sizes are presented as partial eta-squared (η^2).

Third, we conducted multilevel model analyses to determine whether Country, Individual-Level and Cultural-Level predictors influenced *Affective Touch Diversity* with a Partner, a Female Friend, a Male Friend, and own Child. All Individual-Level predictor variables were Group-mean centered, and all Cultural-Level predictor variables were Grand-mean centered. There were no violations to Collinearity, as all predictors (for each model) had an VIF between 1-10. An unstructured covariance matrix was used in all Models as this offered the best fit, based on the 2-log Likelihood criterion. Further, given that the *Affective Touch Diversity* towards own child was 3 standard deviations lower in China than the other countries, China was excluded from the corresponding analysis.

For each Interaction Partner (Partner, Male Friend, Female Friend, Child), a separate five-step Multilevel Analysis was conducted. The first step was to run an Empty *Model,* in which only Country (the nesting variable) was included as an Intercept. This allowed us to determine if a significant amount of the variation in *Affective Touch Diversity* was explained by an individual's Country (i.e., the Intraclass Correlation [ICC][1]). Second, an *Individual-Level Model* was run, in which fixed effects for all Individual-Level predictor variables were added. This allowed us to determine how much of the variation in the *Affective Touch Diversity* was determined by Individual-Level predictor variables. Third, Cultural-Level predictor variables were added into the Individual-Level model, to form the *Cultural-Level Model.* This model allowed us to estimate how much Cultural-Level predictor variables explained the variance between countries. Fourth, a *Random-Coefficients Model* was run to

determine if any of the slopes for Individual-Level predictor variables differed across countries. Fifth, the *Cross-Level Interaction Model* was conducted, in which interactions between all Cultural-Level predictor variables and the Individual-Level predictor variables with random coefficients were run. Only Cross-Level interactions that produced better model fit and were significant are reported in the results section and final models. These Cross-Level Interactions allowed us to determine if any of the variation in Individual-Level predictor variable slopes was explained by Cultural-Level variables. All Statistical Analyses were performed in SPSS version 25.

Results

Country means of *Affective Touch Prevalence, Affective Touch Diversity* and *Touch-type-specific Prevalence* for each interaction partner are presented in Table 1. All data collected for this study are available for further scientific use and can be found here: *the link to the database will be provided for the final version of the manuscript*.

Table 1. Country means of affective touch prevalence, affective touch diversity and prevalence per touch type for each interaction partner.

