BRIEF ARTICLE

Moment-to-moment changes in feeling moved match changes in closeness, tears, goosebumps, and warmth: time series analyses

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ABSTRACT

Feeling moved or touched can be accompanied by tears, goosebumps, and sensations of warmth in the centre of the chest. The experience has been described frequently, but psychological science knows little about it. We propose that labelling one's feeling as being moved or touched is a component of a social-relational emotion that we term kama muta (its Sanskrit label). We hypothesise that it is caused by appraising an intensification of communal sharing relations. Here, we test this by investigating people's moment-to-moment reports of feeling moved and touched while watching six short videos. We compare these to six other sets of participants' moment-to-moment responses watching the same videos: respectively, judgements of closeness (indexing communal sharing), reports of weeping, goosebumps, warmth in the centre of the chest, happiness, and sadness. Our eighth time series is expert ratings of communal sharing. Time series analyses show strong and consistent cross-correlations of feeling moved and touched with each other and with each of the three physiological variables and expert-rated communal sharing - but distinctiveness from happiness and sadness. These results support our model.

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Others' social and relational acts frequently cause feelings and emotions (Fischer & van Kleef, 2010; Keltner & Haidt, 1999; Parkinson & Manstead, 2015). One of those is often labelled feeling moved to tears – a potent yet under-researched emotional experience. People seem to feel it in many social relations that involve sharing communally, such as bonds between parents and children, love between romantic partners, devoted friendship, as well as religious worship and communities. Darwin (1890), James (1890), Claparède (1930), Frijda (1988), and Panksepp (1995) have pointed it out as an object worthy of study, but it has only recently attracted systematic empirical attention.

In the current research, we introduce a model that defines the emotion in question theoretically, linking labels, physical sensations, appraisal, and regulatory functions; we will call this emotion kama muta, using its Sanskrit label, in order to distinguish the scientific construct from the shifting denotations of any vernacular term. We then investigate how feelings, appraisal, and bodily sensations arise concurrently when this emotion unfolds.

How people feel moved or touched

Past work has put forward proposals and some evidence about bodily sensations, affect, appraisals, and motivation accompanying what people often call being touched or moved. When sufficiently intense, feeling moved or touched seems to be accompanied by three bodily sensations: experiencing goosebumps, chills, or shivers; moist eyes or even tears; and often a warm feeling in the centre of the chest (in the "heart"; see Benedek & Kaernbach, 2011; Scherer & Zentner, 2001; Strick, Bruin, Ruijter, & Jonkers, 2015; Wassilwizky, Wagner, & Jacobsen, 2015).

The affective tone of this feeling seems primarily positive (Hanich, Wagner, Shah, Jacobsen, & Menninhaus, 2014), though some have argued that the
Emotions contribute to the constitution and regulation of relationships (Fiske & van Kleef, 2010; Fiske, 2002; Keltner & Haidt, 1999). We assume that kama muta evolved to regulate behaviour in a specific type of relations, namely communal sharing relations. The concept of communal sharing has been developed in Relational Models Theory, which argues that human social relations are built out of four distinct relational models (Fiske, 1992, 2004). In relations based on the model of communal sharing, people have a sense of a common identity, and they distribute resources according to need, rather than according to rank, even matching, or proportionality. Communal sharing is a psychological concept and can be reflected in, but is not restricted to, actual exchange of resources, and can also be implemented in relations to strangers or fictional characters.

Based on this theoretical background, we specify the notion that being moved arises from the activation of “attachment concerns” (Frijda, 1988; Tan & Frijda, 1999), and propose that kama muta arises from appraising increases in the strength of a communal sharing relation, or other contrasts between a strong communal sharing relation and a background of need, separation, or loss. Kama muta orients the individual to communal affordances. Intensifications of communal sharing are typically subjectively experienced and reported as increases in closeness (Aron, Aron, & Smollan, 1992).

In sum, our model proposes that people feel what they typically label in English with lexemes such as being moved, touched, heart-warming, stirring (and sometimes other terms) when communal sharing relations intensify, and that these intensifications are described as, and can be operationalised by, experienced increases in what English speakers often call closeness. The central hypotheses of the kama muta model to be tested in the current research are thus that feeling moved and touched is associated with appraisals of increased closeness, and the physical signature sensations of tearing up, goosebumps, and physical warmth, because these are all components of the kama muta emotion. Our model is more specific about the appraisals than previous conceptualisations regarding fulfilment of latent attachment concerns. We know of no previous similar attempt to measure the complete set of constructs involved in this emotion, or even closeness appraisals.

