Running head: AFFECTING OTHERS

Affecting Others: Social Appraisal and Emotion Contagion in Everyday Decision-Making

Brian Parkinson & Gwenda Simons

Oxford University

Please address correspondence to:

Brian Parkinson

Department of Experimental Psychology

Oxford University

South Parks Road

Oxford OX1 3UD

UK

Email: brian.parkinson@psy.ox.ac.uk

Word count: 9712

Abstract

In a diary study of interpersonal affect transfer, 41 participants reported on decisions involving other people over three weeks. Reported anxiety and excitement were reliably related to the perceived anxiety and excitement of another person who was present during decision-making. Risk and importance appraisals partially mediated effects of other's anxiety on own anxiety as predicted by social appraisal theory. However, other's emotion remained a significant independent predictor of own emotion after controlling for appraisals supporting the additional impact of more direct forms of affect transfer such as emotion contagion. Significant affect-transfer effects remained even after controlling for participants' perceptions of the other's emotion in addition to all measured appraisals, confirming that affect transfer does not require explicit registration of someone else's feelings. This research provides some of the clearest evidence to date for the operation of both social appraisal and automatic affect transfer in everyday social life.

Keywords: Affect transfer; social appraisal; emotion contagion; decision-making

Affecting Others: Social Appraisal and Emotion Contagion in Everyday Decision Making

How are we affected by someone else's emotions? What consequences do they bring for judgements in uncertain situations? For example, does a friend's worried expression increase our sense of risk, and make us feel worried too? Most previous research on the role of affect in decision-making has focused on individually experienced emotions and moods (e.g., Loewenstein, Weber, Hsee, & Welch, 2001). The present study extends this research by considering the informational and affective consequences of another person's perceived emotions (see also Sinaceur & Tiedens, 2006; Van Kleef, De Dreu, Pietroni, & Manstead, 2006). In particular, we investigated two ways in which someone else's anxiety or excitement may influence our own emotions and appraisals during decision-making, the first based on social appraisal (e.g., Manstead & Fischer, 2001), and the second based on emotion contagion (e.g., Hatfield, Cacioppo, & Rapson, 1994). Our distinction between these two processes hinges on the role of appraisal in interpersonal affect transfer (see Figure 1). Affect transfer based on social appraisal occurs because someone else's perceived affect carries information that alters our appraisal of the emotional meaning of what is happening. In emotion contagion, however, we catch another person's affect automatically and without necessarily registering its personal significance.

Hatfield and colleagues' (1994) account of "primitive emotion contagion," postulates a natural tendency to mimic other people's expressions and postural changes during interpersonal interaction. Self-perception of these copied movements in turn produces corresponding emotional experiences via feedback processes (e.g., Adelmann & Zajonc, 1989). In other words, we feel what others feel because we physically react in accordance with their reactions. Alternatively, perceiving someone else's expressive movements may directly activate associated

neural action codes associated with affect (Neumann & Strack, 2000). In either case, the resulting affect transfer requires no explicit appreciation of the implications of the other person's emotions. Thus, an emotion-contagion account implies effects of one person's emotion on a second person's emotion that are not mediated by changes in the second person's appraisals.[1]

By contrast, a social appraisal account of interpersonal affect transfer suggests that one person's emotion effects a second person's emotion because of its effects on the second person's appraisals. In particular, individuals may take other people's feelings into account when arriving at evaluations of the emotional significance of what is happening (e.g., Manstead & Fischer, 2001). For example, the anxiety of someone close may make us more sensitive to the risks facing us (including the risk that the other person may become more anxious if we continue our present course of action).

Although interpersonal affect transfer is commonly reported in both laboratory (e.g., Barsade, 2002) and field settings (e.g., Anderson, Keltner, & John, 2003), few studies have conclusively distinguished between emotion-contagion and social-appraisal explanations. Neumann and Strack (2000) attempted to rule out inferential processes as explanations of mood contagion in a series of experiments where participants listened to recordings of a happy, neutral or sad voice. Mood was rated as better after exposure to the happy voice but there were no corresponding effects of explicit registration of the other's expressed affect or awareness that affect had been influenced. Further, the effect on mood was not moderated either by perspective-taking or performance of a simultaneous attention-demanding task, confirming its implicit basis. However, the investigators obtained contagion effects only on general ratings of mood state and not on specific emotion items, casting doubt on the generality of these findings.