	Affective touch prevalence				Affective touch diversity				Embrace				Stroke				Hug				Kiss			
Country	Partner	FF	MF	Child	Partner	FF	MF	Child	Partner	FF	MF	Child	Partner	FF	MF	Child	Partner	FF	MF	Child	Partner	FF	MF	Child
Algeria	85.77	67.43	52.86	97.37	78.05	49.63	35.13	84.65	78.46	52.19	44.49	84.21	80.08	47.60	40.09	73.68	74.39	43.01	25.77	92.98	79.27	55.74	30.18	87.72
Australia	97.84	80.34	62.80	94.32	95.04	41.50	26.01	80.97	95.69	71.12	51.90	91.01	90.52	14.53	5.44	63.64	96.55	49.64	36.64	89.89	97.41	30.51	9.93	79.78
Austria	100.00	88.73	69.93	-	97.25	51.23	33.92	-	96.00	87.32	62.94	-	98.00	27.46	18.18	-	95	54.23	32.87	-	100.00	35.92	21.68	-
Belgium	98.77	91.56	83.71	95.05	91.56	50.78	37.50	81.68	76.54	69.47	62.18	69.31	96.30	20.87	10.64	75.25	95.47	37.69	20.17	90.10	97.94	75.31	56.74	92.08
Brazil	95.16	93.51	85.92	90.57	89.72	64.32	49.76	72.17	81.45	67.03	63.11	58.49	89.52	33.87	22.71	60.38	92.74	84.95	73.43	88.68	95.16	70.97	39.13	81.13
Chile	99.01	91.67	81.76	95.45	81.19	67.19	52.35	76.14	77.23	75.69	65.29	80.30	55.45	43.75	30.59	56.06	95.05	73.61	61.18	84.85	97.03	75.69	52.35	83.33
China	57.40	55.76	46.32	24.41	52.58	26.44	17.37	18.66	50.22	51.56	47.37	22.43	52.68	29.33	14.55	18.60	53.78	23.49	11.55	19.07	55.11	5.40	1.10	16.82
Colombia	96.97	86.18	57.93	96.15	93.18	51.63	28.28	83.17	90.91	53.66	31.03	82.69	93.94	26.83	11.03	76.92	93.94	72.36	48.97	88.46	93.94	53.66	22.07	84.62
Costa Rica	95.70	96.30	82.42	97.78	89.78	65.74	46.70	74.44	86.02	75.31	62.64	73.33	87.10	38.27	24.18	55.56	91.4	86.42	64.84	88.89	94.62	62.96	35.16	80.00
Croatia	96.65	85.36	55.95	95.04	90.43	49.07	25.60	83.47	89.95	79.75	52.98	93.39	89.95	25.23	10.12	74.38	87.08	47.66	22.32	80.99	94.74	43.61	16.96	85.12
Cuba	99.34	94.37	76.43	97.59	96.19	71.83	48.21	89.46	93.42	75.30	67.20	89.01	96.89	54.67	25.52	85.11	96.89	79.78	68.69	93.00	98.17	93.03	65.50	96.19
El Salvador	93.88	93.33	82.46	-	79.08	56.67	39.04	-	44.90	56.67	68.42	-	87.76	30.00	12.28	-	91.84	80.00	52.63	-	91.84	60.00	22.81	-
Estonia	97.90	79.29	58.71	95.45	82.52	40.38	28.23	67.61	96.50	70.41	52.90	90.91	44.76	17.75	10.32	34.09	95.8	65.09	45.16	93.18	93.01	8.28	4.52	52.27
Georgia	94.34	91.08	83.83	87.50	85.85	59.87	48.50	68.30	84.91	63.29	61.31	60.71	77.36	27.50	15.48	48.21	88.68	67.50	52.38	80.36	92.45	81.76	65.87	83.93
Germany	98.59	95.45	83.33	-	96.83	51.70	38.10	-	94.37	89.77	78.57	-	98.59	34.09	17.86	-	97.18	72.73	48.81	-	97.18	10.23	7.14	-
Greece	95.93	81.41	67.76	95.59	87.80	54.01	35.69	88.97	83.74	66.03	51.63	82.61	86.99	42.95	18.30	88.41	90.24	52.56	36.18	91.18	90.24	54.49	36.60	94.20
Hungary	98.61	68.75	38.23	95.82	92.57	30.86	15.28	76.05	89.13	27.46	15.00	71.48	90.27	11.70	4.03	71.86	93.68	45.87	24.35	80.23	97.22	38.28	17.74	80.61
India	95.16	83.17	77.59	89.80	79.57	48.57	40.52	70.92	87.70	66.77	60.00	79.59	63.10	39.87	34.14	46.94	88.71	70.57	61.72	83.67	79.14	16.51	6.21	73.47
Italy	97.64	84.48	69.94	94.35	89.37	56.47	39.38	78.83	79.53	64.47	56.48	76.61	90.94	35.63	19.31	79.03	93.31	60.46	43.52	82.26	93.70	65.62	38.15	77.42
Lithuania	95.51	76.55	48.03	88.14	87.82	40.27	21.62	77.97	89.10	57.52	39.30	79.66	85.90	17.70	12.23	77.97	88.46	62.83	27.95	79.66	87.82	23.01	6.99	74.58