The current study: a time series approach

Emotional episodes are unfolding processes in which the variables of interest change over time, sometimes

The Kama muta model of feeling moved and touched

Based on the reviewed work and our own ethnographic and interview research, we developed a model of feeling moved that addresses its appraisals, symptoms, and functions (Fiske, Schubert, & Seibt, in press). We start by observing that feelings labelled being moved or touched in English-speaking cultures have counterparts in a number of other languages that typically use the same metaphors of passive body contact (touched), passive displacement or internal motion (moved and stirred), or feelings of warmth. These vernacular terms and their folk-psychological meaning can be understood as culture-specific implementations of an emotion. To prevent confusion between the folk-psychological labels and the scientific concept, we term the putative emotion under investigation here kama muta, which was the Sanskrit label for the feeling, and literally translates into “moved by love”. The vernacular terms become measures of the feeling component, because participants necessarily report their feelings in natural language. In line with our qualitative research and the literature, we see kama muta as linked to experiences of tears, goosebumps, and subjective warmth in the chest.

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rapidly (Scherer, 2009). To capture those dynamics, continuous measures of emotional experiences have been used, both for general affect and for specific emotional states (for an overview, see Ruef & Levenson, 2007). We follow this approach here, measuring the target variables continuously while participants watch short video clips. Popular culture promotes kama muta, for instance, through moving themes in movies, talk shows, and commercials. Short clips of such productions are widely shared on social media. Judging from the comments on those clips, they seem to be very effective in eliciting feelings that people refer to as being moved, with the accompanying physical sensations (cf. Strick et al., 2015), so we use them here.

We continuously assess seven variables. Operationalising the feeling component of kama muta, we ask how moved or touched participants were. Operationalising the hypothesised appraisal of communal sharing, participants judged closeness between the protagonists in the video. We assess reports of three physical sensations: crying, goosebumps, and sensations of a warm chest. To assess discriminant validity, we collect feelings of happiness and sadness, expecting that both, but especially sadness, differ from feeling moved. As an eighth variable, we asked four experts in Relational Models Theory to continuously rate the strength of communal sharing relations in the same video clips. This will additionally validate participants’ closeness ratings as an index of communal sharing.

We assess each of these ratings from different samples, always sampling a sizable group. This prevents any possibility that the participant’s ratings on one variable could influence her ratings on another variable – each participant rates only one variable. We then average across the participants in each group and compare the resulting time series of the eight variables. We do this for six different videos that all elicit a high degree of feeling moved or touched but differ in other respects; this enables us to sample various dynamic sequences.

We analyse these time series by regressing them on time (testing intercept and linear and quadratic slopes), and then compute their cross-correlations. We have the following predictions:

1. A successful elicitation of feelings of being moved and touched in any video clip will be indicated if the regression of that series on time shows at least one significant and positive regression estimate (linear or quadratic; which one depends on the shape of the narrative). This serves as a manipulation check.
2. We predict the time series of feeling moved or touched to be cross-correlated with each of the series of crying, goosebumps, and sensations of warmth in the chest.
3. We predict the time series of feeling moved or touched to be cross-correlated with appraisals of social closeness between the protagonists of the clip, and also the expert CS ratings.

In addition, we explore the cross-correlations between feeling moved, happiness, and sadness, of happiness and sadness with the physical sensations. We expect feeling moved to be cross-correlated more with happiness than sadness because it is typically described as a positive feeling.

Method
All data were collected online. Each sample was asked for continuous reports of only one variable, without any mention of any of the other variables. Participants were asked to watch one video at a time while continuously reporting one feeling or judgement, and then, after completing all their video clips, to fill out a final questionnaire with additional measures. Each participant rated the same one variable throughout.

The majority of the data were collected using surveys that included five videos for a specific variable. We only asked and paid for rating two videos in these surveys, but participants could watch and rate more. Additional smaller surveys including a sixth video (to increase the range of stimuli) and increasing the database for the five videos supplemented the main sample. Order of videos was randomised for each participant.

Based on recent recommendations for cell sizes in experimental studies, we aimed for at least $N = 40$ per cell of the 7 (variable) $\times$ 6 (video) design. We only fell short of that number in two of the 42 cells because of excluded participants (reaching 35 and 39), and oversampled in many (see Supplementary Material).