Totterdell (2000) used a diary method to demonstrate significant affect transfer between

members of a cricket team even after controlling for players' ratings of negative and positive events (see also Ilies, Wagner, & Morgeson, 2007). However, changes in more specific appraisals of emotion-relevant events may still have mediated the reported effects. Studies finding stronger affect transfer among individuals scoring higher on measures of susceptibility to emotion contagion (e.g., Doherty, 1997; Ilies et al., 2007) do not definitively establish contagion either, because these measures may reflect more general sensitivities to others' emotions (including social-appraisal tendencies).

Although there is more direct evidence for social-appraisal accounts of affect transfer, most of the relevant data comes from studies in which parents' emotion expressions influenced their young children's behaviour towards ambiguous objects – a context in which social influence may be particularly likely. For example, Sorce, Emde, Campos, and Klinnert (1985) placed toddlers at the opposite side of a visual cliff from their mothers, who were instructed to show either a happy or fearful facial expression. Almost all infants crawled toward their mother if she was smiling, but none crossed the cliff if she showed a fear expression. Thus, mothers' emotion display probably influenced toddlers' risk appraisals and consequently their emotional orientation to the potentially dangerous situation. Subsequent research confirmed that toddlers influenced by social referencing register the connection between the adult's emotion presentation and the appraisal object, ruling out any interpretation purely in terms of emotion contagion (Feinman & Lewis, 1983; Hornik, Risenhoover, & Gunnar, 1987). However, social referencing effects of this kind depend on the nature and ambiguity of the emotional object and are not consistently reported across all situations (e.g., Hertenstein & Campos, 2004; Mumme, Fernald, & Herrera, 1996).

To date, only indirect evidence for the operation of social appraisal processes in adult

participants is available (but see Parkinson, Simons, & Trombello, under review). Schachter (1959) found that participants facing an anxiety-provoking situation preferred to wait with others facing a similar situation, and concluded that they were motivated to calibrate respective understandings of their emotional state. However, an equally plausible interpretation is that participants used these social comparisons to disambiguate appraisals of the situation rather than of their personal experience. In a related vein, Latané and Darley (1968) found that participants were slower to respond to an apparent emergency when in the presence of impassive confederates posing as co-participants, suggesting that risk appraisals depended on other people's perceived emotional reactions.

More recent research by Fischer, Rotteveel, Evers, and Manstead (2004) found that participants' emotional reactions to an imagined situation in which they received a poor grade from an instructor depended on the described or expressed emotions of others experiencing similar outcomes. In study 1, participants reported greater anger when other students were described as reacting angrily than when other students reacted with sadness. In study 2, participants reported greater sadness when other students expressed sadness than when other students expressed anger. However, in neither case was the reported affect transfer accompanied by changes in self-blame or other-blame appraisals, making a social-appraisal account unlikely.

Like Totterdell's (2000) study, the present research used diary methods to uncover evidence of the operation of social-appraisal and emotion-contagion processes. Our intention was to supplement parallel laboratory-based research (Parkinson, et al., under review; Simons & Parkinson, under review) with evidence concerning the consequences of these processes for everyday decision-making. Further, our use of a naturalistic setting allowed us to investigate how these processes unfold between actors in unconstrained interaction taking place over a more

extended time-period than is usually possible in experimental research.

Unlike previous diary studies of affect transfer (e.g., Ilies et al., 2007; Totterdell, 2000), we focused on specific appraisals of, and affective reactions to events rather than general mood at prespecified times. Our expectation was that these more focused responses would be more likely to carry appraisal-relevant information about what was happening, making it easier to detect the operation of social appraisal processes. We also focused on interpersonal settings rather than the group contexts sampled in previous diary studies in order to permit a tighter focus on the transfer of affect between individuals. Unless all members of a group are simultaneously engaged in a common task, they are less likely than dyads to be oriented to a common object of appraisal (especially when dyad members share a personal relationship as was often the case here). The research reported in the present paper is the first diary study to investigate interpersonal emotional influences on appraisals of, and affective reactions to, real-world events.

The emotional events sampled in this research are everyday decisions. Apart from their obvious practical relevance, our focus on decisions allowed us to preselect situations that involved a limited range of emotions and appraisals, and were associated with an element of uncertainty (allowing the influence of social appraisal). Our intention was to explore how social-appraisal and emotion-contagion processes might operate in these realistic settings. In order to keep the diary questionnaire brief enough to permit repeated completion, we focused on two common affective responses to uncertain situations that have contrasting valences, namely anxiety and excitement. Although other kinds of pleasant and unpleasant affect are experienced during decision-making, the message-value of these emotions as signals of threat and opportunity respectively made it especially likely that they would induce corresponding emotions in others. In particular, we were interested in how other people's anxiety and

excitement influence own anxiety and excitement and own appraisals of decision importance (motivational relevance, Smith & Lazarus, 1993) and of risks associated with decision options (uncertain coping potential, Smith & Lazarus, 1993), on the basis of the two processes distinguished above (see Figure 1).