Malaysia	-	55.56	38.81	-	-	32.41	14.93	-	-	44.44	37.31	-	-	41.98	7.46	-	-	34.57	13.43	-	-	8.64	1.49	-
Mexico	97.65	92.06	88.00	-	90.88	60.71	51.60	-	70.59	65.87	74.40	-	97.65	32.54	27.20	-	97.65	82.54	67.20	-	97.65	61.90	37.60	-
Netherlands	61.67	52.63	37.74	-	57.50	32.46	18.87	-	59.02	38.98	34.55	-	53.33	27.12	7.55	-	80	38.98	18.52	-	58.33	31.58	18.87	-
Nigeria	84.21	86.96	64.91	-	77.63	60.87	30.70	-	82.35	80.70	52.31	-	75.56	60.38	42.42	-	62.07	76.36	40.30	-	81.25	40.82	10.34	-
Pakistan	83.79	70.15	54.72	89.66	62.16	41.50	27.99	74.14	66.90	57.52	43.06	79.31	62.41	38.83	24.44	68.10	95.88	45.87	37.50	72.41	57.24	23.79	6.94	76.72
Peru	95.88	92.54	74.88	-	79.90	58.71	38.15	-	93.81	81.59	62.56	-	34.02	25.37	19.91	-	93.84	57.71	32.70	-	95.88	70.15	37.44	-
Poland	96.92	67.39	29.33	94.59	90.62	35.99	12.61	82.43	90.76	52.66	23.56	89.26	82.91	24.58	5.32	76.51	90.6	43.37	14.41	88.51	94.96	23.13	7.10	75.84
Portugal	96.58	91.16	69.20	100.00	88.03	57.14	35.71	89.09	89.74	57.82	40.44	96.36	77.78	43.54	20.54	76.36	92.41	47.62	35.11	89.09	94.02	79.59	46.22	94.55
Romania	97.93	80.34	62.36	93.88	67.59	42.70	29.21	55.61	80.00	59.55	50.00	65.31	6.21	6.18	5.06	0.00	85.53	61.80	42.70	87.76	91.72	43.26	19.10	69.39
Russia	94.74	61.54	51.20	96.92	86.84	32.69	20.00	86.92	87.50	53.15	41.60	86.15	83.55	13.99	4.00	78.46	92.59	30.77	22.40	92.31	90.79	32.87	12.00	90.77
Serbia	98.58	86.85	65.16	96.82	87.75	54.46	34.25	79.14	88.32	70.42	54.89	85.99	74.93	20.84	8.81	62.42	84.96	61.36	40.38	82.80	95.16	65.34	32.86	85.35
Slovakia	88.50	70.30	43.28	90.84	79.20	38.12	20.00	68.70	64.60	38.61	26.89	52.67	81.42	28.71	14.43	76.34	83.75	54.46	23.93	68.70	85.84	30.69	14.75	77.10
Slovenia	93.00	69.48	44.14	88.78	79.12	33.89	17.45	68.66	76.07	63.65	34.43	82.93	69.30	12.45	8.06	53.66	73.85	37.75	18.32	74.15	87.36	21.69	8.97	63.90
South Korea	85.38	43.20	34.55	85.14	68.46	23.20	18.18	60.81	73.85	30.40	26.36	70.67	73.08	33.60	25.45	64.86	91.06	24.80	18.18	74.67	53.08	4.00	2.73	30.67
Spain	98.30	86.24	73.09	91.26	91.17	59.31	37.16	76.21	85.11	71.48	62.08	74.76	92.77	45.64	20.80	71.84	96.84	52.01	34.86	70.87	95.74	68.12	30.89	87.38
Sweden	97.89	86.09	76.25	98.88	93.95	50.28	38.41	94.66	94.21	65.41	52.49	97.75	87.89	39.47	24.14	91.01	60.66	78.95	69.73	96.63	96.84	17.29	7.28	93.26
Turkey	93.43	86.60	70.39	92.54	81.26	57.90	36.90	73.14	81.72	77.55	60.80	82.10	74.13	27.06	10.70	58.33	81.52	66.77	40.25	79.04	87.68	60.12	36.12	73.36
Uganda	79.82	57.96	41.87	-	43.42	26.91	17.36	-	39.47	29.30	20.69	-	14.91	15.92	14.29	-	57.02	49.04	25.12	-	62.28	13.38	9.36	-
Ukraine	-	85.03	53.54	-	-	45.07	20.87	-	-	74.02	36.22	-	-	5.51	16.54	-	-	45.67	17.32	-	-	55.12	13.39	-
United States	84.38	88.44	69.07	-	48.44	48.84	36.34	-	40.63	70.69	59.28	-	20.31	29.31	18.04	-	65.63	83.91	59.28	-	67.19	11.56	8.76	-
Mean	92.60	79.88	62.71	91.37	81.85	48.03	31.60	75.27	79.75	62.62	49.72	77.55	74.16	29.82	17.05	64.28	86.48	57.62	38.27	82.22	87.34	43.10	22.98	77.30
Median	95.91	85.20	65.04	94.59	87.30	49.96	34.09	76.21	84.33	65.64	52.40	80.30	82.17	29.01	16.01	71.84	91.23	56.09	36.41	84.85	93.36	42.04	18.31	80.61