Participants
Participants for all samples of this study were recruited on MTurk, requesting only workers from the US, and paying between $1 and $2 depending on the length of the task. From all samples, we removed participants
who did not respond to the final questionnaire, who did not watch the full video according to the time auditing, who did not follow instructions, who indicated that they had participated in a recent study on a similar topic, and those who reported technical difficulties. Exclusion was decided before importing the rating data of the participant in question. In total, data were collected from 953 participants; data from N = 909 participants were retained for analysis. The sample included 453 female participants (1 unknown gender); age ranged from 18 to 74 years (M = 34.05, SD = 10.88).

Materials and procedure

We used six different videos in total, labelled here “Thai medicine”, “Elephant rescue”, “Christian the lion”, “Marina Abramovic”, “Two orphans”, and “Thai altruism” (see Supplementary Materials for short synopses and links). All materials were in English. Three of the videos had soundtracks in other languages, but were subtitled in English.

We asked participants to indicate any change in the feeling or judgement as soon as they noticed it. For feeling moved or touched, happy, and sad, we used 5-point scales with each point labelled (e.g. for feeling moved or touched: “1 = not moved at all, 2 = somewhat moved, 3 = moved, 4 = very moved, and 5 = extremely moved”; and the instruction “While you watch the video, please indicate how touched or moved you feel right now”). For goosebumps, we used a dichotomous scale (1 = no goosebumps and 2 = goosebumps), while for both crying and experienced warmth in the chest or some other part of your body we used a 3-point scale (e.g. for crying: 1 = no moist eyes/tears, 2 = moist eyes, and 3 = tears). For measuring closeness, we employed the IOS scale introduced by Aron et al. (1992), which uses a graphical representation of metaphorical “overlap”, with the instruction “While you watch the video, please indicate how close you think the people in the video are” (scale from 1 to 7). Seibt, Zickfeld, Schubert, and Fiske (2016) have shown that ratings on this one-item graphical scale correlate substantially with a multi-item measure designed to assess communal sharing (Haslam & Fiske, 1999), confirming that this is a valid operationalisation of communal sharing.

Instructions on the continuous measure were given together with an example of the scale where participants could practise indicating changes. After instructions, correct comprehension was probed with a test question, offering three possible answers. If a wrong answer was chosen, participants were presented with the instructions again. If a wrong answer was chosen again, participation in the study ended.

The studies were programmed in Qualtrics, videos were embedded and the timestamps accessed using the Google YouTube API. The interaction through keyboard and the recording of keystrokes and timestamps were programmed in JavaScript within Qualtrics. The scale was always visible underneath the video. Changes could be indicated with the mouse or keyboard. Each change of rating was protocolled with a timestamp of the video being played acquired through the API.5 All procedures were in line with local regulations regarding participants’ privacy and approved by the Ethics Committee of the Department of Psychology, University of Oslo. Raw and aggregated data are available at Open Science Framework (https://osf.io/2qces/); stimuli and measures are documented in the supplemental material. We present our complete data from this study; we did not collect additional measures or present other stimuli. In sum, we report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study.

Results

Data preparation and manipulation check

Figure S1 illustrates the process of data preparation, and Table S1 reports additional statistical details (Supplementary Materials). Out of the timestamps of participants’ rating changes, we created time series of ratings consisting of a value for each second over the duration of the particular video. In order to compare the time series for different ratings to each other, we averaged across all participants for each second of the time series of a given rating and video, creating one time series per rating and video (Figure S1-B). Figure 1 shows the time series for moved or touched and closeness for each video. We checked the consistency of time series among participants by computing intraclass correlations (ICCs; Landers, 2015; Shrout & Fleiss, 1979) for all interval-scaled variables; they were all above .80 and are listed in Table S1. For goosebumps, we computed Fleiss’ kappa; the respective values were considerably lower, presumably due to the dichotomous item (between .14 and .26).

When regressed on time, most of the resulting curves of the variables showed increases over time that slowed towards the end. In other words, they
had both positive linear and negative quadratic trends. The trends are informative because they indicate that the measured phenomena actually increased during the video. For the time series of feeling *moved or touched*, linear terms were significant for all videos, confirming that the videos successfully induced the feeling at some point during the video. We report the parameters in Table S1 and the correlations among the raw time series in Table 1 (after smoothing, see below).

In concurrent measurement of a variable changing over time, a linear trend is likely to occur simply as a result of setting the measurement to start at a value and limiting ratings to values above that value. A quadratic trend could then result because the scale has an upper limit that some participants might
reach before the end of the video. When the variables all have linear or quadratic trends, the raw values will cross-correlate simply because they have these measurement-constraint-based trends in common. Therefore, we removed the linear and quadratic trends for the main analysis to increase the likelihood that the cross-correlations reflect changes in the variables that occur at approximately the same time (or with a fixed offset). We de-trended each time series for each video separately by estimating the linear and quadratic effects in a multiple regression (using an index of $t$ in seconds starting at 0, and its square, as predictors) and saving the unstandardised residuals (Figure S1-C; Shumway & Stoffer, 2011).

