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Individual Choose-to-Transmit Decisions Reveal Little Preference for Transmitting Negative
or High-Arousal Content

Florian van Leeuwen¹, Nora Parren², Helena Miton³, and Pascal Boyer⁴

¹Aarhus University

²University of Lyon

³Central European University

⁴Washington University in St. Louis

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Correspondence:

Florian van Leeuwen, Department of Political Science, Aarhus University, Bartholins
Allé 7, DK-8000 Aarhus, Denmark. Email: florianvanleeuwen@ps.au.dk

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Abstract

Research on social transmission suggests that people preferentially transmit information about threats and social interactions. Such biases might be driven by the arousal that is experienced as part of the emotional response triggered by information about threats or social relationships. The current studies tested whether preferences for transmitting threat-relevant information are consistent with a functional motive to recruit social support. USA residents were recruited for six online studies. Studies 1a and 1B showed that participants more often chose to transmit positive, low-arousal vignettes (rather than negative, high-arousal vignettes involving threats and social interactions). Studies 2A and 2B showed higher intentions to transmit emotional vignettes (triggering disgust, fear, anger, or sadness) to friends (rather than to strangers or disliked acquaintances). Study 4 showed a preference for transmitting stories that participants had modified and were therefore novel and unique. Studies 2A and 3 (but not Studies 2B and 4) suggest that motivations for seeking social support might influence transmission preferences. Overall, the findings are not easily accounted for by any of the major theories of social transmission. We discuss limitations of the current studies and directions for further research.

Individual Choose-to-Transmit Decisions Reveal Little Preference for Transmitting Negative or High-Arousal Content

Information about threats seems prevalent in Western and industrialized cultures. From work-floor gossip, newspaper headlines, talk show punditry, to urban legends, information about potentially dangerous situations are shared between members of society, even as some of these people enjoy lives that are safer, longer, and healthier than ever before. Empirical research and evolutionary psychological theory suggests that this cultural pattern is due to a human psychology that is biased to transmit threat-related information. Building on this literature, we conducted six studies testing hypotheses about the psychological processes involved in social transmission, i.e., the transmission of information between individuals.

Multiple Biases in Social Transmission

Evidence of a general negativity bias, whereby people tend to be especially sensitive to negative information and stimuli, is substantial. This sensitivity appears to be general, with researchers in different disciplines noting that stimuli and events that are experienced as negative, threatening, or costly often have stronger effects on psychological processes and behavior than comparably positive stimuli and events (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Park & Van Leeuwen, 2014; Peeters & Czapinski, 1990; Rozin & Royzman, 2001; Taylor, 1991).

This bias for negative information seems also to apply to social transmission (Bebbington, MacLeod, Ellison, & Fay, 2016; Heath, 1996; Walker & Blaine, 1991). Threat-related information is predominant in other products of cultural transmission, including urban legends and supernatural beliefs (Fessler, Pisor, & Navarrete, 2014; Stubbersfield, Tehrani, & Flynn, 2015). Social transmission of threat information may be driven by a negativity biases in attention (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & Van Ijzendoorn, 2007), memory (Mitte, 2008) and/or in credulity (Fessler, Pisor, & Navarrete, 2014). Of course, there

is likely variation across individuals in any negativity bias, as research on negativity bias in attention and memory suggest that negativity bias may be observed particularly among individuals with high anxiety. Therefore, a negativity bias account of social transmission suggests that individuals may display a tendency to transmit negative, threat-relevant information, which may be particularly strong when they have high (state or trait) anxiety.

There might also be other biases in social transmission. Human memory seems to be better at retaining narratives that involve social interactions than narratives that involve no social interaction (Mesoudi, Whiten, & Dunbar, 2006; Stubbersfield et al., 2015). Such a bias for social information might affect the prevalence of particular information in culture. An unpublished study (Van Leeuwen, 2014) analyzed the frequencies with which 40 lethal events that occurred in the 19th and 20th century in a large sample of digitized books (i.e., Google's Ngram corpus; Michel et al., 2011). The analysis compared 20 lethal events caused by humans—wars—with 20 lethal events caused by nature—natural disasters (matched for number of deaths, time period, and continent). The wars were on average mentioned 10 times more often than natural disasters. Therefore, it may be that social transmission involves a bias for information about (or implying) a social interaction.

Other research on cultural transmission points to a key role for emotions. Studies of urban legends found that individuals prefer to transmit stories that trigger emotions, such as disgust, so that disgusting urban legends become more prevalent and widespread (Eriksson & Coultas, 2014; Heath, Bell, & Sternberg, 2001; Peters, Kashima, & Clark, 2009). The spread of emotion-eliciting stories in a culture has been labeled emotional selection, and it is thought to apply to a broad range of emotions, not just negative emotions like disgust. (Of course, certain emotions, e.g. disgust, might be easier to elicit consistently and strongly across individuals than other emotions, e.g. sadness. Hence, disgust-inducing stories might spread more easily through a social network than sadness-inducing stories.)

One limitation of negativity-bias or emotional-selection accounts is that it is not clear why the capacity of a story to reliably trigger a negative mood or a particular emotion would motivate individuals to transmit that story to others. Heath et al. (2001) speculated that people may be motivated to transmit emotional stories because of emotional consumption (i.e., to experience a certain emotion when telling the story, and make the recipient also experience that emotion), or because of social bonding. That is, experiencing the same emotion as another individual might increase social bonding, so transmitting emotional stories might be a way to achieve social bonding.

Emotions may also play a key role in social transmission for another reason. Experiencing certain emotions—e.g., disgust, fear, anger—inherently involves increased levels of arousal, and research has shown that increased arousal results in increased social transmission. In one experiment, half of the participants did 1 min of exercise and increased their arousal and half of the participants sat still for 1 min and did not increase their arousal. Afterwards, all participants were offered the opportunity to send an email to whomever they wanted. Among the participants who had increased their arousal, the proportion of those who sent an email was higher (Berger, 2011). Analysis of the frequency with which internet users email newspaper articles to others, has revealed consistent effects (Berger & Milkman, 2012). Articles that trigger high-arousal emotions such as awe and anger were more likely to be emailed. However, this research has observed effects inconsistent with a general negativity bias. Overall, articles that triggered negative emotions were less likely to be emailed than articles that triggered positive emotions. Thus, it may be that the arousal which is part of the emotional response to both positive and negative stories drives social transmission, but that when all else is equal, individuals prefer to transmit positive rather than negative information. In other words, when controlling for arousal, social transmission might be characterized by a positivity bias. Note that this arousal account suffers from the same limitation as the

emotional selection account: it is not clear why the capacity of a story to evoke arousal would make individuals want to transmit it.

Another finding in research of social transmission is that epistemic characteristics are associated with higher transmission rates. This is a deeply intuitive finding: individuals prefer to transmit information that is perceived as true, useful, interesting, and/or surprising (Berger & Milkman, 2012; Heath et al., 2001). Such effects are consistent with the perspective that motives for social bonding or affiliation may underlie information sharing.

Biases in Social Transmission for Social Bonding

As social bonding might be a prime motive underlying social transmission, we hypothesize that individuals who are motivated to increase or maintain their social support, will have a preference to transmit information that is likely to make them be perceived as a source of valuable information. If you are a reliable source of information that is valued by another individual, then the other has an incentive to increase her interest in your welfare. And, other people having an interest in your welfare, is in your self-interest. (See Tooby & Cosmides, 1996, for a discussion of this logic in the context of friendship.) Therefore, if one wants to gather social support, one could try to become a source of good, valuable information.

Of course, the value of reputational benefits is dependent on the sender's current social standing and the value (ability for providing social support) of the potential recipient. Therefore, we predict that the value and trustworthiness of the recipient would influence transmission decisions. A number of additional factors may contribute to an individual's assessment that transmitting information could improve their social standing.

Transmitting precautionary rather than prescriptive statements may be advantageous to the sender. Precautions invite fewer efforts at falsification, which may allow the sender to enjoy greater reputational benefits with fewer risks. That is, to the extent that individuals

believe a precautionary statement, they are unlikely to engage in the possibly costly activity, and are thus unlikely to learn whether the activity indeed results in bad consequences. In contrast, prescriptions invite falsification. To the extent that individuals believe a prescriptive statement, they are likely to engage in the possibly beneficial activity, and are thus likely to learn whether the activity indeed results in good consequences. Such differential attempts at falsification for precautions and prescriptions entail that senders of these two kinds of information are differentially likely to be revealed as sources of false information.

Prescriptive statements invite falsification and so a recipient of a prescriptive statement may learn that the sender provided them with false information. In contrast, as precautionary statements do not invite falsification, a recipient of a precautionary statement is less likely to learn that the sender provided them with false information. Therefore, a sender striving to be perceived as a source of valuable information might preferentially transmit precautionary information.

Additionally, the sender may be cognizant of the general information available to potential receivers. If a particular threat is common knowledge, transmitting it would not make the sender be seen as a source of valuable information. We therefore predict that transmission decisions are sensitive to perceptions of novelty and uniqueness of information.

Of course, preferences to transmit information that is perceived as true, useful, interesting, surprising, or valuable in another way, need not be inconsistent with tendencies to transmit threat-relevant narratives that trigger high-arousal emotions such as disgust, fear, or anger. Indeed, narratives about threats that elicit disgust, fear, or anger may be also be perceived as interesting, surprising, useful (when the story suggests how to avoid the threat), or true. For example, statements phrased in terms of risks might be perceived as more true than statements phrased in terms of gains (Fessler et al., 2014). For another example, in the

set of vignettes written for the current studies, ratings of interest and perceived threat were positively correlated (see Supplement S1).

To understand why people share the information that they share, a synthesis of these various perspectives and findings is required. How do motivations for social bonding interact with biases for transmitting negative, emotional, social, or arousing information? Research on social transmission has distinguished several phases relevant for the transmission of information: a choose-to-receive phase, an encode-and-retrieve phase, and a choose-to-transmit phase (Eriksson & Coultas, 2014). In an attempt to learn about how the transmission of threat-related information is affected by motivations for social bonding, the current studies investigated processes involved in the choose-to-transmit phase. To examine these processes, we recruited participants via Amazon Mechanical Turk for ~~five~~six online studies. (For the utility of samples recruited via Mechanical Turk for social science research, see Berinski, Huber, & Lenz, 2012; Buhrmester, Kwang, & Gosling, 2011; Paolacci, Chandler, & Ipeirotis, 2010.)