Note: FF – female friend; MF – male friend. For information on country-level descriptive statistics, please refer to supplementary Table S2.

H1. Prevalence of Affective Touch behaviors

The mean *Affective Touch Prevalence* across countries towards the Partner was 92.6% (CI 89.4-95.8%), with the lowest frequency reported in China (57.4%). The affective touch prevalence towards Female (79.7%; CI 75.1-84.3%) and Male Friends (62.7%; CI 57.3-68.1%) was lower and the range was higher than that reported for the Partner. The lowest values were reported for Female Friends in South Korea (43.2%) and for Male Friends in Poland (29.3%). The mean prevalence reported for touch with one's own Child was 91.4% (CI 86.1-96.7%) with the lowest prevalence reported in China (24.4%), while participants from all other countries reported a prevalence higher than 85% (see Figure 1A). Following this result, we noticed that the mean age of participants answering the children touch question in China was 10 years lower than the mean age of all other participating countries (see Supplementary Table S2).

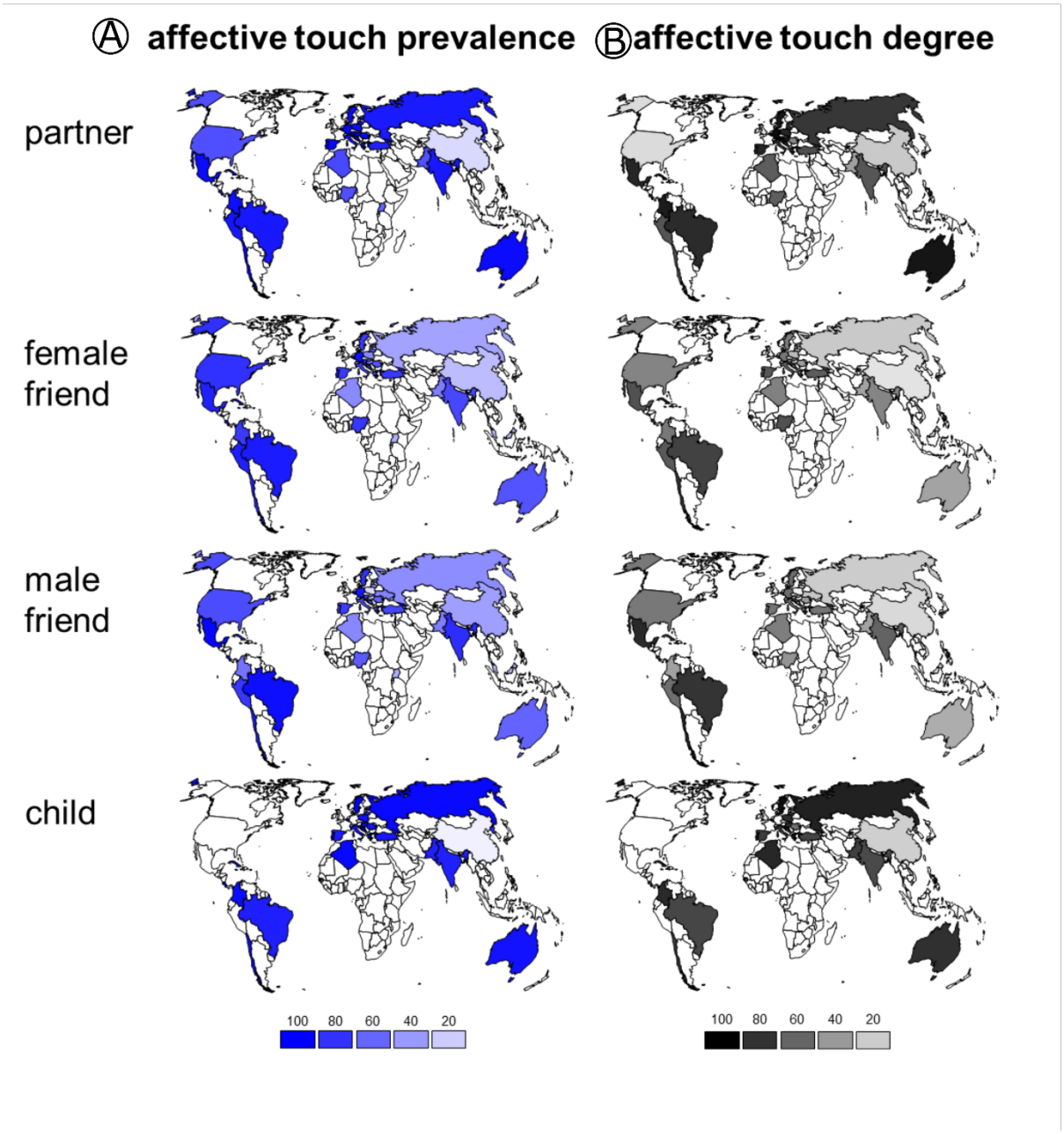

Figure 1. Affective touch indices visualized on the world map. A) *Affective Touch Prevalence* indicates the percentage of individuals per country who touched the respective interaction partner using at least one touch type (hug, embrace, kiss or stroke). B) *Affective Touch Diversity* indicates the variety of touch types used by the individuals of each country. Darker colors indicate higher percentages of touch prevalence or variety. Countries displayed in white were not sampled.

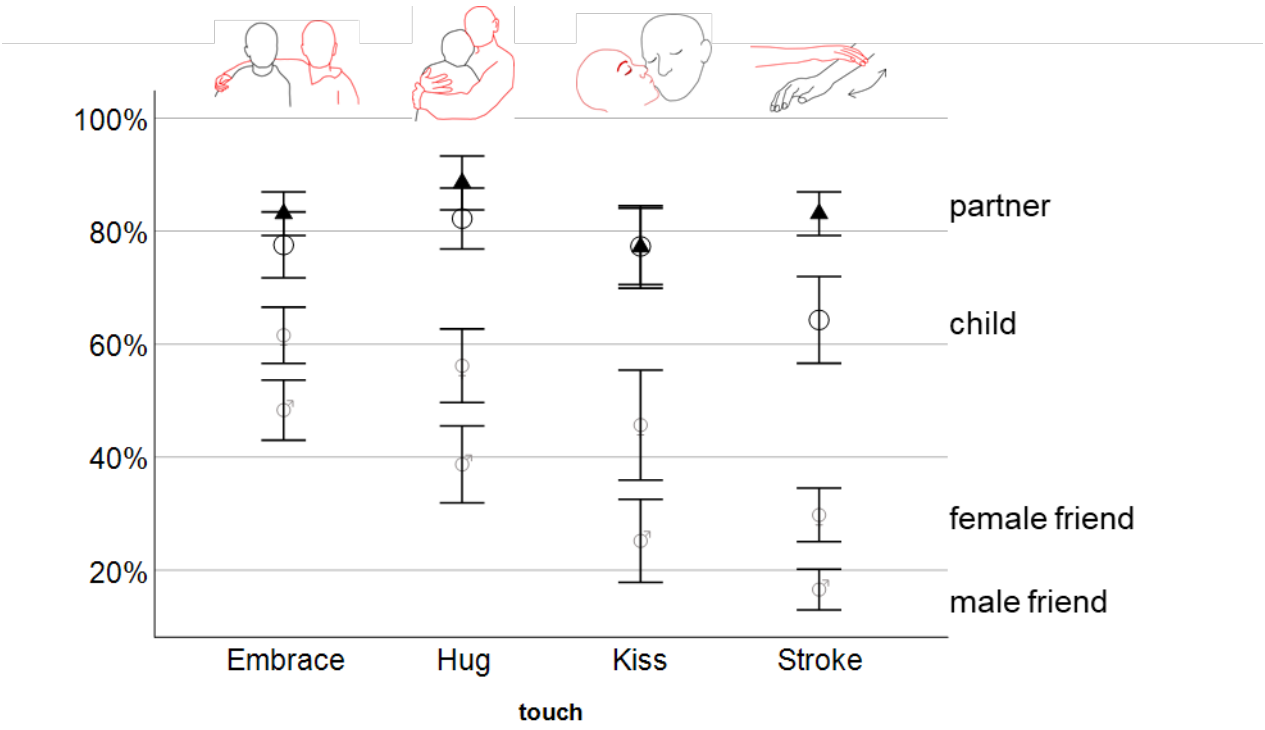

Figure 2. Touch-type Specific Affective Touch Prevalence in relation to interaction partner. Results are averaged across all participants and countries. Error bars indicate 95% CI.