Finally, we reduced the resolution of the time scale. The time series analysis determines simultaneousness within specific time windows. One cannot expect participants to indicate a change in emotion or judgement in the one-second clock interval they experience it, or with a constant temporal offset. Before analysing the data we decided upon a window of three seconds because in most cases that should be sufficient for participants to indicate changes, and because chunks of about three seconds seem to be the building blocks of human perceptual and motor existence (Nagy, 2011). We thus aggregated the time courses by averaging judgements within units of three consecutive seconds, which smooths the curves somewhat (Figure S1-D).

### Cross-correlations

To compare the changes in the various indicators over time, we computed the cross-correlation function between the time series and, in line with that literature, their 95% CIs. Table 1 shows the cross-correlation function at lag 0 (CCF₀) among moved or touched and the seven other variables (before and after linear and quadratic de-trending of all); Table S2 lists CCF₀s between feeling moved or touched and the other variables for each video separately. Figure 2 shows the correlations with moved or touched after linear and quadratic detrending. A high correlation at lag 0 means that the two self-reports tend to change concurrently along the video. CCFs at lag 0 were almost always the highest ones; there was no systematic pattern regarding other lags. We therefore report only lag 0 CCFs in the following (see Supplementary Materials text for more information).

#### Feeling moved and closeness
As predicted, for all the videos, curves of feeling moved or touched cross-correlated strongly and significantly with closeness, between CCF₀ = .54 [.29, .72], and CCF₀ = .84 [.74, .90] (see the first column of values in Figure 2). The mean cross-correlation across the videos is .75. The respective cross-correlations among the time series before de-trending are even higher, but note that these also reflect the shared presence of linear and quadratic trends (Table 1). The former associations reflect changes that occur nearly simultaneously, while the latter in addition reflect correspondence among trends across the complete clips.

#### Feeling moved and physical sensations
Reports of all three physical sensations also substantially cross-correlated over time with feeling moved or touched. Feeling warmth in the chest (second column in Figure 2) cross-correlated significantly and strongly with feeling moved or touched in all six videos, between CCF₀ = .68 [.49, .81] and CCF₀ = .97 [.94, .98]. The same was true for crying: CCF₀ = .49 [.26, .66], to CCF₀ = .93 [.87, .96] (third column in Figure 2). Goosebumps had moderate to strong cross-correlations with feeling moved or touched for

| Table 1. Mean of six videos’ cross-correlation functions at lag 0 (CCF₀) between time-series of all eight measured variables, before/after de-trending and smoothing. |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Feeling moved   | Closeness       | Warmth          | Crying          | Goosebumps      | Expert CS       | Happiness       |
| Closeness       | .97/.75         | .99/.77         | .94/.73         | .86/.65         | .64/.56         | .96/.79         |
| Warmth          | .99/.93         | .98/.77         | .89/.36         | .84/.43         | .68/.65         | .91/.61         |
| Crying          | .94/.73         | .98/.77         | .92/64          | .89/.75         | .70/66          | .94/73          |
| Goosebumps      | .86/.65         | .99/.77         | .82/64          | .70/.66         | .63/39          | .86/44          |
| Expert CS       | .64/.56         | .99/.77         | .78/35          | .70/66          | .63/39          | .78/35          |
| Happiness       | .96/.79         | .91/61          | .86/44          | .70/66          | .63/39          | .78/35          |
| Sadness         | .33/−.15        | .36/−.03        | .35/−.10        | .14/−.18        | .24/−.09        | .19/02          |
| Notes: First and second numbers in each cell respectively show cross-correlations at lag 0 before and after removing linear and quadratic trends and smoothing. Cross-correlations were computed for each video separately, then Fisher’s z-transformed, and then averaged and re-transformed. Expert CS scores are averages of four experts’ ratings of communal sharing. |
all of six videos, from $CCF_0 = .47 \ [.15, .71]$, to $CCF_0 = .87 \ [.76, .93]$ (fourth column in Figure 2). Averaged across the videos, the cross-correlation of feeling moved or touched with warmth was .93, with crying .73, and goosebumps .65, and the three physical sensations cross-correlated with each other between .63 and .75 (Table 1).