In the emotion-contagion sequence, the effects of the other person's emotion on own emotion are not mediated by appraisals. However, we also propose that any contagion-induced emotion in turn affects appraisals of the current situation (cf. Keltner, Ellsworth, & Edwards, 1993). For example, my automatically activated anxiety may draw my attention to potentially risky aspects of decision options (e.g. Hockey, Maule, Clough, & Bdzola, 2000; Naqvi, Shiv & Bechera, 2006). According to Loewenstein et al.'s (2001) "risk as feelings" model, own emotions may influence appraisal because of direct priming effects (e.g., Bower, 1981; Isen 1984) or because they provide information directly relevant to judgement (Schwarz & Clore's "how do I feel about it?" heuristic, 1990).

In the social-appraisal sequence, however, the other person's emotional reaction provides information that changes the participant's own appraisal of decision options, and these appraisal changes in turn affect emotions (e.g., Lazarus, 1991). For example, your anxiety might make me reconsider my initial opinion that an option was safe, and my consequent appreciation of its possible risks might then make me more anxious too. Conversely, if I register your excitement about the potential outcome of a decision, then that might increase my appreciation of its possible positive consequences.

Our study used an event-contingent recording procedure (Wheeler & Reis, 1992) where participants reported on own and other's anxiety and excitement relating to everyday decisions over a three-week period. We also collected data from a "reference person" nominated by each

participant as the individual most commonly involved in his or her decisions in order to validate interpersonal perceptions of emotion. Our analyses investigated the operation of social appraisal and emotion contagion by assessing whether effects of another person's emotion on own emotion are mediated by appraisal (social appraisal) and whether effects of another person's emotion on appraisal are mediated by own emotion (emotion contagion). Our basic prediction was that another person's perceived anxiety concerning decision options will be positively related to own anxiety (affect transfer), appraisals of the risks associated with these options (including importance, level of risk, and probability of negative outcomes. We also expected that mediational analyses would confirm the operation of both social appraisal and emotion contagion in explaining affect transfer. In particular, controlling for relevant appraisals should significantly reduce the strength of transfer effects (consistent with a social appraisal account), but the other person's emotion should continue to have a significant positive impact on own emotion even after controlling for appraisals (consistent with an emotion-contagion account, cf. Ilies et al., 2007; Totterdell, 2000). Finally, we predicted that effects of the other person's emotion on own appraisal would remain significant after controlling for own emotion, thus ruling out an emotion-contagion explanation for any obtained social appraisal effect.

Method

Pilot Study

Materials and procedures were piloted on a sample of 24 paid participants (9 males, 15 females, aged between 20 and 80), who completed paper questionnaires after decisions over a two-week period. Results were highly similar to those obtained in the main study and are therefore not reported here.

Participants

Forty-one participants (15 males, 26 females) aged between 18 and 52 years (M = 26.80, SD = 7.79) were paid £50 (about $80) to complete the main study. Data from two additional participants were discarded because time-records on the hand-held computer showed that all decision information had been entered retrospectively on the final day.

The sample included full-time and part-time students and employed people. Twenty-six participants (63%) indicated that they were either in a stable relationship or married at the time of the study. All but two of these participants nominated their spouse or partner as the reference person who was most likely to be involved in their decisions. All other participants nominated a close friend, relative, or housemate.

Equipment

Diary measures were administered on PalmOne Tungsten T5 handheld computers using iESP software (see Consolvo & Walker, 2003), an adaptation of the Experience Sampling Program (ESP, L. F. Barrett & D. J. Barrett, 2001). Each device was programmed to generate an audible alarm signal at least once a day as a reminder to enter any relevant data.

Diary Measures

We asked participants to complete a pre-programmed decision questionnaire[2] as soon as possible after each relevant decision made during the study period. The first question asked for an open-ended description of the decision situation and the various decision options available. Participants also described and categorised the potential negative consequences of each option.