Touch-type Specific Prevalence was significantly related to relationship type (F[3,84] = 222, $p < 0.001$; $\eta^2 = 0.89$), but also to the type of touch used (F[3,84] = 31, $p < 0.001$; $\eta^2 = 0.52$). Across all touch types, affective touch towards the partner was the most prevalent, followed by touching one's own child, a female friend and a male friend. All pairwise comparisons were significant at $p < 0.001$. Across all interactions, embracing and hugging were significantly more prevalent than kissing or stroking (each $p < 0.001$), while there was no significant difference between embrace and hugging.

In addition, there was a significant relationship by touch type interaction (F[9,252] = 16, $p < 0.001$; $\eta^2 = 0.37$). All affective touch types were most prevalent for the partner and the child. While friends were often hugged and embraced, they were rather seldom stroked or kissed (Figure 2).

H2. Affective Touch Diversity variance is caused by Individual and Cultural predictors.

A summary of the subsequent models and significant predictors is displayed in Table 2. For the sake of brevity only significant predictors are reported in the following paragraphs, for full results please see Supplementary Tables S5-S8.

Table 2: Significant predictors of affective touch diversity (summary). Positive predictors are indicated by "+", negative ones by "-".

	Significant individual level	Significant cultural level	Cross level
Partner	Age (-) Conservatism (-) Parasite Load (-)	Religious (-) Temperature (+)	Religiousness and age *(in more religious cultures, relationship between age and partner aft touch is less pronounced)*
Male	Age (-) Sex (females more) Conservatism (-) Male distance (-) Female distance (+)	Conservatism (-) Temperature (+)	Conservatism and age (*in more conservative cultures, relationship between age and male friend touch is less pronounced)*
Female	Age (-) Sex (females more) Conservatism (-) Male distance (+) Female distance (-)	Temperature (+)	Age and collectivism (*collectivistic cultures have a more pronounced negative relationship between age and female friend aft touch)*
Child	Age (-) Sex (females more) Conservatism (-)	-	

1. Affective Touch Diversity towards a Partner

Affective Touch Diversity towards a Partner varied significantly across countries ($p < 0.001$) and the Intraclass Correlation (ICC) of the Empty Model indicated that 24.4% of the total variance in *Affective Touch Diversity* was between countries.

The Individual-Level Model showed that relatively younger ($p < 0.001$), less conservative individuals ($p < 0.001$) individuals and individuals with low parasite load ($p = 0.02$) report a greater *Affective Touch Diversity* toward their Partner. The Cultural-Level Model revealed that the Partner *Affective Touch Diversity* was higher in less religious

countries (p = 0.002). Further, while Collectivism was a positive predictor (p = 0.03) in the Cultural Level Model, it became non-significant after inclusion of random slopes and coefficients in the cross-level Interaction Model. Conversely, Temperature was a positive predictor of Partner *Affective Touch Diversity* after inclusion of a random slope and a cross-level interaction in the latter model (see Supplementary Table S5). The Random Coefficients Model showed that the relationship between Age and Partner *Affective Touch Diversity* varied across countries (Variance Estimate = .20, p = .001). The Cross-Level Interaction Model explored if any cultural level variable could explain this variation. This model revealed a negative interaction between Country-Religiosity and Age (p = 0.02). Specifically, as the Religiosity of a Country increases, the relationship between Age and *Affective Touch Diversity* toward a Partner *weakens* (i.e., in religious countries younger and older individuals have a similar *Affective Touch Diversity* to their partner; See Supplementary Figure S1).

2. Affective-Touch Diversity to a Male Friend

Affective-Touch Diversity toward a Male Friend varied significantly between countries (p < 0.001) and the Intraclass Correlation (ICC) of the Empty Model indicated that 13.6 % of the total variance in Male Friend *Affective Touch Diversity* was between countries. The Individual-Level Model showed that females, younger and less conservative individuals and people with a lower preferred distance to males and a higher preferred distance to females (*each* p < 0.0005) report a higher *Affective Touch Diversity* to a Male Friend. The Cultural-Level model revealed that the *Affective Touch Diversity* to a Male Friend was higher in less conservative (p = 0.031) and warmer (p = 0.001) countries. The Random coefficients Model showed that the relationship between Sex and *Affective Touch Diversity* to a Male Friend differed across countries (Variance Estimate = 193.95, p = 0.001). This effect was explored further in the Cross-Level Interaction Model which revealed a significant and negative

Interaction between Conservatism and Sex ($p = 0.004$). While Conservatism level of a Country *decreased*, the effect of Sex on *Affective Touch Diversity* to a Male Friend *increased* (i.e., females had a more pronounced increase in their *Affective Touch Diversity* to a Male Friend, than Males; see Supplementary Table S6 and Supplementary Figure S2).

2. Affective-Touch Diversity to a Female Friend

Affective-Touch Diversity to a Female Friend varied significantly between countries of the Empty Model. Country had a significant Intercept value, and the ICC indicated that 13.9 percent of the total variance in Female Friend *Affective Touch Diversity* was between countries. The Individual-Level Model showed that females, younger, less conservative individuals and individuals with a lower preferred distance to females and with a higher preferred distance to males (*each* $p < 0.0005$) report a higher *Affective Touch Diversity* towards a Female Friend. The Cultural-Level Model revealed that the *Affective Touch Diversity* towards a Female Friend was higher in warmer countries ($p = 0.003$). Further, while Conservativism was a negative predictor ($p = 0.03$) in this model, it became non-significant after inclusion of random slopes and cross-level interactions. The Random coefficients Model showed that the relationship between the Female Friend *Affective Touch Diversity* and both Sex (Variance Estimate = 138.84, $p < 0.0005$) and Age (Variance Estimate = .08, $p = 0.009$) varied across countries. These random slopes were explored further in the Cross-Level Interaction Model, which showed a negative interaction between Collectivism and Sex ($p = 0.009$). As Country-Level Collectivism increased, Age became more negatively related to Female Friend *Affective Touch Diversity* (i.e., younger individuals had a more pronounced increase of the *Affective Touch Diversity*; see Supplementary Table S7 and Supplementary Figure S3). There was no significant Cross-Level Interaction between the Cultural-Level Predictors and Sex.