**Feeling moved and other feelings**

Happiness cross-correlated with feeling moved or touched substantially in five out of the six videos, between $CCF_0 = .47 \ [.21, .67]$, and $CCF_0 = .97 \ [.94, .98]$ (sixth column of Figure 2) – but not for the “Two orphans” video. The average cross-correlation across all six videos was .79. The picture for sadness is more varied. Its curve cross-correlated with the feeling moved or touched curve negatively for two videos, positively for another, and not significantly for three others. The final column in Figure 2 shows the wide spread of these cross-correlations. Across the six videos, the mean cross-correlation of sadness with feeling moved or touched is $- .15$.

**Exploratory analyses**

Finally, we inspected cross-correlations between sadness and crying. Sadness and crying were positively cross-correlated in only one video, $CCF_0 = .82 \ [.71, .89]$, negatively in two others, and not significantly associated in three others. The mean cross-correlation is small and negative: $- .18$. In contrast, happiness cross-correlated positively with crying for four out of the six videos, between $CCF_0 = .33 \ [.08, .55]$ and $CCF_0 = .92 \ [.86, .96]$. In contrast, in the “Two orphans” video the cross-correlation between happiness and crying was negative, $CCF_0 = - .31 \ [- .53, - .06]$, while the cross-correlation for “Marina Abramović” was not significant. The mean cross-correlation was .44 (for an overview see Table S3).

**Expert ratings**

Using the same methodology as above, we asked experts in Relational Models Theory to continuously rate the presence of the communal sharing relational model in the video clips. All expert raters have conducted research and published on the theory. Five experts responded, but one affirmed during debriefing that she or he was already familiar with our kama muta construct, so we used only the data from the four others. The video Christian the lion was rated by only three raters, while all raters rated the other five videos.

The expert raters first always watched each clip without rating it, and then watched it again, rating continuously “Right now, how intense is the Communal Sharing relationship, if any, between the characters?” on a scale from 1 (No CS at all) to 5 (Very Intense CS; see Supplementary Materials for complete instructions). To assess inter-rater consistency, we computed intraclass correlations as above.
Consistencies were satisfactory; for videos 1–6, respectively, they were ICC(2,4) = .79, ICC(2,4) = .76, ICC(2,3) = .79, ICC(2,4) = .92, ICC(2,4) = .64, and ICC(2,4) = .71. We aggregated and transformed these ratings as we did all of the other ratings.

The expert rating of communal sharing cross-correlated with participants’ mean feeling moved or touched on average CCF₀ = .56. For one of the six videos (Elephant rescue), the CCF₀ was small and not significant (.10), while it was between .43 and .81 and significant for the remaining five video clips. Table 1 and Supplemental Table S2 show that the cross-correlations of the expert-rated communal sharing and the other variables are all sizable. The largest cross-correlations were obtained with participants’ judgements of closeness and feelings of warmth in the chest (.65 and .66). Only sadness was not on average cross-correlated with expert-rated communal sharing.

**Discussion**

The current study measured feeling moved or touched while watching “moving” video clips. We predicted that participants’ feeling moved or touched would co-occur in time with physical sensations of tears, goosebumps, felt warmth in the chest, and also with appraised strength of communal sharing relations – ratings of closeness – because we assume all of these to be components of the hypothesised emotion, kama muta. This was confirmed by our findings:

First, over the course of every video, there was a strong increase in feeling moved or touched. In line with many Internet comments on these videos, the clips consistently evoked this feeling in our participants.

Second, we found strong cross-correlations between the curves of feeling moved or touched and other participants’ reports of goosebumps, a warm feeling in the chest, and crying. The cross-correlations with goosebumps were lowest, possibly due to the dichotomous answering format, lower consistency among participants’ reports for this variable, less specificity of goosebumps for kama muta, or all of these. These data corroborate earlier work which showed such associations when people provide a summary report after experiencing the emotion (Benedek & Kaernbach, 2011; Seibt, Schubert, Zickfeld, & Fiske, in press; Strick et al., 2015). What is unique about the current data is the evidence that the feeling and the physical sensations develop concurrently (at the level of 3-second intervals). The cross-correlations confirm that these components of a coherent emotion change together over time. However, there are enough differences between the curves to suggest that at least in some people at some moments, feeling moved or touched can occur without tears, or without goosebumps, or without a warm feeling in the chest.