Studies 1A and 1B

Study 1a was designed to test whether there is a bias to transmit threat-related stories. We designed a protocol to study transmission tendencies online. In this protocol, participants were ostensibly matched to another anonymous participant from whom they received two stories. Participants were then asked to select one of four stories to send to another matched participant. To verify that the protocol was a valid measure of transmission tendencies, we conducted a pilot study (see Supplement S2), which supported the validity of the protocol. Study 1B was a replication of 1A using different stories.

Method

For both studies, adult USA residents were recruited via Mechanical Turk. For Study 1A, N = 130 (66 females, age M = 32.3, SD = 12.07), for Study 1B, N = 150 (76 females, age

$M = 32.9$, $SD = 13.84$.) Participants read that they were paired with another player as part of an experiment about transmission. The ostensible matched player (really computer generated) sent two neutral stories to the participant and then the participant was given the opportunity to send one of 4 vignettes to another matched player. The content of the 4 vignettes was manipulated orthogonally: 2 (social vs. non-social) $\times$ 2 (threat vs. non-threat) (for details, see Supplement S2). The vignettes were selected from a set of 52 vignettes that had been written and rated in a separate study on several characteristics relevant for social transmission (see Supplement S1). Four vignettes were selected so that the threat and non-threat vignettes had similar plausibility and length. For Study 1 A, the four selected vignettes were: Beating (threat, social), Stomach pain (threat, non-social), Diet (non-threat, social), and Drive (non-threat, non-social). For Study 1B, we selected Cough (threat, social), Tree (threat, not-social), Phone (non-threat, social), and Late (non-threat, non-social).

To test whether transmission of threat-related stories was predicted by trait anxiety, participants completed a measure of trait anxiety. After selecting a story for sending, participants completed the STAI Y-form trait anxiety questionnaire (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). This questionnaire consists of 20-items (e.g., “I feel nervous and restless”) answered on a 4-point scale (1 = *almost never*, 2 = *sometimes*, 3 = *often*, 4 = *almost always*). In both samples, reliability of the scale was good (Cronbach’s $\alpha = .94$ for both).

Results

In both studies, participants’ belief in the protocol varied. On average, participants indicated that they could not say whether the message they sent was actually received by the matched participant (Study 1A: mode = 4, $M = 4.35$, $SD = 1.40$, range 1–7; Study 1B: mode = 4, $M = 4.36$, $SD = 1.61$, range 1–7).

Table 1 shows the frequencies for choosing to transmit each of the vignettes in Study 1A. A chi-square test indicated no association between social interaction and threat, $\chi^2 = 0.04$, $df = 1$, $p = .84$. In other words, the proportions of participants who sent a threat story did not differ across those who sent a story involving a social interaction and those who sent a story about a single individual. Two chi-square tests that collapsed across levels of *Social* and *Threat*, respectively, revealed that the participants responded non-randomly. In Study 1A, participants had a tendency to send stories that contained no threat, $\chi^2 = 6.92$, $df = 1$, $p = .009$, and that contained no social interaction, $\chi^2 = 8.89$, $df = 1$, $p = .003$.

Table 1: Observed frequencies of selected stories. Marginal percentages are in parentheses.

Social interaction	Threat		Totals
	Yes	No	
Yes	19	29	48 (37%)
No	31	51	82 (63%)
Totals	50 (38%)	80 (62%)	130

Table 2 shows frequencies for choosing to transmit each of the vignettes [in Study 1B](#). A chi-square test indicated dependency between whether the selected story involved a threat and whether the selected story involved a social interaction, $\chi^2 = 5.92$, $df = 1$, $p = .01$. When participants selected a social story, they were more likely to select a non-threat story. In contrast, when participants selected a non-social story, they were more likely to select a threat story. (But note that none of the standardized residuals was significant, i.e. $> |1.96|$, indicating that in no cell the observed frequency differed significantly from the expected frequency.)

Table 2: Observed frequencies of selected stories. Marginal percentages are in parentheses. Standardized residuals in brackets.

Social	Threat		Totals
	Yes	No	
Yes	30 [-1.22]	48 [1.17]	78 (52%)
No	42 [1.27]	30 [-1.22]	72 (48%)
Totals	72 (48%)	78 (52%)	130

To test for the effect of trait anxiety on story selection, we analyzed the aggregated data of Studies 1A and 1B ($N = 280$). The data were analyzed with multinomial logistic regression using the package *mLogit* in R. The choice to transmit a neutral (non-social and non-threat) story was set as the reference category. We modelled probabilities for the three alternatives: selection of a social (and non-threatening) story, selection of a threatening (and non-social) story, and selection of a social and threatening story. The model included the key predictor of interest, trait anxiety (centered), and variables for age (centered), sex (0 = *female*, 1 = *male*), participants' disbelief in the study (centered, higher values meaning that participants did not believe they sent a story), and a dummy variable for sample (0 = *Study A*, 1 = *Study B*), and all two-way interactions with trait anxiety. This model revealed no significant interaction effects for trait anxiety (p s > .055). We therefore dropped the interaction effects from the model. Table 3 reports the odds ratios and 95% confidence intervals for the final model.

Compared to sending a neutral story, there was no significant effect of trait anxiety for selecting a social story ($b = -0.08$, $SE = 0.31$, $p = .803$), a threat story ($b = 0.38$, $SE = 0.31$, $p = .218$), or a social-threat story ($b = 0.24$, $SE = 0.35$, $p = .499$). That is, high trait anxiety was not associated with selecting a social story, a threat story, or a social-threat story. In addition, there was a significant effect of study for all alternatives. That is, in Study 1B the probabilities of sending a social story, threat story, or social-threat story (vs. a neutral story) were higher than in Study 1A. Also, there was a significant effect of sex for selecting a social-threat story (vs. a neutral story, $b = 0.76$, $SE = 0.38$, $p = .047$) indicating that males were more likely to send a social-threat story, and a significant effect of age for selecting a threat story (vs. a neutral story, $b = -0.04$, $SE = 0.02$, $p = .023$) indicating that older participants were less likely to send a threat story).

Table 3: Results of a multinomial logistic regression for the combined samples of Studies 1A and 1B (N = 280). The model estimated probabilities of selecting a particular story (social, threat, social-threat). Odds ratios larger than 1 mean that an increase in the predictor variable is associated with an increased probability of selecting a story, odds ratios smaller than 1 mean that an increase in the predictor variable is associated with a decreased probability of selecting a story.

	Odds Ratio	95% CI
Social vs. Neutral		
intercept	0.57	0.33, 0.99
trait anxiety	0.93	0.50, 1.71
age	1.02	1.00, 1.05
sex	0.85	0.44, 1.64
disbelieve	1.18	0.95, 1.47
sample	2.86	1.48, 5.50
Threat vs. Neutral		
intercept	0.44	0.25, 0.78
trait anxiety	1.47	0.80, 2.69
age	0.96	0.93, 0.99
sex	1.50	0.78, 2.92
disbelieve	1.13	0.91, 1.41
sample	2.36	1.22, 4.58
Social Threat vs. Neutral		
intercept	0.24	0.12, 0.49
trait anxiety	1.27	0.64, 2.52
age	1.01	0.97, 1.04
sex	2.13	1.01, 4.48
disbelieve	0.92	0.72, 1.17
sample	2.71	1.30, 5.67

Discussion

In Study 1A the most often transmitted story was a non-threat and non-social story. In Study 1B, the most often transmitted story was a non-threat and social story. In addition, high trait anxiety was not associated with a higher probability of transmitting a threatening (social or non-social) story. These findings do not support a general negativity bias account of social transmission. The results are also not consistent with the arousal hypothesis about social transmission. In neither study was the story that triggered the highest level of arousal (i.e., Beating in Study 1A, Cough in Study 1B) the most transmitted story. Indeed, it seems that in both studies participants transmitted the most pleasant story. In both studies, the most

transmitted story (Drive in Study 1A, Phone in Study 1B) was the story that had been rated the most positive in terms of valence.

One limitation of Studies 1A and 1B was that participants were provided with very little information about the individual to whom they transmitted information. Although such minimal specification of the target is not uncommon in research of social transmission (e.g., Heath et al., 2001), specification of the target of transmission can substantially influence transmission decisions (Peters, Kashima, & Clark, 2009). Therefore, Study 2A was designed to assess transmission intentions for different targets and stories that trigger different kinds of emotions. Study 2A also included measures of trait anxiety and social bonding motivations to examine their effects on social transmission.

Study 2A

Study 2A was designed to assess whether intentions to transmit different kinds of stories (stories that trigger positive, negative, or little emotion) differ according to type of recipient (stranger, friend, or someone who is disliked). To assess transmission intentions for positive information, we included vignettes that specifically triggered joy. To assess transmission intentions for negative information, we included vignettes that specifically triggered disgust. Disgust is a relatively well understood emotion that seems to cause increased social transmission (Eriksson & Coultas, 2014; Heath et al., 2001; Peters et al., 2009).

In addition, Study 2A was designed to test whether such intentions are predicted by individual differences in anxiety, arousal, extraversion, and social support. Extraversion was included to test a personality account of social transmission, that people who are sociable or extraverted are more talkative and may therefore be more likely transmit stories. Social support was included to test whether social transmission is driven by motives for social bonding. That is, if motives for social bonding drive social transmission, then individuals who

have low social support (and thus have stronger incentives to gather social support) might be more motivated to transmit valuable information. Specifically, low social support might be associated with intentions to transmit stories that trigger negative emotions, as such stories imply threats and are thus likely to be perceived as valuable.

Method

In total, 207 adult USA residents were recruited via Mechanical Turk. Seven participants did not complete the study and were thus excluded from analyses. This yielded $N = 200$ (100 females, age $M = 32.5$, $SD = 11.59$).

Participants started the study by providing their demographics. Their response for sex was used to subsequently present them with same-sex stories. Participants were given a questionnaire including six vignettes. The vignettes were selected based on the strongest emotion they triggered. For each emotion, we selected one vignette that involved a social interaction and one vignette that involved no social interaction. Two vignettes triggered joy (Drive, Meeting); two vignettes triggered disgust (Water, Spots); and two vignettes did not strongly trigger any emotion (Gym, Commute). The disgust vignettes had the highest ratings for arousal and all vignettes had high ratings for plausibility (see Supplement S3).