4. Affective Touch Diversity to the Child

Affective Touch Diversity toward one's own Child varied significantly between countries (p=0.002) and the Intraclass Correlation (ICC) of the Empty Model indicated that 7.0 percent of the total variance in Affective-Touch Diversity was between countries. The Individual-Level Model showed that females, younger and less conservative individuals (each $p <$ 0.0005) reported higher *Affective Touch Diversity* toward their Children. The Cultural-Level Model revealed no Cultural-Level Predictors that were significantly related to the (rather low) cultural variation in Child *Affective Touch Diversity* (see Supplementary Table S8). As Cultural-Level variables were not significant predictors of Child *Affective Touch Diversity*, further models (i.e., Random Coefficients, and Cross-Level) were not run.

Discussion

Our global study shows that affective touch is an extremely prevalent behavior across human cultures, fine-tuned according to the type of interaction partner and influenced by both culture and individual differences. In general, affective touch was most prevalent in relationships with partners and children, and its diversity was relatively higher in warmer, less conservative and religious countries, and among younger, female and liberal people.

One of the most interesting findings of our study was that people use affective touch in different relationships all over the world, regardless of their culture or the location they inhabit. As expected, touch prevalence was very high within romantic partnerships and in relation to one's own child, with a median touching prevalence of 95.9% or 94.6% across countries, respectively. Not only *Touch Prevalence*, but also *Touch Diversity* were very high in such close relationships. Previous studies report that humans allow for more touch in close relationships (Suvilehto et al., 2015) and that intimate touch is associated with increased relationship commitment (Johnson & Edwards, 1991). Consistent with this, in our study

stroking and kissing was observed more often in romantic relationships or in parent-child relationships than between friends. Therefore, diverse affective touch seems to be more important in the closest, personal relationships. This confirms the previously assumed role of touch in fostering and strengthening romantic relationships (Gallace & Spence, 2010; Watkins et al., 2019) and for building bonds between parents and offspring (McGlone et al., 2014). Indeed, the gentle affective touch of a parent can generate positive emotions and decrease negative emotions in children and to a certain extent, such touch can even compensate for low affectivity of depressive mothers (Pelaez-Nogueras, Field, Hossain, & Pickens, 1996). For romantic partnerships, touch improves affectivity, increases well-being (Debrot et al., 2013) and has a positive influence on emotion regulation by supporting stress-sensitive physiological processes (Holt-Lunstad, Birmingham, & Light, 2008). Our data suggest that people use different types of affective touch as a partnership and parenting fostering strategy all over the world. This supports the assumption that touch is a cross-cultural phenomenon, likely with a biological or evolutionary foundation (see also Dunbar, 2010), and with ecological relevance for establishing and maintaining close relationships.

Nevertheless, our study confirmed significant cross-country variability in *Affective Touch Prevalence* (Regan et al., 1999; Remland, Jones, & Brinkman, 1995;) and in *Affective Touch Diversity*. The data partially support the assertion that some countries can be classified on a continuum from high- to low-contact (Knapp et al., 2014), although not all of our results concur with this "classical" perspective. For example, the previously assumed touch avoidance in northern European countries or high importance of touch in Central America is contradicted by data we collected in Sweden and El Salvador. Some of these discrepancies can be explained with the factors we assumed to underlie the global affective touch variance discussed in further sections of the discussion.

Our data indicate that the predictors of the *Affective Touch Diversity* form two non-exclusive groups affecting tendencies and rules of touching: biological (i.e., temperature-disease factors likely associated with behavioral immunology) and social factors (i.e., religion-conservatism factors related mostly to culture) that influence reported touch behavior of men and women of different age groups.

Cultural predictors - biological factors

Temperature was a positive predictor of *Affective Touch Diversity* toward partners, male and female friends. The reason may be that warmer climate and pleasant weather leads to increased frequency of interpersonal interactions (Tucker & Gilliland, 2007), promotes interpersonal trust (Kang, Williams, Clark, Gray, & Bargh, 2011) and thereby facilitates the formation of social networks. This notion is also consistent with embodiment theories, linking physical warmth with social proximity (IJzerman & Semin, 2009).