Appraisal measures included participants' ratings of the *importance* of the decision, and of the perceived *risk* of each specified option. After describing and classifying the potential negative consequences of the decision, participants also rated how likely they had thought it was

that these negative consequences would occur while making the decision (*outcome probability*, comparable to Smith and Lazarus's (1993) appraisal dimensions of motivational congruence and future expectancy).

Participants rated their *own emotional reactions* (anxiety and excitement) in relation to two time-points. T1 referred to when they first considered the decision and T2 referred to when they had made the decision. Participants further reported on the other person's role in the decision (i.e., as co-decision-maker, advisor, or bystander), who the other person was, whether they were aware of the other's feelings, and how much contact they had with this person. If participants indicated being aware of the other's feelings, they were asked to rate that person's anxiety and excitement at T1 and T2.

If reference persons were available immediately after participants had completed the questionnaire, they were also asked to rate (privately) their levels of anxiety and excitement concerning the decision in a separate section of the questionnaire. All ratings were made on visual analog scales running from 0 to 100, with appropriately labeled endpoints (usually 'not at all' and 'extremely').

Procedure

We ran the study in five waves, each lasting approximately four weeks, with up to nine participants in each wave, allowing more individualised instruction about using the handheld and a greater level of support whenever technical difficulties arose. Briefing sessions informed participants of the study's procedures and general purpose. Participants were asked to complete a computerised questionnaire for all non-routine decisions that had some impact on their lives and/or that of others, where someone else was involved in the decision-making process (as co-decision maker, advisor, or bystander). We also provided written guidelines regarding which

decisions to report together with illustrative examples based on results from the pilot study. Decisions made repeatedly on a regular basis (e.g., whether to eat) were explicitly excluded.

After signing consent forms, participants completed a demographic questionnaire, and nominated their reference person, specified as someone regularly involved in their decisions, who would be available during the recording period. The second part of the briefing meeting allowed participants to try out the questionnaire and familiarise themselves with the handheld computer.

Participants were instructed to keep the handheld with them for a period of three weeks and to access the questionnaire at least once a day (signalled by an alarm set to go off at a time chosen by the participant), even if only to report that no relevant decision had occurred in the last 24 hours. Participants were also told to pass the handheld to their reference person for completion of the final part of the questionnaire whenever possible, but not to discuss their specific ratings with this person.

Results

Response Rate

Participants accessed decision questionnaires on 377 occasions. Data were incomplete for 28 reported decisions, leaving 349 usable entries. For 232 of these complete questionnaires (across 39 participants), participants indicated that they were aware of the feelings of the other person involved. These 232 decision reports were the main focus of the hierarchical analyses reported below. However, analyses including reference persons' ratings used a smaller dataset of the 49 decisions during which the reference person was available to complete the relevant items.

Nature of Reported Decisions

Mean rated importance of reported decisions (aggregated across decisions for each

participant) was 59.14 (*SD* = 12.60). The chosen option (option 1) was rated as moderately risky (aggregated *M* = 43.23, *SD* = 15.43), and the probability of its perceived negative consequences was rated as relatively high (aggregated *M* = 57.95, *SD* = 12.27). Table 1 presents frequencies and examples of the reported decisions based on participants' own classifications of their potential negative consequences (using a simplified version of Singleton and Hovden's category scheme, 1987). Forty-one percent of reported decisions were joint decisions, the other person acted as advisor in 29% of decision, and the role of the other person was described as 'bystander' or 'other' for all remaining decisions. The other person involved was the nominated reference person in 60% of reported decisions.

Accuracy of Perceptions of Reference Person's Emotions

In order to assess validity of participants' perceptions of the other's emotions, we specifically focused on the 49 decisions (reported by 19 participants) for which data about the reference persons' emotions were provided by both participants and reference persons themselves. Before computing correlations between these measures, we centered observed scores around the relevant participant's mean score to remove individual differences (see Jones & Fletcher, 1996). We found significant correlations between participants' and reference persons' reports of the reference person's excitement at both T1 (r (49) = .64, $p < .001$) and T2 (r (49) = .46, p = .001) and of the reference person's anxiety at both T1 (r (49) = .33, p = .019) and T2 (r (49) = .38, p = .007). These significant positive correlations help to confirm the validity of participants' ratings of the other person's emotions, although the moderate size of the correlations also suggests some level of independence between participants' perceptions of reference persons' emotions and reference persons' self-reports (see also below).