To assess transmission intentions for different targets, participants answered three questions for each vignette: “Would you pass on this story to a stranger?”, “Would you pass on this story to a friend?”, “Would you pass on this story to someone you dislike?” (cf. Peters et al., 2009). Participants indicated their transmission intentions on a 7-point scale from 1 = *Strong no* to 7 = *Strong yes*. The order of vignettes was randomized across participants.

Participants completed four individual difference questionnaires in randomized order. They completed the trait anxiety questionnaire used in Studies 1A-1B. Participants completed the 15-item perceived arousal scale (Anderson, Deuser, & DeNeve, 1995). This questionnaire asks participants to rate their current feelings (e.g., “Active”, “Energetic”) on a 5-point scale

from 1 = *Not at all* to 5 = *Extremely*. Participants completed the 8-item extraversion subscale from the BFI-44 (John, Donahue, & Kentle, 1991; John, Naumann, & Soto, 2008), which includes items such as “I am someone who is talkative” rated on a 5-point scale from 1 = *Disagree strongly* to 5 = *Agree strongly*. In addition, participants completed the 24-item social provisions scale (Cutrona & Russell, 1987). This questionnaire asks participants to think about their current relationships and indicate how well the items (e.g., “There are people I can depend on to help me if I really need it.”) describe them. Answers were scored on a 4-point scale from 1 = *Strongly disagree* to 4 = *Strongly agree*.

Results

Transmission intentions for the two vignettes in each emotion category were generally positively and highly correlated (r s ranged from .53 to .76, all p s < .001). Therefore, ratings for the two stories of each emotion were averaged to obtain a measure of the tendency to transmit a story that triggered that emotion. The individual difference measures showed good reliabilities and correlated significantly with each other (see Supplement S3, Table S3c).

The data were analyzed with a multilevel model (hierarchical linear regression) using maximum likelihood estimation with the R package *nlme*. We fitted a model that predicted transmission intentions (level 1) from level-1 dummy variables coding for target = *friend* and target = *disliked*, and coding for emotion = *joy* and emotion = *disgust*, and all target $\times$ emotion interaction terms (i.e., the “baseline” category for target was *stranger* and for emotion was *neutral*). Transmission intentions were nested within participants and the intercept was allowed to vary across participants. Table 4 shows the regression coefficients of the model. There was a significant effect for friend and dislike, indicating that for neutral stories participants indicated (a) higher intentions to transmit to a friend than to a stranger, and (b) lower intentions to transmit to a disliked individual than to a stranger. There was a significant effect for disgust, indicating that when the recipient was a stranger, participants showed

higher transmission intentions for disgusting vignettes than for the neutral vignettes.

Furthermore, there was a friend $\times$ disgust interaction effect. This interaction effect indicated that even though participants had increased intentions to transmit to friends and to transmit disgusting vignettes, they indicated particularly strong transmission tendencies to pass on a disgusting vignette to a friend. Figure 1 shows the mean transmission intentions for all targets and all emotions to illustrate these effects.

Table 4: Regression coefficients of multilevel model predicting transmission intentions from level-1 dummy variables coding for different targets and different emotions (N = 200).

Predictor	b	SE _b	t(1592)	P
Intercept	1.88	0.11	17.78	< .001
Friend	0.95	0.12	7.97	< .001
Dislike	-0.35	0.12	-2.90	.004
Joy	-0.21	0.12	-1.73	.085
Disgust	0.84	0.12	7.09	< .001
Friend $\times$ joy	0.00	0.17	0.01	.988
Friend $\times$ disgust	1.10	0.17	6.56	< .001
Dislike $\times$ joy	0.17	0.17	0.98	.326
Dislike $\times$ disgust	-0.13	0.17	-0.76	.448

Figure 1: Study 2A. Mean transmission intentions for passing on stories that trigger different emotions to different targets (i.e., a stranger, a friend, a disliked individual). Error bars show the standard error of the mean.

To test for effects of the individual difference variables we computed models that included these variables as level-2 predictors. First, we computed a model that included age (centered) as a level-2 predictor and included all interaction terms. Adding age improved model fit ($-2LL$ change = 19.6, df change = 9, $p = .021$). Examination of the effects of age showed that age had different slopes depending on the target, we thus included age, age $\times$ friend, and age $\times$ disliked in the models testing for effects of trait anxiety, arousal, extraversion, and social provisions. We also computed a model that included sex as a level-2 predictor (including all interactions). Adding sex did not improve model fit ($-2LL$ change = 7.6, df change = 9, $p = .579$).

We then computed four models that included one of the individual difference variables (trait anxiety, arousal, extraversion, and social provisions, all centered) as a level-2 predictor and all interaction terms. Only social provisions significantly improved model fit (-2LL change = 28.45, df change = 9, $p < .001$). Adding individual differences in arousal (-2LL change = 10.0, df change = 9, $p = .35$), extraversion (-2LL change = 5.96, df change = 9, $p = .74$), or trait anxiety (-2LL change = 12.2, df change = 9, $p = .204$) did not significantly increase the prediction of transmission tendencies. We examined the effect of social provisions. Social provisions did not show significant interaction effects with dummies for target or emotion, thus these interactions were dropped from the model. In the final model, the effects of the level-1 variables were similar to those reported in Table 4. Moreover, there was a significant negative effect for social provisions ($b = -0.52$, $p < .001$) indicating that (on average across targets and emotions) individuals with lower social provisions scores had higher transmission intentions (see Supplement S3, Table S3d, for the details of the final model).

Discussion

The results of Study 2A show that transmission intentions differed substantially across targets. For each of the categories of vignettes, participants indicated the highest transmission intentions when the recipient was specified as a friend. Results also showed that regardless of the recipient, transmission intentions were higher for vignettes that triggered disgust than for neutral vignettes or vignettes that triggered joy. Moreover, results showed an interaction effect. Participants indicated particularly high transmission intentions when the recipient was specified as a friend and the vignette triggered disgust. The results also showed relatively low transmission intentions for the joy story (not different from the neutral vignettes). This was unexpected, as the vignettes selected for joy were comparable to the non-threat vignettes used in Studies 1A and 1B.

The analysis of the associations ~~between~~with individual differences in trait anxiety, arousal, extraversion, and social provisions showed that social provisions was the best individual-difference predictor of transmission intentions. On average, individuals with lower social provisions—and who therefore might be more strongly motivated to engage in social bonding—indicated higher transmission tendencies. This is consistent with the social bonding hypothesis of social transmission. However, social provisions were not especially predictive for transmission of stories eliciting disgust or to valuable targets (e.g., friends or strangers rather than disliked acquaintances).

These results are not well explained by an arousal model of transmission. If arousal drives transmission, then individual differences in arousal should have predicted transmission intentions (cf. Berger, 2011). This was not the case. In addition, an arousal model can hardly account for the observed friend $\times$ disgust interaction. Presumably, the participants had similar levels of arousal when answering the three pass-on questions for each disgusting vignette.

Study 2B

Study 2A showed that individuals had particularly high transmission intentions when the recipient was a friend and the vignette triggered a threat-relevant emotion, disgust. Study 2B was designed to test whether such an interaction effect would also be observed for other threat-relevant emotions. Study 2B was similar to Study 2A, but involved more vignettes involving different threat-relevant emotions (i.e., fear, anger, and sadness). The aim was to test whether the emotion $\times$ target interaction would be observed for vignettes triggering different kinds of threat-relevant emotions. Study 2B also assessed the effects of individual differences in social provisions and trait anxiety.

Methods

One-hundred and five adult USA residents were recruited via Mechanical Turk and completed the survey online. Four individuals did not complete the study and were excluded from analyses. This yielded $N = 101$ (61 females, age $M = 32.2$, $SD = 11.53$).

Unfortunately, it was difficult to find in our set of stories, vignettes that specifically triggered the one negative emotion (fear, anger, sadness), but no other negative emotions. This was particularly so for anger. Therefore, we selected those vignettes that best triggered these emotions. We included four vignettes that triggered anger, two of which also triggered disgust, and two of which also triggered sadness (see Supplement S3). Transmission intentions were measured for three targets (friends, strangers, disliked individual) as in Study 2A. The order of vignettes was randomized across participants. Participants completed the social provisions and trait anxiety scales as in Study 2A ($\alpha s = .93$).

Results

Transmission intentions for the two stories that triggered the same emotion correlated in general positively (range of $r s .29-.79$, all $p s < .005$) and were averaged as in Study 2A. We analyzed transmission intentions with a multilevel model. Transmission intentions (level 1) were predicted from level-1 dummy variables coding for target = *friend* and target = *disliked*, and for emotion = *fear*, emotion = *anger-disgust*, emotion = *anger-sadness* and emotion = *sadness*, and all target $\times$ emotion interaction terms (as in Study 2A the “baseline” category for target was *stranger* and for emotion was *neutral*). Transmission intentions were nested within participants and the intercept was allowed to vary across participants. Table 5 shows the regression coefficients for this model. There was a significant effect of friend indicating that for neutral stories, transmission intentions were higher for friends than strangers. There were significant effects for fear, anger/disgust, anger/sadness, and sadness, indicating that for strangers, transmission intentions were higher for all emotional vignettes compared to neutral vignettes. Furthermore, consistent with the pattern observed in Study 2A,

there were significant interaction effects of friend with each of the emotions. These effects indicated that transmission intentions were particularly high for emotion-evoking stories when the target was specified as friend (see Figure 2).

Table 5: Regression coefficients for a multilevel model predicting transmission intentions from dummy variables coding for different targets and different emotions (N = 101).

Predictor	b	SE _b	t(1400)	P
Intercept	2.07	0.17	11.97	< .001
Friend	0.73	0.19	3.79	< .001
Disliked	-0.30	0.19	-1.55	.123
Fear	1.04	0.19	5.41	< .001
anger/disgust	0.55	0.19	2.88	.004
anger/sadness	1.66	0.19	8.63	< .001
Sadness	1.67	0.19	8.70	< .001
friend × fear	0.63	0.27	2.33	.020
friend × anger-disgust	1.08	0.27	3.99	< .001
friend × anger-sadness	1.01	0.27	3.71	< .001
friend × sadness	1.04	0.27	3.84	< .001
disliked × fear	-0.46	0.27	-1.69	.091
disliked × anger-disgust	-0.14	0.27	-0.51	.610
disliked × anger-sadness	-0.52	0.27	-1.93	.054
disliked × sadness	-0.45	0.27	-1.66	.098

Figure 2: Study 2B. Mean transmission intentions for passing on stories that trigger different emotions to different targets (i.e., a stranger, a friend, a disliked individual). Error bars show the standard error of the mean.