Third, we found that one set of participants’ feeling moved or touched matches changes in another sample’s judgements of social closeness at the same moments in the videos. Inspection of the curves in Figure 1 shows that most large swings of closeness judgements correspond to swings in feeling moved or touched; this observation is confirmed by high and significant cross-correlations between the two curves for all video clips, even after removing linear and quadratic trends in each variable from each respective video. We interpret participants’ judged closeness as indexing intensification of communal sharing. This is backed up by its cross-correlations with expert-rated presence of communal sharing, which also predict participants’ feelings moved, with the exception of one video clip. These results go beyond previous work that characterised feelings labelled “being moved” or “touched” as caused by the “fulfilment” of attachment “concerns” (e.g. Frijda, 1988); we present and support a more precise emotion construct and a more precise mechanism for its activation. We also go beyond work theorising that such feelings are caused by other social judgements – work that never directly measured those hypothesised judgements (Algoe & Haidt, 2009; Cova & Deonna, 2014; Frijda, 1988; Schnall et al., 2010).

The current results are backed up by our findings from not yet published studies, which show that the same and similar video clips evoke appraisals of increased closeness, feeling moved and touched, and the same physiological sensations – not just in the U.S., but also in several non-English-speaking cultures (Seibt, Schubert, Zickfeld, Zhu, et al., 2016).

Each of the time series averages the judgements of a different group of participants. We believe that given this, the similarity of the curves is remarkable. Aggregating across many participants reduces error variance, analogous to aggregating across many items of a scale. The resultant increase in reliability makes these high cross-correlations possible – but of course far from inevitable, as we can see from the low, varying, and sometimes negative correlations with sadness. Before de-trending, some cross-correlations are close to one. This is informative because it indicates the presence of parallel linear
and quadratic trends in most of the variables across the whole length of the roughly two-minute videos, in addition to the moment-to-moment synchronisation of the changes.

Our data did not reveal any consistent time lag between the curves of feeling moved or touched and judged closeness. Given that we argued that judged closeness is the appraisal leading to kama muta, one might wonder whether it should not precede the feeling. There may be several reasons for why it did not: The temporal resolution is not precise to the second, and therefore we actually smoothed the data into three-second segments. Also, given the nature of fast emotions as opposed to deliberate conscious judgements, it is questionable whether we should expect the judgement curve to precede the curve of feeling moved or touched.

Our data are correlative. One potential third variable is the music present in all six of our video clips. Sloboda (1991) identified structural features of musical passages that are reported to frequently cause tears and a lump in the throat. We do not think that the scores can explain what we found – just telling the same stories orally or presenting moving videos without sound can move people considerably, while our impression is that hearing these particular musical pieces alone would not cause the same feelings. However, the scores likely amplified what was happening in the story (Strick et al., 2015).

The predicted cross-correlations are strong and significant across six videos depicting diverse social interactions. Any alternative interpretation of our findings would have to account for that consistency across narratives whose only evident commonality is that they all consist of rapid and pronounced intensifications of CS relationships. Nevertheless, future work should strive to develop a method for sampling stimuli clips from the population of clips that are deemed “moving”, “touching”, “heart-warming”, etc., in various cultures – as well as other kinds of stimuli and experiences in which CS intensifies.

In the present data, increases in social closeness are associated with increases in feeling moved and physical sensations. However, we would argue that especially sudden and significant increases cause the full-blown emotion, while slow increases should not reach that quality (Fiske, Schubert, & Seibt, in press; Frijda, 1988). Testing this precise prediction remains a task for future studies with more variations in the stimulus materials and improved statistical methods.

Exploring related emotions

Comparing the curves of feeling moved or touched with those of happiness and sadness suggests two conclusions: First, kama muta is distinct from both happiness and sadness. Kama muta can coincide with happiness, but does not always. Kama muta can also coincide with sadness, but often does not. This is what one would expect for distinct emotions: They may occur at the same time, or not. Second, kama muta’s observable association with happiness is stronger than its association with sadness. To the extent that this can be generalised beyond the stimuli in this study, our results support findings in the literature that kama muta is consistently associated with positivity, but not with negativity (Seibt et al., in press). It is a mostly positive, satisfying, desirable emotion; people often actively seek it. Importantly, our data show that kama muta can arise independently of being sad. This is in line with the kama muta model, where sadness as such is not assumed to play a causal role, even though obstacles or relational problems can induce momentary sadness that provides the background condition for an intensification of communal sharing.

Our data are also informative about crying, which is a topic of study on its own (Vingerhoets & Bysma, 2015). The field recognises that crying can result from both negatively and positively evaluated situations. Our situations are clearly of the latter type: Crying cross-correlated positively with happiness, and overall slightly negatively with sadness. When people experience kama muta, their tears are happy ones.