Overview of Multilevel Analyses

The diary data collected in this study had a hierarchical structure, with decisions (level 1) nested within participants (level 2). The statistical analyses reported in the following sections involved multi-level linear modelling and used the HLM 6.03 software package (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2004). The full maximum likelihood option was used, and all models were random regression coefficient models.

We focused on the influence of the other person's emotion on participants' appraisals and emotions during reported decisions, so the predictor variables in most of our analyses were other excitement and other anxiety at T1 and T2, and the outcome variables were own anxiety and own excitement at T1 and T2, and appraisals of decision importance, risk of chosen option, and probability of negative outcomes. We also assessed the influence of level 2 predictors such as age and gender. A significant fixed effect of any of these predictors in the multilevel model shows that it is reliably related to the outcome variable across reported decisions independent of any individual differences between participants. A significant change in the likelihood index means that the addition of the predictor improves the fit of the overall model.[3] In addition, we assessed whether any effects of others' emotions on own emotion were mediated by appraisals, and whether any effects of others' emotions on own appraisals were mediated by own emotions. In these analyses, we assessed whether the predictor had a significant effect on the potential mediating variable, whether the potential mediating variable had a significant effect on the outcome variable, and whether the fixed effect of the predictor was reduced when the potential mediator was added to the regression equation. If any of these conditions is not met then mediation can be ruled out (Baron & Kenny, 1986). All level 1 predictor and mediator variables described above were standardized and centered around the group (participant) mean prior to

analysis, whereas age (a non-categorical level 2 variable) was standardized and centered around the grand mean.

Emotion Transfer

Null models for T1 and T2 own anxiety and excitement are presented in Table 2. In each case, less than 22% of variance was due to differences between participants. Single predictor models demonstrated that T1 other anxiety was a significant positive predictor of T1 own anxiety and T2 other anxiety was a significant positive predictor of T2 own anxiety (see Table 3). The time-lagged (positive) effect of T1 other anxiety on T2 own anxiety was also significant. Similarly, T1 other excitement was a significant positive predictor of T1 own excitement, T2 other excitement was a significant positive predictor of T2 own excitement, and the time-lagged (positive) effect of T1 other excitement on T2 own excitement was significant.

Some of the reported affect-transfer effects were moderated by the nature of the other person's involvement in the decision. In particular, there was a significant effect of the interaction between decision involvement (dummy coded for joint decision vs. other) and T1 other excitement on T1 own excitement (Interaction term coefficient = 9.70, $t_{38} = 3.064$, $p = .004$), showing that other and own excitement were more closely related in joint decisions.

Effects of Other's Emotion on Own Appraisals

Similar single predictor models were used to assess whether T1 and T2 other anxiety and excitement were significant single predictors of importance, risk, and outcome probability appraisals. Null models for these three appraisal variables are again presented in Table 2. In each case, less than 15% of variance was due to differences between participants.

T1 and T2 other anxiety were both significant and positive single predictors of importance and risk, but not of outcome probability. T1 other excitement had no significant effects on

any appraisal variable. T2 other excitement was a positive single predictor of importance but not of risk or outcome probability (see Table 4 for significant effects).

Effects of Appraisals on Own Excitement and Anxiety

Importance, risk, and outcome probability were significant single predictors of T1 and T2 own anxiety (see Table 5). However, none of these appraisal variables were significant predictors of own excitement at T1 or T2.

Appraisals as Mediators of Anxiety Transfer

The results reported in the previous two sections clarify which appraisals are potential mediators of affect transfer. In particular, outcome probability cannot be a mediator because neither other anxiety nor excitement influenced this variable significantly at either T1 or T2 (Baron & Kenny, 1986). Further, none of the measured appraisal variables can be mediators of excitement transfer because they had no significant effects on own excitement at T1 or T2 (Baron & Kenny, 1986). Our analyses therefore focused on importance and risk as mediators of anxiety transfer.

The effects of T1 other anxiety on T1 and T2 own anxiety remained significant after controlling for importance and risk separately and in combination. Similarly, T2 other anxiety remained a significant predictor of T2 own anxiety after controlling for both of these appraisal measures (see Table 6). However, Sobel tests suggested that both importance and risk were significant partial mediators of the effects of T1 other anxiety on T1 own anxiety ($z = 2.79$, $p = .005$ and $z = 2.91$, $p = .002$, respectively) and T2 own anxiety ($z = 2.76$, $p = .006$ and $z = 2.92$, $p = .003$, respectively) and of T2 other anxiety on T2 own anxiety ($z = 3.31$, $p < .001$ and $z = 4.13$, $p < .001$, respectively) as predicted by the social appraisal model.