We also tested for effects of individual differences. First we included age (centered), age $\times$ friend, and age $\times$ disliked as in Study 2A. This improved model fit ($-2LL$ change = 16.91, df change = 3, $p < .001$). Subsequently, we added sex as a level-2 predictor (including all interactions with the level-1 dummies). This also improved model fit ($-2LL$ change = 36.30, df change = 15, $p = .002$). Examination of the effects of sex showed that age-it had different effects depending on the emotion, we thus included sex, sex $\times$ fear, and sex $\times$ anger-disgust, sex $\times$ anger-sadness, and sex $\times$ sadness in the models testing for effects of trait anxiety and social provisions. We computed a model that included social provisions (centered) as a level-2 predictor (including all interactions with the level-1 dummies). This did not improve model fit ($-2LL$ change = 17.24, df change = 15, $p = .305$). Social provisions did not show significant interaction effects with dummies for target or emotion, thus these

were dropped from the model. In the final model, the slope for social provisions was not different from zero, $b = 0.05$, $SE = 0.23$, $t(97) = 0.23$, $p = .819$. As in Study 2A, including trait anxiety did not improve model fit ($-2LL$ change = 8.71, df change = 15, $p = .89$).

Discussion

Study 2B tested whether the emotion $\times$ target interaction observed in Study 2A was also present for vignettes triggering fear, anger, and sadness. Results showed an emotion $\times$ friend interaction for all threat-relevant emotions that were tested. This suggests that such an increased preference to transmit threat-relevant vignettes to friends may be observed across different types of threats and their associated emotions.

Study 2B also tested whether individual differences in social support motivations predicted transmission intentions. The effect of social provisions observed in Study 2A was not replicated in Study 2B.

Participants indicated higher transmission intentions to transmit threat-relevant vignettes to friends. Presumably, participants considered their friends as more trustworthy than strangers or disliked individuals. Taken together, Studies 2A and 2B suggest that two factors might increase motivations to transmit threat-relevant information: a trustworthy target and (tentatively) a motivation for social bonding. Study 3 was designed to assess the role of these factors in the transmission of threat-relevant information in the form of precautionary statements.

Study 3

All four studies above operationalized threat-relevant information as brief vignettes that triggered threat-relevant emotions (e.g., disgust, fear). Study 3 operationalized threat-relevant information in a different way. Threat-relevant information can also come in precautionary statements of the form “Do *not* do X, because *bad* consequence”. (In contrast to prescriptive statements of the form “Do X, because *good* consequence”.) As mentioned

above, transmitting precautionary statements may facilitate ~~for~~ social bonding, as such ~~the statements~~ invite fewer efforts at falsification and thus are a safer bet in terms of maintaining a reputation of providing valuable information.

Study 3 tested whether transmission to seemingly trustworthy targets is different from transmission to seemingly untrustworthy targets and thus involved a manipulation of the trustworthiness of the recipients of the transmission. In addition, Study 3 included a measure of social support to test whether motives for social bonding influence transmission tendencies. It was predicted that trustworthy targets and bonding motivations would be associated with an increased preference for transmitting precautions.

Method

One-hundred and ninety-three adult USA residents were recruited via Mechanical Turk. Participants were excluded from analysis for not completing the study ($n = 7$), failing to respond correctly on the manipulation check (any answer other than “a stranger you met at a party”, $n = 7$, see below), taking insufficient time to complete the dependent variable (participants who took less than 48 s to complete the dependent variable, i.e., less than 2 s per statement, $n = 10$, see below), or taking insufficient time to complete the individual difference measures (participants who took less than 1 s per item on the individual difference measures, $n = 2$). This yielded $N = 167$ (95 females, age $M = 36.75$, $SD = 13.02$).

Participants completed their demographics at the start of the experiment and were then presented with different instructions depending on their condition and sex. The instructions asked the participant to imagine they were at a party and hear gossip about a same-sex individual that suggests that this individual is either trustworthy or untrustworthy.

Shown below the instructions was one of four constructed images of a human face from Wincenciak, Dzhelyova, Perrett, & Barraclough (2013). Participants were always shown a same-sex face image that was designed to appear trustworthy or untrustworthy. (These

images had been created by averaging the images of human faces that had been judged as appearing trustworthy or untrustworthy; Wincenciak et al., 2013.)

Below the facial image were twelve pairs of statements (i.e., pieces of advice) and participants were asked which piece of advice they would share with the target individual. Each pair consisted of a precautionary advice and a prescriptive advice. Pairs were presented in random order. The statements were paired based on ratings collected in a separate study and were matched for arousal, interest, surprise, plausibility, and utility (see Supplement S4). Participants were asked to select one statement of each pair (precautions scored as 1, prescriptions scored as 0). As a measure of preference to transmit precautionary information, a *precaution score* was computed as the total score over the twelve choices.

The next page in the survey involved a manipulation check. Participants were reminded of the face they had seen on the previous page and were asked “How was the person on the picture described?” (Four answer options: *a stranger you met at a friend’s party; a colleague from work; a salesman in a furniture shop; cannot remember*). In addition, participants were asked to rate whether the person they had seen was trustworthy and reliable on scales from 0 (*strong no*) to 6 (*strong yes*).

Finally, participants completed the social provisions scale as in Study 2A and two other trait measures that might be relevant for the transmission of negative (precautionary) rather than positive (prescriptive) statements. Participants completed the trait anxiety scale as used in Study 1A and the Brief Fear of Negative Evaluation scale (Leary, 1983; because individuals worried about being evaluated negatively might refrain from transmitting negative information, see Maner, DeWall, Baumeister, & Schaller, 2007).

Results

Participants in the trustworthy condition (average of rated trustworthiness and reliability: $M = 4.21$, $SD = 1.00$) rated the target as more trustworthy than participants in the untrustworthy condition ($M = 2.87$, $SD = 1.17$), $t(165) = 7.90$, $p < .001$).

Responses across the twelve item pairs showed moderate internal consistency, Cronbach's $\alpha = .62$. On average, participants showed a preference for transmitting prescriptive rather than precautionary advice ($M = 3.93$, significantly lower than would be expected for indifference (i.e., 6), $t(166) = -11.14$, $p < .001$). The precaution score was significantly correlated with age, $r = -.21$, $p = .006$, and sex (0 = female, 1 = male), $r = .26$, $p = .001$. The precaution score was marginally, negatively correlated with social provision scores, $r = -.15$, $p = .056$. (In addition, trait anxiety correlated negatively with social provisions and positively with fear of negative evaluation; see Supplement S4, Table S4c.)

Precaution scores were regressed on age (centered), sex (0 = *female*, 1 = *male*), target (0 = *trustworthy*, 1 = *untrustworthy*), social provisions (centered), and all interactions between sex, target, and social provisions. This model significantly predicted precaution scores, Adjusted $R^2 = .14$, $F(8, 158) = 4.35$, $p < .001$ (see Supplement S4, Table S4d). There was a significant effect of age ($b = -0.04$) indicating that higher age was associated with lower precaution scores. There was no effect of target (and no significant sex $\times$ target interaction) indicating that neither females nor males had different precaution scores for trustworthy target vs. untrustworthy target conditions. There was no significant effect for social provisions, but there was a significant sex $\times$ social provisions interaction ($b = -2.53$, $p = .013$). This interaction effect indicated that social provisions predicted precaution scores differently for males and females. We computed simple slopes (Aiken & West, 1991) for males and females to examine this interaction. To compute the average slope for social provisions across the different conditions for target, target was effects-coded (untrustworthy = -1, trustworthy = +1). For females, social provisions did not significantly predict precaution scores ($b = 0.22$, p

= .61). In contrast, for male participants, social provisions significantly and negatively predicted precaution scores, $b = -1.74$, $SE = 0.56$, $t = -3.13$, $p = .002$. (Partial correlations between social provisions and precaution score that controlled for age showed a similar pattern, for females $r = .03$, $p = .75$, for males $r = -.28$, $p = .018$.) Figure 3 shows the association between social provisions and precaution scores for males and females.

Figure 3: Study 3. Predicted precaution scores for male and female participants with different social provision scores. The horizontal axis shows the range of observed social provision scores. Higher precaution scores indicate a preference to transmit precautionary rather than prescriptive information.

Discussion

Study 3 tested whether trustworthiness of the recipient influenced tendencies to transmit precautionary vs. prescriptive advice. No effect of the trustworthiness of the recipient

on transmission intentions was observed. The study also tested whether social bonding motivations are associated with intentions to transmit precautionary advice. There was some support for this hypothesis: Among male participants, those with lower social provision scores—and presumably with higher motivations for social bonding—displayed increased preferences to transmit precautionary statements. No such effect was observed among female participants. The reason for this sex difference is unclear. Overall, the results suggest that participants preferred to transmit positive (prescriptive) statements rather than negative (precautionary) statements. This positivity bias is consistent with the arousal hypothesis as prescriptions and precautions were matched for arousal. Considering that the recipient was described as an unfamiliar individual, this positivity bias is consistent with the findings of Study 1A, but inconsistent with the findings in Studies 2A and 2B.

Study 4

Given the lack of consistency in the results for social provisions and trustworthiness of the recipient, we designed Study 4 to involve a different measure of motivations for social bonding, a different manipulation of trustworthiness of the recipient, and a different operationalization of high and low value information.

As mentioned above, if an individual wants to gather social support by being a source of valuable information, then ~~he~~ she might transmit privileged information. If one has unique or novel information, then others might find this novel information particularly valuable (as it is scarce, they do not have any other way to obtain the information). In Study 4 we examined whether the novelty of information influenced participants' transmission preferences. We manipulated the novelty of information by having participants modify a story. We assumed that when participants modified a story (i.e., improved it as they desired) this would increase the extent to which they perceived it as novel and unique.

As in the previous studies, Study 4 tested whether participants preferred to transmit to seemingly trustworthy targets or untrustworthy targets. We predicted that modified stories would be transmitted more often, that modified stories would be transmitted more often to trustworthy targets, and that these biases would be stronger among participants with stronger motivations for social bonding.

Method

Three-hundred and seventy adults^s USA residents were recruited via Mechanical Turk. Participants were excluded from analysis for not completing the study ($n = 66$), responding within 1 s to at least four questions about sharing the story ($n = 3$), or completing the Need To Belong Scale (see below) in less than 1 s per item ($n = 7$). This yielded $N = 294$ (160 males, 134 females, age $M = 35.9$, $SD = 11.9$). Most participants were White ($n = 235$) or Black ($n = 21$).