Kinds of sharing

We base our theoretical model of kama muta on communal sharing, a theoretical concept introduced in Relational Models Theory (Fiske, 1992), and argue that this model underlies the appraisal. Communal sharing should not be confused with other kinds of sharing, such as the sharing of emotional experiences that tends to make the emotions stronger (e.g. Boothby, Smith, Clark, & Bargh, 2016), or the sharing of emotional episodes after they have occurred, which has been identified as an important characteristic of how humans experience and regulate emotions (Rimé, 2009).

However, both of these are also important for kama muta: Joint experiences of kama muta should be stronger, especially if the relation to the other
person is one of communal sharing. Experiences of kama muta will also be “shared” in the other sense: actively transmitted to others. This can be observed in social media, where we found our stimuli because they were shared (with the intention to evoke kama muta in others, presumably) and commented upon as moving and touching. Together, these various notions of sharing show that emotional appraisal, experience, expression, regulation, and regulatory function are largely socio-relational (cf. Fischer & Manstead, 2016; Fiske, 2002).

Notes

1. It has also been argued that feeling moved or touched is associated with motivation to identify and empathize more with others. Because we do not investigate motivation in the present study, we do not discuss it here.
2. Consequently, in this manuscript, we use the terms “feeling moved/touched” and “being moved/touched” only when referencing other work that used those terms, and when referring to our actual measures that used these terms. When we denote the emotion (a scientific concept), we call it “kama muta.”
3. Communal sharing should not be confused with other notions of social sharing, although these are important – see the General Discussion.
4. Note that we are not aiming to map the denotations of being moved and touched or similar terms in English or other languages. There certainly are situations in which people say that they are moved or touched that do not fit our concept kama muta, and there are definitely instances of kama muta that people do not label being moved or touched.
5. For exploratory purposes not relevant to the present hypotheses, at the end participants also answered questions on mood, arousal, trait empathy, and a 10-item personality survey. We will not report these data here.
6. We used the CCF command in SPSS 22. Computationally, CCF is identical to Pearson’s correlation coefficient. We use the abbreviation CCF instead of \( r \) to emphasize that we report correlations among aggregated time series, where the units of analysis are the units of time in the series.

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References

Algoe, S. B., & Haidt, J. (2009). Witnessing excellence in action: The “other-praising” emotions of elevation, gratitude, and admiration. The Journal of Positive Psychology, 4(2), 105–127. doi: 10.1080/17439760802650519
Aron, A., Aron, E. N., & Smollan, D. (1992). Inclusion of other in the self scale and the structure of interpersonal closeness. Journal of Personality and Social Psychology, 63(4), 596–612.
Benedek, M., & Kaernbach, C. (2011). Physiological correlates and emotional specificity of human piloerection. Biological Psychology, 86(3), 320–329. doi:10.1016/j.biopsycho.2010.12.012
Boothby, E. J., Smith, L. K., Clark, M. S., & Bargh, J. A. (2016). Psychological distance moderates the amplification of shared experience. Personality and Social Psychology Bulletin, 42, 1431–1444. doi:10.1177/0146167216662869
Claparède, E. (1930). L’émotion «pure». Extrait Des Archives de Psychologie, 22, 333–347.
Cova, F., & Deonna, J. A. (2014). Being moved. Philosophical Studies, 169(3), 447–466. doi:10.1007/s11098-013-0192-9
Darwin, C. (1890). The expression of the emotions in man and animals. London: John Murray.
Deonna, J. A. (2011). Etre ému. In C. Tappolet, F. Teroni, & A. Konzelmann Ziv (Eds.), Les Ombres de l’âme: Penser les emotions negatives (pp. 111–128). Genève: Markus Haller.
Fischer, A. H., & van Kleef, G. A. (2010). Where have all the people gone? A plea for including social interaction in emotion research. Emotion Review, 2(3), 208–211. doi:10.1177/1754073910361980
Fischer, A. H., & Manstead, A. S. R. (2016). Social functions of emotion and emotion regulation. In L. Feldman Barrett, M. Lewis, & J. M. Haviland-Jones (Eds.), Handbook of emotions (4th ed., pp. 424–439). New York: Guilford Press.
Fiske, A. P. (1992). The four elementary forms of sociality: Framework for a unified theory of social relations. Psychological Review, 99(4), 689–723.
Fiske, A. P. (2002). Socio-moral emotions motivate action to sustain relationships. Self and Identity, 1, 169–175.
Fiske, A. P. (2004). Relational models theory 2.0. In N. Haslam (Ed.), Relational models theory: A contemporary overview (pp. 3–25). Mahwah, NJ: Erlbaum.
Fiske, A. P., Schubert, T. W., & Seibt, B. (in press). “Kama muta” or “being moved by love”: A bootstrapping approach to the ontology and epistemology of an emotion. In J. Cassaniti & U. Menon (Eds.), Universalism without uniformity: Explorations in mind and culture. Chicago: University of Chicago Press.
Frijda, N. H. (1988). The laws of emotion. The American Psychologist, 43(5), 349–358.
Hanich, J., Wagner, V., Shah, M., Jacobsen, T., & Menninghaus, W. (2014). Why we like to watch sad films: The pleasure of being moved in aesthetic experiences. Psychology of Aesthetics, Creativity, and the Arts, 8(2), 130–143. doi:10.1037/a0035690
Haslam, N., & Fiske, A. P. (1999). Relational models theory: A confirmatory factor analysis. Personal Relationships, 6(2), 241–250.
James, W. (1890). The principles of psychology (Vol. 2). Cambridge, MA: Harvard University Press.