Another explanatory mechanism is possible: Following the Parasite-Stress (Thornhill & Fincher, 2014; 2015) and the Behavioral Immune System (Murray & Schaller, 2016) theories, it is beneficial to increase local disease transmission to boost immune memory to local pathogens and decrease their virulence. As higher temperature can be a proxy for higher disease incidence (Guernier, Hochberg, & Guégan, 2004), it may lead to culture-driven increased Affective Touch Diversity in social interactions, meaning more types of bodily contact in close relationships and resulting in higher chances for disease transmission within a particular society. Still, we found no corresponding effect for country-level parasite stress, despite a positive correlation of temperature with this variable. There are two nonexclusive explanations for this inconsistency: first, the parasite stress factor we included in our research was relatively narrow and it did not cover the whole range of existing pathogens and contagious diseases. This hypothesis might be tested in further research by exploring the dependencies between our

touch indices and other pathogen stress variables, such as longitudinal pathogen prevalence (Kusano & Kemmelmeier, 2020). Second, our pathogen index was based on averaged responses of individual participants of our research. The biological explanation posed above assumes a long-lasting influence shaping the culture-level disease incidence and touch behaviors interaction. The averaged parasite index we used related to current health state of individuals living in a time of rapid medicine development and growing hygiene awareness. Multiple programs aim to reduce threats of pathogens like malaria (World Health Organization, 2019) and recent studies show that such global efforts are effective (Weiss et al., 2019). Consequently, current disease incidence can differ from the previous parasitic influences on touch diversity. Nevertheless, we observed a negative association between individual parasitic history and diversity of touching in interactions with one's partner. It seems then that – contrary to cultural, temperature-driven tendencies formed across generations – current individual disease history may exert a separate influence on affective touch behavior, decreasing the likelihood of diversified touch interactions within one's romantic relationship.

Cultural predictors - social factors

Country-level conservatism and religiosity decreased *Affective Touch Diversity* to one's male friends or partner, respectively. Regardless of one's culture, individual-level conservatism decreased *Affective Touch Diversity* in all relationships. We believe that our data illustrate an important trend associating conservatism and religiosity in the context of a decreased expression of affection with the use of touch. We interpret these findings together, as religiosity relates to conservatism (Carney et al., 2008; Malka, Lelkes, Srivastava, Cohen, & Miller, 2012), probably through a constellation of certain psychological dispositions that increase some individuals' need for control and uncertainty reduction (Carney et al., 2008; Jost, Glaser, Kruglanski, & Sulloway, 2003). Culture-level conservatism and religiosity were also highly and positively correlated in our sample (see Supplementary Table S3).

Children originating from very religious homes experience less affectionate touch (and more punishing touch) from their parents beginning in late childhood (Hatfield, 1986, 1994). Imprinting such family values and behaviors might lead to less affectionate behaviors with one's partner in the future (Hatfield, 1986, 1994; Wallace, 1981) and can consequently shape social environments characterized by fewer affectionate touch behaviors. The same relates to conservative values that can be transferred from generation to generation (Carney et al., 2008; Klofstad, McDermott, & Hatemi, 2013). Additionally, conservatism positively correlates with disgust sensitivity (Terrizzi et al., 2010), and this can further decrease affective touch likelihood in conservative individuals. Interestingly, culture-level conservatism was linked to opposite-sex interactions in such a way that high conservatism was related to reduced opposite-sex touch interaction (see Supplementary Information S7.1). The reason for this remains unknown. We consider the following explanation to be plausible: our *Affective Touch Diversity* index shows the variability of the expression of affection through touch. Religiosity and conservatism promote adherence to local norms (Tybur et al., 2016). Therefore, conservatism and religiosity may generate more formalized (and less freely and diversely expressed) affective behaviors towards the opposite-sex friends. Nevertheless, it remains warranted to further explore the relationship between conservatism, religiosity, gender of both partners of an interaction and expression of affection in further studies using a variety of touch expression measures (e.g., touch frequency, DiBiase & Gunnoe, 2004; or touch acceptability, Burleson et al., 2019).

It is also worthwhile to relate the interpretation of our findings on social factors to the pattern of results observed for biological factors. As mentioned in the introduction, it is likely that in our distant ancestral past, culture-level conservatism and religiosity evolved partially in response to environmental threats, like pathogen stress (Fincher & Thornhill, 2012). This theoretical link is supported by the negative association of touch diversity and conservatism

and the significant correlations of culture-level conservatism, religiosity and parasite history in our sample. However, the interactions analyzed were based on affective touch in close relationships, while from the biological, pathogen protection perspective (Fincher & Thornhill, 2012) affective touch may theoretically be the least diverse and most formalized with regard to out-group members. Indeed, further theoretical explorations are necessary to assess the interplay between the current and historical pathogen influence on cultural values and behavioral displays of affection, as noted above.

Individual predictors

Affective Touch Diversity was related to several individual-level predictors, including individual conservatism, parasite load, age, sex and interpersonal distance preferences. The discussion of the two former factors concurs with the arguments posed above. This section addresses the three latter predictors. The consistent, negative association between age and *Affective Touch Diversity* concurs with the social cultural predictors as conservatism is more prevalent in older generations (Cornelis, Van Hiel, Roets, & Kossowska, 2009). Further, this result is consistent with the negative association between age and preferred interpersonal distance (Sorokowska et al., 2017) which suggests that young people prefer closer physical proximity. Young people spend much time initiating and maintaining relationships with peers and partners (Walen & Lachman, 2000) and affective touch is an efficient strategy for bonding (McGlone et al., 2014). According to the Triangular Theory of Love (Sternberg, 1986), frequent touch is characteristic of early stages of romantic relationships, and a recent study showed that it positively predicts one's reproductive success (Sorokowski et al., 2017). Although this line of thinking is most important in the case of affective touch within couples, studies show that there is a high likelihood that friends become romantically (or physically)

involved (Barelds & Barelds-Dijkstra, 2007; Bisson & Levine, 2009) which extends this hypothesis also to opposite-sex friendships.