Participants completed their demographics (age, sex, ethnicity, and state) at the start of the experiment. Participants were then presented with the following instruction (names were always of same sex as participant):

Next you will be presented with several stories. For each story, please indicate whether you would prefer to share it with John [Kate] or Mark [Michelle]. John [Kate] lives in [participants'^s state] and is an insurance salesperson. Mark [Michelle] lives in [participants'^s state] and is a high school teacher. Because in the USA insurance salespeople are considered less trustworthy than high school teachers (Gallup, 2015), this instruction described one target (Mark/Michelle) as relatively trustworthy and the other target (John/Kate) as relatively untrustworthy.

Participants were randomly placed in the *modify* or control condition. Participants in the control condition were then presented with eight vignettes (see supplement S5) in random order and were asked to choose between the following alternatives: “I would not share this story”, “I would share this story with John [Kate] - insurance salesperson”, “I would share this

story with Mark [Michelle] - high school teacher". The eight vignettes were selected to include four that involved low threat and four that involved high threat.

Participants in the modify condition were presented with the same eight vignettes, but were given the following instruction: "Next you will be presented with several stories. For each story, please take a moment to improve the story, so that it is how you would tell the story." After participants had improved all eight stories, they were presented with each of their own improved and unique stories and asked to indicate whether they would prefer to share them with John or Mark (or not share at all).

Participants completed a manipulation check consisting of two questions, "Mark [Michelle] seemed more trustworthy than John [Kate]" and "John [Kate] seemed more reliable than Mark [Michelle]" (reverse-scored), rated on a 7-point scale from 1 = *strongly disagree* to 7 = *strongly agree*.

Finally, participants completed two measures of individual differences in social support, the 10-item Need To Belong Scale (Leary, Kelly, Cottrell, & Schreindorfer, 2013) and one item about relationship satisfaction ("How satisfied are you with your personal relationships?", rated on an 11-point scale from 0 = *completely dissatisfied* to 10 = *completely satisfied*).

Results

To test the effect of the trustworthiness manipulation, we averaged scores for the two manipulation check questions. On average, participants perceived the high school teacher as more trustworthy than the insurance salesperson, $M = 4.29$, $SD = 0.95$ (higher than the midpoint of the scale, $t[293] = 5.27$, $p < .001$).

Participants' responses regarding the sharing of stories were recoded into variables indicating the number of stories they preferred to share with the trustworthy target (i.e., the high school teacher) and the number of stories they preferred to share with the untrustworthy

target (i.e., the insurance sales person). We coded such variables for the four low-threat stories and the four high-threat stories. Table 6 shows the mean number of preferred story sharing for the two targets and the two story types for participants in both conditions.

Table 6: Mean number of preferred story sharing for participants in the modify condition and control condition.

Target	Story	Modify condition (n = 117)		Control condition (n = 177)	
		M	SD	M	SD
Trustworthy	High threat	1.85	1.22	1.61	1.02
Trustworthy	Low threat	1.91	1.35	1.29	1.17
Untrustworthy	High threat	1.50	1.14	1.42	1.09
Untrustworthy	Low threat	1.14	1.13	0.83	1.00

To test for the effects of condition and social support, we first analyzed decisions to share a story (vs. deciding not to share a story). We computed a mixed-design ANOVA that predicted the number of shared stories from threat (low vs. high, within-subjects), condition (control vs. modify, between-subjects), relationship satisfaction (centered), need to belong (centered), age (centered), sex, the two-way interactions of condition with between-subject variables (relationship satisfaction, need to belong, age, and sex), and all interactions of threat with between-subjects effects. This model revealed an effect for threat, $F(1, 284) = 60.94, p < .001$, partial $\eta^2 = .177$ and an effect for condition, $F(1, 284) = 21.46, p < .001$, partial $\eta^2 = .070$. These effects were qualified by a threat $\times$ condition interaction, $F(1, 284) = 15.23, p < .001$, partial $\eta^2 = .051$. There was also a marginal effect for age, $F(1, 284) = 2.84, p = .093$, partial $\eta^2 = .010$, and a marginal age $\times$ condition interaction, $F(1, 284) = 2.99, p = .085$, partial $\eta^2 = .010$. No other effects approached significance, $ps > .100$.

We examined estimated marginal means to assess the effects of threat, condition, and threat $\times$ condition. On average, participants shared more high threat ($M = 3.17, SE = 0.063$) than low threat ($M = 2.56, SE = 0.086$) stories. Also, participants shared more stories in the modified condition ($M = 3.17, SE = 0.101$) than in the control condition ($M = 2.57, SE =$

0.081). The threat $\times$ condition interaction indicated that the effect of the modify manipulation was larger for low-threat stories (a mean increase of 0.90, $SE = 0.172$, $p < .001$) than for high-threat stories (a mean increase of 0.29, $SE = 0.126$, $p < .021$).

We then analyzed decisions to share a story with a trustworthy target (vs. sharing a story with an untrustworthy target). We conducted separate analyses for high-threat and low-threat stories. For each participant we computed the proportion of high-threat stories shared with the trustworthy target (number of high-threat stories shared with trustworthy target divided by the total number of high-threat stories shared) and the proportion of low-threat stories shared with the trustworthy target (number of low-threat stories shared with trustworthy target divided by the total number of low-threat stories shared). We analyzed each proportion with an ANOVA that included condition, relationship satisfaction, need to belong, age, sex, and the two-way interactions of condition with relationship satisfaction, need to belong, age, and sex. (These analyses excluded participants that had not shared any stories.)

For low-threat stories, the effect of condition was not significant, $F(1, 237) = 0.39$, $p = .532$, partial $\eta^2 = .002$. Estimated marginal means showed that the proportion of stories shared with the trustworthy target was similar in the modify condition ($M = .62$, $SE = .034$) and control condition ($M = .64$, $SE = .029$), and that in both conditions participants had a preference to share low-threat stories with the trustworthy target (i.e., proportions $> .50$, 95% CI [.55, .68] and [.59, .70], respectively). In addition, there was a marginal effect of age, $F(1, 237) = 3.25$, $p = .073$, partial $\eta^2 = .014$, and a marginal effect of need to belong, $F(1, 237) = 3.56$, $p = .060$, partial $\eta^2 = .015$. A partial correlation showed that higher age was associated with a higher proportion of sharing stories with the trustworthy target ($r = .12$, $p = .054$, controlling for condition, relationship satisfaction, need to belong, and sex). Furthermore, a partial correlation showed that—consistent with predictions—higher need to belong was

associated with a higher proportion of sharing with the trustworthy target ($r = .14$, $p = .034$, controlling for condition, relationship satisfaction, age, and sex).

For high-threat stories the effect of condition was also not significant, $F(1, 276) = 0.12$, $p = .735$, partial $\eta^2 < .001$. In addition, there was a marginal effect of relationship satisfaction, $F(1, 276) = 3.58$, $p = .060$, partial $\eta^2 = .013$. Estimated marginal means showed that the proportion of stories shared with the trustworthy target was similar in the modify condition ($M = .53$, $SE = .031$) and control condition ($M = .54$, $SE = .024$). In contrast to the low-threat stories, in both conditions participants showed no preference to share high-threat stories with the trustworthy target (i.e., proportions not $> .50$, 95% CI $[.47, .59]$ and $[.50, .59]$, respectively). A partial correlation showed that—in contrast to predictions—preferences to share high-threat stories with the trustworthy target were not associated with low relationship satisfaction (if anything, the correlation with relationship satisfaction was positive, $r = .09$, $p = .142$, controlling for condition, need to belong, age, and sex).

Discussion

Overall, the results were consistent with a general negativity bias as high-threat stories were more likely to be transmitted than low-threat stories. The results also support the prediction that modified stories (i.e., novel and unique information) would be transmitted more often. However, the results provide no support for the prediction that novelty would increase transmission to trustworthy targets in particular (novelty did not influence tendencies to transmit a story to a trustworthy rather than an untrustworthy target). The results also provide no support for the prediction that individual differences in motivations for social bonding correlate with social transmission. Neither decisions to transmit (vs. not transmit) nor decisions to transmit to a trustworthy target (vs. transmit to an untrustworthy target) were consistently predicted by one of the two variables related to social support (relationship satisfaction or need to belong).

General Discussion

Studies 1A–1B showed that participants preferred to transmit positive, low-arousal vignettes (rather than negative, high-arousal vignettes involving threats and social interactions). Studies 2A–2B showed that participants preferred to transmit emotional vignettes (triggering disgust, fear, anger, or sadness) especially to friends. Study 3 showed that among male participants, low social support was associated with a preference for transmitting precautions. Study 4 showed that an increase in the uniqueness of information (by personal modification) increased transmission preferences. The findings of the six studies hardly paint a coherent picture.

The findings provide little support for a general negativity bias account of social transmission. Some studies showed findings consistent with a bias to transmit negative information (Studies 2A, 2B, and 4), whereas some studies showed findings consistent with a bias to transmit positive information (Studies 1A, 1B, and 3). We observed an effect of trait anxiety in Studies 1A and 1B, but not in Studies 2A, 2B, and 3.

Similarly, the findings provide mixed support for an arousal model of social transmission. The findings of Studies 1A and 1B were inconsistent with the arousal model (no transmission bias for high-arousal content), but the other studies showed some consistent findings. Studies 2A and 2B showed that participants preferred to transmit emotional vignettes (although the arousal model does not account for the effects of target—friends vs. stranger—observed in Studies 2A and 2B). Study 3 showed support for the arousal model’s proposed positivity bias for content that is equally arousing. The findings of Study 4 are consistent with the arousal model as participants preferred to transmit high-threat stories (which were more arousing) more than low-threat stories.

The findings also provide mixed support for the social bonding account of social transmission. Preferences to transmit valuable threat-relevant information were associated

with low social support (and presumably high motivations to seek social support) in Studies 2aA and 3 but not in Studies 2B and 4. Consistent with the social bonding account, preferences to transmit threat-relevant information were higher for valuable recipients in Studies 2A and 2B (i.e., for friends) but were not higher for valuable recipients in Studies 3 and 4 (i.e., for trustworthy targets). Consistent with the social bonding account, in Study 4 participants showed a bias to transmit modified, novel information. But this bias seems general, not specifically directed at high value recipients, nor stronger among participants motivated to gather social support.