Keltner, D., & Haidt, J. (1999). Social functions of emotions at four levels of analysis. Cognition and Emotion, 13, 505–521. doi:10.1080/026999399379168

Konečný, V. J. (2005). The aesthetic trinity: Awe, being moved, thrills. Bulletin of Psychology and the Arts, 5, 27–44.

Kuehnast, M., Wagner, V., Wassiliwizky, E., Jacobsen, T., & Menninghaus, W. (2014). Being moved: Linguistic representation and conceptual structure. Frontiers in Psychology, 5, 239. doi:10.3389/fpsyg.2014.01242

Landers, R. N. (2015). Computing intraclass correlations (ICC) as estimates of interrater reliability in SPSS. The Winnower, 2, e143518.81744. doi:10.15200/winn.143518.81744

Menninghaus, W., Wagner, V., Hanich, J., & Wassiliwizky, E. (2015). Towards a psychological construct of being moved. PLOS One, 10(6), e128451. doi:10.1371/journal.pone.0128451

Menninghaus, W., Wagner, V., Hanich, J., & Wassiliwizky, E. (2015). Towards a psychological construct of being moved. PLOS One, 10(6), 1–33. doi:10.1371/journal.pone.0128451

Nagy, E. (2011). Sharing the moment: The duration of embraces in humans. Journal of Ethology, 29(2), 389–393. doi:10.1007/s10164-010-0260-y

Panksepp, J. (1995). The emotional sources of “chills” induced by music. Music Perception, 13, 171–207.

Parkinson, B., & Manstead, A. S. R. (2015). Current emotion research in social psychology: Thinking about emotions and other people. Emotion Review, 7, 371–380. doi:10.1177/1754073915590624

Rimé, B. (2009). Emotion elicits the social sharing of emotion: Theory and empirical review. Emotion Review, 1(1), 60–85. doi:10.1177/1754073908097189

Schnall, S., Roper, J., & Fessler, D. M. T. (2010). Elevation leads to altruistic behavior. Psychological Science, 21(3), 315–20. doi:10.1177/0956797609359882

Seibt, B., Schubert, T. W., Zickfeld, J. H., & Fiske, A. P. (2016). Interpersonal closeness and morality predict feelings of being moved. Emotion. doi:10.1037/emo0000271.

Seibt, B., Schubert, T. W., Zickfeld, J. H., Zhu, L., Arriaga, P., Simão, C.,… Fiske, A. P. (2016). Kama Muta: Similar emotional responses to touching videos across five cultures. Manuscript in preparation.

Seibt, B., Zickfeld, J. H., Schubert, T. W., & Fiske, A. P. (2016). Communal sharing and being moved in social relationships. Manuscript in preparation.

Shrout, P., & Fleiss, J. (1979). Intraclass correlations: Uses in assessing rater reliability. Psychological Bulletin, 86, 420–428.

Tan, E. S. (2009). Being moved. In D. Sander & K. R. Scherer (Eds.), Companion to emotion and the affective sciences (p. 74). Oxford: Oxford University Press.

Tan, E. S., & Frijda, N. H. (1999). Sentiment in film viewing. In C. Plantinga & G. M. Smith (Eds.), Passionate views: Film, cognition, and emotion (pp. 48–64). Baltimore, MD: Johns Hopkins University Press.

Vingerhoets, A. J. J. M., & Bylsma, L. M. (2015). The riddle of human emotional crying: A challenge for emotion researchers. Emotion Review. doi:10.1177/1754073915586226

Wassiliwizky, E., Wagner, V., & Jacobsen, T. (2015). Art-elicited chills indicate states of being moved. Psychology of Aesthetics, Creativity, and the Arts, 9(4), 405–416.