Sex did not predict Partner *Affective Touch Diversity*, but women touched their friends and children with a greater variety of touch types than did men. Previous studies show that women are generally more likely to use touch in interpersonal interactions (Ford & Graves, 1977; Jones, 1986). This aligns with the notion that women's social networks are more extensive and denser than those of men (Walen & Lachman, 2000) and affective touch may facilitate bonding. In addition, our data show that social-cultural factors like conservatism decrease this propensity, likely leading to more formalized (and less diverse) touch interactions between friends (especially for opposite-sex friends, as shown in Supplementary information S7.1). For peer touch, the cross-level interaction between country conservativism and sex showed that women from liberal countries touched their male friends with a greater diversity than males touched other males. Results for interactions between friends of the same sex are generally consistent with those of previous studies. Especially among young people, women touch other women more often than men touch other men (Hall & Veccia, 1990; Stier & Hall, 1984) whereas men often perceive touch from a same-sex person as a great invasion of privacy (Heslin et al., 1983).

The observation that women touch their children with very high prevalence and in a variety of ways reflects the importance of affective touch in mother-child interactions for communicating intimacy (Marston, Hecht, Manke, Mcdaniel, & Reeder, 1998). It is nevertheless interesting that mothers report using touch more often than fathers do. One explanation may relate to lower paternity certainty of fathers, which can result in lower parental investment (Trivers, 1972). Our finding can be further associated with the notion that women have a generally higher interest in children than men, which indicates a specific adaptation for parenting (Maestripieri & Pelka, 2002). Finally, reduced parental touch could

also be an outcome of increasingly pervasive cultural taboos. In some countries, such as the USA, interpersonal touch is actively discouraged, in order to minimize the potential for child abuse or the threat of litigation (Field, 2001). The negative association between age and affective touch toward once's children and age adds broader context to the findings regarding sex, as it is a likely by-product of the youngest participants having the youngest children and spending more time with their offspring during, e.g., maternity leave. Touch is a pivotal stimulus in newborns' lives (Barnett, 2005; Hertenstein et al., 2006; Underdown et al., 2010), this is probably why the diversity of affective touch is the highest among young mothers, whose younger children need it the most.

Finally, our data show that preferred interpersonal distance is a predictor of *Affective Touch Diversity* in relationships with male and female friends, but not with one's partner or child. Interpersonal distance preferences can be seen as a trait relating to one's general preferred physical closeness with others. Following this argument, this result suggests that personality moderates affective touch behaviors – but not in the relationship to partners or children. This is an important avenue for future investigations.

Summarizing the group of individual factors shaping *Affective Touch Diversity*, we agree that touch is crucial for creating and strengthening of social bonds (for reviews see: Gallace & Spence, 2010; McGlone et al., 2014). Therefore, its behavioral expression can be the richest among people for whom bonding and physical contact is the most important, namely young women and people with low interpersonal distance preferences. The interactions with culture-level religiosity and conservatism additionally suggest that these individual factors only enhance affective touch to others in ecological and social contexts where it is culturally permissible.

In conclusion, our data show that culture affects our general inclination to use or avoid affective touch and modifies the diversity of touch behaviors in a range of social relationships. The observed variance in diversity and prevalence of touch behaviors suggest that touch can either be a common expression of affection that is not excessively formalized and has a variety of displays or, quite the opposite, can be subject to a limiting influence of personal and cultural taboos.

Limitations and future directions

To the best of our knowledge, this is the first large-scale empirical investigation of affective touch across different relationship types, and therefore, our results need to be considered with caution. The study was guided by theoretical considerations but does not exhaust the individual and culture level predictors of affective touch. We hope to inspire further studies and suggest four adjustments to their methods and design. First, in the current study, we only asked about affective touch during the "last week" interval and participants did not report exact frequencies of affective touch types. Finer tuned scales, ideally involving repeated daily measurements over extended time intervals (Jones, 1986) and direct observations of physical interactions (e.g., Dibiase & Gunnoe, 2004; Regan et al., 1999), will allow for more detailed analyses and for creating a fuller picture of global *Affective Touch Diversity* and *Prevalence*. Second, as it is difficult to separate cohort from age effects in our sample, future research should comprise longitudinal data. Third, the measure of preferred distances used in this study involved different interaction partners (i.e., female- and male- acquaintance, close-friend, stranger) than those in the affective-touch questionnaire (i.e., partner, child, female- and male- friend). To more accurately assess if preferred-distance to an individual relates to affective-touch towards that *same* individual, future touch-studies should adjust these measures such that the interaction partners are congruent. Fourth, to further discern the interplay of biological and personality factors in individual and cultural affective touch

variation, future research should look at a broader range of personality measures related to both touch and the behavioral immune system – e.g., disgust sensitivity, perceived vulnerability to disease, or longitudinal pathogen prevalence (Croy et al., 2014; Duncan et al., 2009; Hertenstein et al., 2006; Kusano & Kemmelmeier, 2020). We also recommend using a variety of our touch indices as dependent variables in future multi-level analyses. All data used in this research are published in an open access repository and we encourage further explorations and hypotheses generated on the basis of the wealth of information we collected. For example, our indices of affective touch behaviors that were computed prior to the COVID-19 pandemic can be especially relevant to explore multiple social consequences of this pandemic, or to conduct post-hoc analyses of the disease spread.

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