The current studies suffer from several limitations. We highlight four. First, all studies were conducted online and did not involve transmission in a typical human face-to-face context (e.g., a dinner table, a pub). Second, except for Studies 2A and 2B, the studies did not involve transmission to recipients with whom the participants were familiar. Third, except for Studies 1A and 1B, the studies did not involve (ostensible) decisions to transmit information but assessed transmission preferences. Although belief in the veracity of the study protocol did not influence results in Studies 1A and 1B, and although multiple studies of social transmission have measured transmission preferences (e.g., Heath et al., 2001), it is not clear to what extent transmission preferences reflect transmission behavior. Four, except for Study 4, all studies involved transmission of information that was provided to the participants, rather than information created, modified, or remembered by the participants.

In conclusion, the dissonant findings from these studies suggest that to advance understanding of the motivations that govern choose-to-transmit decisions there is need for both theoretical and methodological improvements regarding social transmission. A starting point might be a methodological difference between the current studies and studies that have found a negativity bias in transmission. Several studies that found a negativity bias in transmission involved a transmission-chain design that was operationalized as a memory task

(Bebbington et al., 2016; Eriksson & Coultas, 2013, Study 1; Stubbersfield et al., 2015; Walker & Blaine, 1991). Participants in these studies are given a story to read and then are later asked to write down what they recall. Participants in such studies are typically not aware that they are part of a transmission chain. None of the current studies involved such a memory task. Furthermore, several studies that find little or no support for a negativity bias also did not involve memory recall (Berger, 2011; Berger & Milkman, 2012; Eriksson & Coultas, [2013](#), Studies 2 and 4; Peters et al., 2009).

Over the course of human evolution, most gossip and story-telling relied on memory recall (or creative imagination). Perhaps functional biases in social transmission only come to the fore when measuring transmission via memory recall. Further research might explore (1) whether transmission involving memory recall shows different regularities than transmission not involving memory recall and (2) whether humans are able to make valid forecasts about their transmission behavior. (E.g., Are self-reported preferences to transmit a particular story valid indicators of face-to-face oral transmission?)

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Supplementary materials

Individual Choose-to-Transmit Decisions Reveal Little Preference for Transmitting Negative or High-Arousal Content

Supplement S1

Ratings of vignettes.

We wrote 52 vignettes which described various threat-related or threat-unrelated activities and events that involved a social interaction or involved no social interaction (some of the threats included were physical violence, contagious disease, poisoning, loss of social relationships, dangerous animals, and free-riding). For each vignette, a male and female version were written by using typically male or female names for the individuals described in the vignette. This was done so that in the subsequent studies, participants could be presented with same-sex versions of all vignettes. Vignettes were short, 26-35 words, and were rated in a separate study on variables relevant to social transmission.

These vignettes were randomly divided in four batches of seven vignettes and four batches of six vignettes. For all eight batches we recruited participants via Amazon Mechanical Turk (Ns ranged from 24 to 26 per batch). Participants were presented with a batch of same-sex vignettes and rated these vignettes on a number of variables relevant for social transmission: (a) three dimensions of affect experienced when reading the vignettes (valence/pleasure: 1 = *very unpleasant*, 7 = *very pleasant*; arousal: 1 = *very calm*, 7 = *very excited*; control: 1 = *completely in control*, 7 = *completely not in control*); (b) the intensity of seven emotions experienced when reading the vignettes (fear, anger, sadness, disgust, surprise, interest, joy; all with 7-point scales with 1 = *not at all*, and 7 = *very strongly*); (c) plausibility (two questions: “Do you think that the described event has actually occurred?”, “Do you think that the described event could actually occur?”, $r = .57$, $N = 1320$, $p < .001$); (d) controllability (two questions: “Could the individuals influence what happened to them?”, “Could the individuals control their outcomes?”, $r = .86$, $N = 1320$, $p < .001$); (e) perceived threat (two questions: “Was the described event dangerous?”, “Was the described event safe?” [reverse scored], $r = .81$, $N = 1320$, $p < .001$), and perceived harm (two questions: “Did the described event involve suffering?”, “Did the described event involve someone who was harmed?”, $r = .85$, $N = 1320$, $p < .001$). The questions for plausibility, controllability, perceived threat, and perceived harm were rated on 7-point scales with 1 = *strong no*, and 7 = *strong yes*.

For all vignettes, mean ratings were computed for the three dimensions of affect (pleasure, arousal, feeling not in control), the seven emotions, and plausibility, controllability, perceived threat, and perceived harm. Across vignettes ($N = 52$) mean ratings of perceived threat correlated positively with harm ($r = .84$, $p < .001$), arousal ($r = .69$, $p < .001$), feeling not in control ($r = .73$, $p < .001$), fear ($r = .89$, $p < .001$), sadness ($r = .66$, $p < .001$), disgust ($r = .40$, $p = .004$), surprise ($r = .54$, $p < .001$), interest ($r = .41$, $p = .002$), and—marginally—with anger ($r = .27$, $p = .054$). Perceived threat correlated negatively with pleasure ($r = -.67$, $p < .001$) and joy ($r = -.37$, $p = .008$). Perceived threat did not correlate with plausibility ($r = -.16$, $p = .25$) and controllability ($r = -.15$, $p = .27$).

Selection of vignettes for Studies 1a and 1b.

Based on the collected ratings, we selected vignettes to be used in the transmission protocol (see Supplement S2). Two stories that triggered low levels of emotion were selected for the receiving phase of the protocol (see Table S1). The mean ratings for the vignettes used in the transmission phases of Studies 1a and 1b are shown in Table S1.

Table S1: Mean ratings of the vignettes used in Studies 1a-1b for plausibility, perceived threat, perceived harm, valence, arousal, and the highest rated emotion. Within brackets are 95% confidence intervals.

Vignette	Type	Word count	Plausible	Threat	Harm	Pleasure	Arousal	Strongest emotion*
Receiving phase								
Gym	Neutral	33	6.69 [6.46, 6.92]	2.02 [1.58, 2.46]	1.29 [1.04, 1.53]	4.58 [4.18, 4.97]	2.65 [2.15, 3.16]	Interest 2.31
Commute	Neutral	29	6.46 [6.06, 6.86]	2.04 [1.69, 2.39]	2.12 [1.72, 2.53]	3.08 [2.69, 3.47]	2.92 [2.33, 3.51]	Interest 2.24
Study 1a								
Beating	Social / Threat	28	6.44 [6.12, 6.75]	6.54 [6.24, 6.84]	6.65 [6.37, 6.92]	1.54 [1.25, 1.83]	4.88 [4.33, 5.42]	Anger / Sad 5.25
Stomach Pain	Not-social / Threat	34	5.58 [5.13, 6.02]	6.10 [5.63, 6.56]	6.29 [5.87, 6.71]	1.81 [1.39, 2.23]	3.46 [2.87, 4.05]	Sad 4.96
Diet	Social / No threat	34	5.87 [5.42, 6.32]	2.50 [2.01, 2.99]	1.90 [1.36, 2.45]	5.04 [4.56, 5.52]	3.46 [2.77, 4.15]	Interest 4.54
Drive	Not-social / No threat	32	6.46 [6.13, 6.79]	1.68 [1.17, 2.19]	1.38 [0.96, 1.80]	5.56 [5.07, 6.05]	2.80 [2.03, 3.57]	Joy 3.48
Study 1b								
Cough	Social / Threat	32	5.92 [5.42, 6.41]	6.04 [5.59, 6.49]	6.08 [5.66, 6.51]	1.67 [1.20, 2.13]	4.00 [3.39, 4.61]	Interest 4.42
Tree	Not-social / Threat	34	5.50 [4.94, 6.06]	5.70 [5.08, 6.32]	6.58 [6.26, 6.90]	1.88 [1.45, 2.31]	3.96 [3.49, 4.43]	Surprise 4.92
Phone	Social / No threat	33	5.46 [4.80, 6.11]	1.35 [1.01, 1.62]	1.13 [0.95, 1.30]	4.25 [3.67, 4.83]	3.00 [2.42, 3.58]	Interest 3.38
Late	Not-social / No threat	32	6.08 [5.64, 6.52]	2.08 [1.52, 2.63]	2.42 [1.70, 3.14]	2.77 [2.39, 3.15]	3.35 [2.81, 3.88]	Interest 3.12

Note: *Highest rating for fear, anger, sadness, disgust, joy, interest, or surprise.

Vignettes.

Below are the female versions of all the vignettes used. Words used in the male version are in brackets.

GYM: Camila [Chris] went to a new gym for the first time. On the way, she [he] got lost, so she [he] asked a woman [man] waiting at a bus stop for directions. The woman [man] gave her [him] directions.

COMMUTE: Michelle [Mike] was walking home after work. In the morning it had been sunny, but now the rain was pouring down. Michelle [Mike] was soaked by the time she [he] got home.

BEATING: Nancy [William] was walking home. A group of unfamiliar men approached her [him]. Nancy [William] knew she [he] could not escape. The men beat her [him] up. Nancy [William] lost a tooth but survived.

STOMACH PAIN: Alice [Patrick] went camping. She [He] ate soup with mushrooms she [he] had picked. That night, Alice [Patrick] woke up with pain in her [his] stomach. She [he] had to vomit and a couple of hours later she [he] was dead.

DIET: Lucy [Owen] told Melanie [Gavin] about a new diet she [he] had heard about. The diet could make you lose weight and at the same time increase muscle mass. Melanie [Gavin] was interested, and asked how it worked.

DRIVE: Jeanette [Jeff] was driving to work. On the way she [he] listened to music on the radio. She [He] took a route so that she [he] avoided the heavy traffic. She [He] arrived at work on time.

COUGH: Molly [George] was riding the bus. In the bus was a woman [man] who was coughing a lot. Two days later, Molly [George] felt ill and went to see a doctor. She [He] had resistant tuberculosis.

TREE: Becky [William] went hiking in a forest. She [He] picked some berries and ate them. A few hours later she [he] got diarrhea. She [He] felt weak and sat down under a tree. That is where she [he] died.

PHONE: Bella [Adrian] told Chloe [Robert] about this news she [he] had heard, that soon smartphones would have flexible displays. Chloe [Robert] said that this was silly. She [He] asked Bella to explain the purpose of a flexible display.

LATE: One morning, Nancy's [David's] alarm clock broke and she [he] overslept. She [He] was late for an important meeting. She [He] left the house and hurried to work. The meeting had already finished. She [He] felt ashamed.

Supplement S2

Transmission protocol used in Studies 1a and 1b.

Participants were explained that they were participating in an experiment about social transmission of information, and that they would be part of a transmission chain. The instruction read:

This is an experiment about social transmission of information. Individuals transmit information in many social interactions, such as when they gossip, tell a story, or send a chain letter. Transmission involves a sender, a receiver, and a piece of information. In this experiment, you will be part of a transmission chain. This means that during the experiment you are matched-up, or paired, with other participants. During a part of the experiment you will have the role of receiver and you will receive two stories from another participant you are matched with. During another part of the experiment you will have the role of sender and you will be asked to send one story to another participant you are matched with. All participants in the transmission chain are identified by an identity number, for example "A123".

Participants started the study by providing their demographics. Participants were then presented with a screen reading "Matching with other participant. Please wait a few seconds when we match you with another participant." After 2 s, the following message appears: "You have been matched with participant S537". The next screen constituted the receiving phase and read: "S537 has sent you the following stories", below which two neutral stories were presented. For each of these neutral stories, the participant was asked to indicate how they felt about the story on a 7-point scale (1 = *very unpleasant*, 4 = *neutral*, 7 = *very pleasant*). Based on the results of the pre-ratings of the vignettes (see Supplement S1), we selected Gym and Commute as the two neutral vignettes that the participant ostensibly received.

Participants were then again presented with a screen reading "Matching with other participant. Please wait a few seconds when we match you with another participant." After 2.5 s, the following message appeared: "You have been matched with participant R449". The next screen constituted the choose-to-transmit phase and read: "You were matched with participant R449. Below are four stories. Please select one story to send to participant R449". Below this four different stories were presented (the order of presentation of the vignettes from top to bottom was randomized across participants). From these four stories, the participant was asked to select one story for transmission to R449.

At the end of the study, participants completed two questions about the protocol: "Did you think that the stories that you received were sent to you by your matched participant?" and "Did you think that the stories you sent were received by your matched participant?" (7 answer options were provided: 1 = *Certainly yes*; 2 = *Probably yes*; 3 = *Perhaps yes*; 4 = *Cannot say: maybe yes, maybe not*; 5 = *Perhaps not*; 6 = *Probably not*; 7 = *Certainly not*). When a participant answered on the "not" side of the scales, the participant was presented with a comment box and asked to explain why he/she did not believe that stories were sent and received by the matched participant.

Pilot study testing the protocol.

One-hundred participants were recruited via Amazon Mechanical Turk and completed the study online (42 females, age $M = 32.4$, $SD = 9.76$). Participants completed the protocol described above. The four stories that were presented to participants in the choose-to-transmit phase were the vignettes used in Experiment 2 of Mesoudi et al. (2006). We selected these four vignettes because one of these, labelled Gossip by Mesoudi et al., was a typical example of information that is generally transmitted which had shown to be preferentially transmitted in Mesoudi et al.'s transmission chain study. The vignettes were labelled Affair (original label Gossip), Directions (original label Social), Late (original label Individual), and Summer (original label Physical). The order in which the vignettes were presented from top to bottom was randomized across participants.

In the debriefing, 37 participants indicated that they did not believe that they had sent a story to the matched participant (scores > 5), 63 participants indicated that they believed or were not sure that they had sent a story to the matched participant. A two-way chi-square test revealed no dependence between whether participants believed in the protocol (yes vs. no) and the story that they chose to transmit (Affair, Directions, Late, Summer), $\chi^2 = 1.23$, $df = 3$, $p = .75$. A one-way chi-square test that collapsed over believing in the protocol revealed that the selection of stories was different than would be expected by chance, $\chi^2 = 14.96$, $df = 3$, $p = .002$. Standardized residuals indicated that Affair was selected significantly more often than expected by chance ($p < .001$), whereas Directions was selected significantly less often than expected ($p < .05$; see Table S2).

These results show that the story Affair was selected for transmission more often than the other stories. This result is consistent with the transmission bias for this story observed in Mesoudi et al. (2006). The consistency of the pilot study with these previous findings supports the validity of the transmission protocol. The protocol was used in Studies 1a and 1b in the same format.

Table S2: Frequencies for story selection observed in the pilot study.

Selected vignette	Believe in sending		Total	
	Yes	No	Observed (Expected = 25)	Standardized Residual
Affair	28	13	41	3.70
Directions	9	6	15	-2.31
Late	12	10	22	-0.69
Summer	14	8	22	-0.69
Total	63	37	100	

Supplement S3

Vignettes included in Study 2a.

Table S3a: Means for emotion ratings for the vignettes used in Transmission Study 2a.

Emotion	Vignette	Mean ratings in pre-test					
		Disgust	Joy	Strongest emotion*	Arousal	Plausible	Threat
Disgust	Water	5.04	1.08	Disgust 5.04	4.28	5.88	5.72
Disgust	Spots	5.48	1.28	Disgust 5.48	4.20	5.52	4.96
Joy	Drive	1.28	3.48	Joy 3.48	2.80	6.44	1.68
Joy	Meeting	1.04	3.96	Joy 3.96	3.42	6.26	1.50
Neutral	Gym	1.08	1.92	Interest 2.31	2.65	6.69	2.02
Neutral	Commute	1.84	1.20	Interest 2.24	2.92	6.46	2.04

Note: *Highest rating for fear, anger, sadness, disgust, joy, interest, or surprise.

Vignettes Gym, Commute, and Drive were used as in Study 1a. Below are the female versions of all the vignettes used. Words used in the male version are in brackets.

WATER: On vacation, Vicky [John] had been swimming in a lake. She [He] had accidentally swallowed some water. Later, she [he] got health problems. Vicky [John] had been infected by a worm that was living in her [his] gut.

SPOTS: Jenny [Craig] had been on a plane sitting next to a woman [man] with sores on her [his] face. A few days after the flight, Jenny [Craig] noticed itching spots on her [his] arms.

MEETING: One day, Zoey [Jimmy] put on sports clothes and went to the park. [He] She played a game of soccer with colleagues from work. Afterwards they went out for drinks and pizza.

Vignettes included in Study 2b.

Table S3b: Means for emotion ratings for the vignettes used in Transmission Study 3B.

Emotion	Vignette	Mean ratings in pre-test						
		Fear	Anger	Sadness	Strongest emotion*	Arousal	Plausible	Threat
Neutral	Gym	1.50	1.08	1.08	Interest 2.31	2.65	6.69	2.02
Neutral	Tennis	1.04	1.17	1.21	Interest 3.17	2.71	6.29	1.29
Fear	Wolf	3.62	1.12	1.42	Surprise 3.81	4.54	5.48	4.73
Fear	Bear	4.19	1.58	2.00	Interest 4.27	4.54	6.15	5.92
Anger-disgust	Locksmith	1.73	4.58	2.73	Anger 4.58**	4.08	5.94	2.69
Anger-disgust	Project	1.46	3.92	2.50	Disgust 3.96	3.11	6.23	1.67
Anger-sadness	Beating	4.58	5.25	5.25	5.25***	4.88	6.44	6.54
Anger-sadness	Attacked	3.65	5.31	5.42	Sadness 5.42	4.38	5.94	6.46
Sadness	Flooding	3.42	2.62	5.42	Sadness 5.42	3.88	5.85	6.52
Sadness	Traffic	3.76	3.60	5.20	Sadness 5.20	4.44	6.14	6.44

Note: *Highest rating for fear, anger, sadness, disgust, joy, interest, or surprise. **The mean rating of this vignette for disgust was 4.38. ***This vignette triggered anger and sadness equally strongly and triggered all other emotions less.

Vignettes Gym and Beating were used as in Study 1a. Below are the female versions of all the vignettes used. Words used in the male version are in brackets.

TENNIS: Macy [Mark] and Danielle [Dan] played a game of tennis. It was the first time they played together. There was no referee and they found it difficult to count the points, so there was no winner.

WOLF: Patricia [Henry] went on a hike through a forest. Suddenly, she [he] noticed a wolf in the distance. Patricia [Henry] immediately turned around and walked to the nearest village. She [He] was happy when she [he] got there.

BEAR: Maria [Mark] went camping in a forest. One day, she [he] spotted a bear ahead of her on the trail. The bear started moving in her [his] direction. Maria [Mark] walked slowly backwards. After a while the bear went away.

LOCKSMITH: Hannah [Ian] is a locksmith. One time, she [he] had helped someone who had been locked out of her [his] house. Then the person just went inside, closed the door, and refused to pay Hannah [Ian].

PROJECT: Lauren [Mike] and Caroline [Ben] worked on a school project together. They divided the tasks evenly. Caroline [Ben] did not do her [his] tasks. They both got a pass, but only because Lauren [Mike] had done all the work.

ATTACKED: Mary [John] walked across a parking lot at night. She [He] was attacked by a group of three men. They beat her [him] up very bad. Mary [John] died in the hospital.

FLOODING: Emma [Mike] and Katie [Jim] were neighbors. One day, the nearby river flooded. The flood was caused by heavy storms and rainfall. Emma [Mike] had tried to save Katie [Jim], but Katie [Jim] had drowned.

TRAFFIC: Caroline [John] was driving home. She [He] was talking on the phone with her [his] husband [wife]. Caroline [John] got distracted and missed a warning sign. She [He] took the curve too fast, crashed into a tree, and died.

Table S3c: Correlation table for individual difference measures. On the diagonal are Cronbach's α s (N = 200, for all rs, $p < .001$).

	Trait anxiety	Extraversion	Arousal	Social provisions
Trait anxiety	.94			
Extraversion	-.41	.86		
Arousal	-.51	.29	.89	
Social provisions	-.53	.32	.30	.94

Table S3d: Regression coefficients of multilevel model predicting transmission intentions (level 1) from dummy variables coding for different targets (level 1) and different emotions (level 1) and individual differences in social provisions (level 2; N = 200).

Predictor	b	SE _b	t	p
Intercept	1.88	0.10	18.11	< .001
Friend	0.95	0.12	8.01	< .001
Disliked	-0.35	0.12	-2.92	.004
Joy	-0.21	0.12	-1.73	.083
Disgust	0.84	0.12	7.12	< .001
Friend $\times$ joy	0.003	0.17	0.01	.988
Friend $\times$ disgust	1.10	0.17	6.59	< .001
Disliked $\times$ joy	0.17	0.17	0.99	.324
Disliked $\times$ disgust	-0.13	0.17	-0.76	.446
Age	-0.002	0.01	-0.35	.727
Age $\times$ friend	0.02	0.01	2.62	.009
Age $\times$ disliked	-0.01	0.01	-1.62	.106
Social provisions	-0.52	0.13	-3.90	< .001

Note: Df = 1590, except for the effects of age and social provisions dfs = 197.

Supplement S4

Instructions Study 3

Participants in the trustworthy target condition read the following instructions (instructions for females, different words for males are in brackets):

Imagine you are at a party where you don't know a lot of people. You see a woman [man] who you have never met and who looks like the woman [man] in the picture below. The couple standing next to you notices her [him] too. You overhear them saying that the woman [man] had helped one of her [his] friends with cooking and cleaning when her [his] friend was sick. Later on at the party you find yourself standing next to this woman [man]. She [He] starts talking to you and says that she [he] is new in town. You could help her [him] with some advice about your town. Below are several pairs of pieces of advice. Please assume that each piece of advice is true. For each pair, please indicate which piece of advice you would share if you had to choose just one.

The underlined sentence constituted the trustworthiness manipulation (it was not underlined in the experiment). In the untrustworthy target condition this sentence read: “*You overhear them saying that she [he] had spread some pretty nasty rumors about one of her [his] friends.*”

Rating and matching precautionary and prescriptive statements.

We wrote 20 precautionary and 20 prescriptive statements and had these rated in a separate study on variables relevant for social transmission: arousal (Berger, 2011), interest, surprise, plausibility, and utility (Heath et al., 2001, Berger & Milkman, 2012).

We recruited 23 individuals residing in the USA via Amazon Mechanical Turk. Participants rated all statements for valence and arousal (i.e., how the statement made them feel on a 7-point scale from 1 = *Very unpleasant* to 7 = *Very pleasant* and on a scale of 1 = *Very calm*, to 7 = *Very excited*, respectively). Participants were then given the following instruction: “Imagine that the fragment is part of a conversation you have with an acquaintance, and that the acquaintance shares this information with you.” after which they rated the statement for surprise, interest, plausibility (“Does the information seem believable?”), and utility (on 7-point scales from 1 = *No, not at all* to 7 = *Yes, very much*).

We computed mean ratings for all statements on all six variables. To match statements, mean ratings for surprise, interest, plausibility, and utility were summed as all these four features were identified by previous research as contributing to increased transmission tendencies. Prescriptions were matched with precautions that elicited similar levels of arousal and had similar scores for the sum of surprise, interest, plausibility, and utility. (It was not feasible to match the statements on the four variables that comprise the sum score separately as precautions generally had higher means for surprise, but lower means for believable, useful, and interested.) We were able to match 12 pairs for arousal and the sum score (see Table S4a). Paired t-tests revealed that the selected 12 precautions and 12 prescriptions did not differ in arousal, difference $M = -0.0036$, $t(11) = -0.07$, or sum score, difference $M = -0.366$, $t(11) = .145$. (Tests confirmed that the precautions were rated as more surprising, but less interesting, believable, and useful than the prescriptions, all $ps < .01$.) As was expected, the precautions were experienced as less pleasant than the prescriptions, difference $M = -3.011$, $t(11) = -18.36$, $p < .001$. For mean ratings of the selected prescriptions and precautions see Table S4b.

Table S4a: Pairs of precautions and prescriptions. In Study 3, the order of pairs was randomized across participants. In addition, the order of precautions and prescriptions was also randomized: pairs 1, 4, 5, 6, 10, 11 were presented “prescription top, precaution bottom”, pairs 2, 3, 7, 8, 9, 12 were presented “precaution top, prescription bottom”.

pair	Precaution	Prescription
1	When you are looking for a house, try to avoid the South side, because that is where there are the most break-ins and burglaries.	If you are looking for a gym, you might want to try “Fitness 100”. You will have a lot of fun. Everyone loves it there.
2	When you go out on a Saturday night, don’t park your car near the main bars. Some drunk people knock off car mirrors there.	When you are looking for a house, try to find something in the North side, because there is a very nice community and everyone looks out for each other.
3	If you go to the airport from the city center, it is probably better to avoid the taxis. If they think you are not a local, they might take you on a long detour.	When you need fruit and vegetables, you should try out the West-side market place. At the market they usually sell better quality food than at the supermarkets.
4	If you are looking for a DIY store, avoid the big one on East Street. They staff is not helpful and they often make a fuss when you want to return or exchange something.	When you are choosing where to live, try to find somewhere near the public school on Main Street. Because of the school, the area is very safe.
5	When you are driving to the shopping center in the morning, it is better to avoid Route 45, because there are often traffic jams that take a long time to get through.	There is a locally made cereal called NuToo Grains. It is all natural and really healthy. You should try it.
6	If you are looking for a gym, you might want to avoid “Joe’s Gym”. They have old equipment and a lot of people have gotten injured there.	The southern part of the city is nice, if you are looking for an area to live. There is a park, a swimming pool, and a nice boulevard.
7	If you are looking for a picnic spot, I would avoid Regent Park because it is a junkie hangout, and there are sometimes used needles lying around.	If you are looking for a DIY store, try the one on West Street. They are really helpful and it is no problem when you want to return or exchange something.
8	There are two bookstores in town, The Plume and McEvoy’s Books. I wouldn’t go to McEvoy’s as they often try to overcharge you.	If you are going downtown from here, I would recommend taking Bus 21, because it is fast and cheap.
9	When you need fruit and vegetables, don’t go to the East-side market. Pickpockets are targeting the market squares, as people usually carry cash there.	When you are driving to the shopping center in the morning, it is better to take Route 5A because it is usually fast with no traffic.
10	If you are thinking of a nice day out of the city, I would not recommend the nature reserve west of the city. When I went there, I got bitten by ticks.	If you are looking for a picnic spot, you might want to try City Park, because there are tables and drinking water.
11	There is a local app that claims to find the cheapest place to buy your food. Unfortunately, it ends up costing you more money than it saves, so don’t bother trying it.	The police force in this city is excellent. If you ever need some help, even for the little things, like directions, just ask a police officer.
12	If you are going downtown from here, I would recommend avoiding Bus C3, because it is slow and expensive.	If you need any help with the paperwork involved in moving to town, try asking at the city office. They are more than happy to answer questions and give advice.

Table S4b: Means ratings for the selected precautions and prescriptions.

	Valence	Arousal	Surprise	Believable	Utility	Interest	Σ (S, B, U, I)
Precautions	2.30	3.82	3.67	4.80	5.02	3.52	17.01
Prescriptions	5.32	3.82	2.73	5.15	5.26	4.24	17.38

Table S4c: Descriptive statistics and correlations for the precaution score and the individual difference variables. Cronbach's α is on the diagonal.

	Precaution score	Social provisions	Trait anxiety	Fear of negative evaluation
Precaution score	.62			
Social provisions	-.15 ^m	.96		
Trait anxiety	.04	-.57*	.95	
Fear of negative evaluation	-.06	-.09	.56*	.95
M	3.93	3.28	2.02	2.84
SD	2.40	0.52	.062	1.02

Note: ^m $p = .056$, * $p < .05$.

Table S4d: Regression coefficients for predicting precaution scores from age, sex (female = 0, male = 1), target (trustworthy = 0, untrustworthy = 1), and social provisions.

Predictor	b	SE _b	t(158)	p
Age	-0.04	0.01	-3.03	.003
Sex	0.43	0.51	0.85	.400
Target	-0.36	0.46	-0.77	.443
Social provisions	-0.16	0.55	-0.30	.765
Sex $\times$ target	1.28	0.71	1.80	.073
Sex $\times$ social provisions	-2.53	1.01	-2.50	.013
Target $\times$ social provisions	0.78	0.89	0.88	.382
Sex $\times$ target $\times$ social provisions	1.13	1.42	0.80	.427

Note: intercept = 3.54.

Supplement S5

Table S5: Mean ratings for the vignettes selected for Study 4.

vignette	Surprise		Plausibility		Threat		Condition
	M	SD	M	SD	M	SD	
Traffic	3.96	1.86	6.14	1.20	6.44	0.91	High Threat
Bear	3.58	2.28	6.15	0.95	5.92	1.41	High Threat
Puke	3.52	2.00	6.10	1.25	6.06	1.19	High Threat
Poker	3.31	2.04	6.02	1.29	5.90	1.09	High Threat
Refusal	3.96	1.93	6.28	1.32	1.24	0.41	Low Threat
Controversy	3.62	2.21	4.94	1.34	2.00	1.27	Low Threat
Dinner	3.40	1.91	6.36	0.93	1.28	0.68	Low Threat
Present	3.35	2.02	6.33	0.85	1.29	0.67	Low Threat

TRAFFIC: Steve [Caroline] was driving home. He [She] was talking on the phone with his wife. Steve [Caroline] got distracted and missed a warning sign. He [She] took the curve too fast, crashed into a tree, and died.

BEAR: Chris [Maria] went camping in a forest. One day, he [she] spotted a bear ahead of him on the trail. The bear started moving in his direction. Chris [Maria] walked slowly backwards. After a while the bear went away.

PUKE: Ethan [Kylie] drank a lot when he partied. He [She] knew that he [she] might pass out when drinking too much. One time he [she] really drank too much. He [she] passed out and suffocated in his [her] own puke.

POKER: Alexander [Alice] and his [her] friends were playing poker. Suddenly the house started to shake. They realized that this was an earth quake. They quickly hid under the table. They were scared, but survived.

REFUSAL: Luke [Lilly] asked Henry [Julia] if he could take care of Luke's [Lilly's] dog for a week. Henry [Julia] took good care of Luke's [Lilly's] dog. A few months later, Henry [Julia] asked Luke [Lilly] to look after his [her] dog. Luke [Lilly] refused.

CONTROVERSY: George [Jennifer] is a famous movie star. Controversy has erupted over his [her] latest film. The film did well in screenings, but George [Jennifer] blocked the film from being released.

DINNER: Matthew [Emily] invited Daniel and Claire for dinner at his [her] house. They had a good time. Three weeks later, Matthew [Emily] finds out that Daniel and Claire hosted a dinner party. Matthew [Emily] was not invited.

PRESENT: Rob [Mandy] and Jim [Sophie] both have good jobs. Rob [Mandy] bought Jim [Sophie] a 100 dollar watch for his [her] birthday. A few months later, Jim [Sophie] bought Rob [Mandy] a 10 dollar bottle of wine for his [her] birthday.