Clarifying Time-Lagged Effects

The effect of T1 other anxiety on T2 own anxiety was significantly reduced but remained significant after controlling for T2 other anxiety. However, the effect was no longer significant after controlling for T1 own anxiety, suggesting that the delayed influence of the other's anxiety on own anxiety may have depended on a simultaneous effect operating at T1 coupled with persistence of the change in own anxiety from T1 to T2. However, the effect of T1 other excitement on T2 own excitement remained significant even after controlling either for the participant's own excitement at T1 or the other person's excitement at T2, and marginally significant after controlling for both of these variables simultaneously, suggesting that the influence of the other's excitement on subsequent own excitement does not simply depend on the persistence of either the other's or one's own excitement (see Table 7).

Mediation of Effects of Other's Anxiety and Excitement on Appraisals

T1 other anxiety's effects on both importance and risk ratings were reduced to non-significance after controlling for T1 own anxiety, suggesting that the effects of the other person's emotions on appraisals may have depended on changes in own emotion, consistent with an emotion-contagion account. However, the effect of T2 other anxiety on importance and risk remained significant after controlling for T2 own anxiety as predicted by the social appraisal model. Similarly, T2 other excitement was a significant predictor of importance, even after controlling for T2 own excitement. See Table 4 for a summary of the significant results.

Level 2 Variables

Apart from a significant positive influence of participant age on T1 excitement, none of the level 2 variables we measured (including gender) had any significant effects on participants' own anxiety or excitement at either T1 or T2. Further, none of these variables moderated the

effects of other anxiety or excitement on own anxiety or excitement at either T1 or T2.

Analyses Using Reference Persons' Ratings

To further assess the validity of our results, we checked whether the significant effects were replicated after substituting participants' ratings of others' emotions with reference persons' self-reported emotions. All of these analyses used the reduced dataset of 49 decisions described above in which the participant reported being aware of the reference person's feelings and when the reference person was available to provide independent ratings of emotions. The limited sample size made the dataset unsuitable for multilevel modelling, so instead we used the pooled within-person variation approach described by Kessler (1987). This involves centering observed scores around the relevant participant's mean score to remove individual differences prior to conducting correlational and regression analyses (see Jones & Fletcher, 1996).

None of the associations between reference person's self-rated anxiety or excitement on any of the appraisal measures was significant in this smaller sample. Further, reference person's own ratings of anxiety at T1 and T2 were not significantly associated with T2 own anxiety. However, reference person's self-rated anxiety at T1 showed a significant positive correlation with participant's own anxiety at T1 (r (49) = .42, p = .003). Reference person's T1 excitement also showed significant positive correlations with T1 own excitement (r (49) = .57, $p < .001$) and T2 own excitement (r (49) = .44, p = .002). Finally, reference person's T2 excitement showed a significant positive correlation with T2 own excitement (r (49) = .44, p = .002).

Each of these significant relations between reference persons' and participants' emotions remained significant even after controlling for all three rated appraisals (importance, risk, and outcome probability) separately and in combination using multiple regression. Indeed, Sobel tests showed that participants' appraisals were not significant mediators of any of these effects.

Finally, we assessed whether these effects of reference persons' self-rated emotions remained significant after controlling for participants' corresponding ratings. The effect of T1 reference person's self-rated anxiety on T1 own anxiety remained significant after controlling for (participant-rated) T1 other anxiety ($\beta = .28$, t (46) = 2.21, $p = .032$). Similarly, the effects of T1 reference person's self-rated excitement on T1 own excitement ($\beta = .57$, $t(46) = 3.36$, $p = .001$), T2 own excitement ($\beta = .49$, t (46) = 2.88, $p = .006$) remained significant after controlling for (participant-rated) T1 other excitement, and the effect of T2 reference person's self-rated excitement on T2 own excitement remained significant after controlling for (participant-rated) T2 other excitement ($\beta = .44$, $t(46) = 2.97$, $p = .005$). These findings suggest that the reference person's anxiety and excitement influenced own emotions independently of their explicit registration by participants. Non-significant Sobel tests further demonstrated that none of these effects were mediated by participants' ratings of the reference persons' emotions.

Discussion

The diary data reported here confirm that other people's emotions influence own emotions and appraisals during decision-making in naturalistic settings. They clearly establish that our anxiety and excitement about decision options are affected by the anxiety and excitement experienced by others. The fact that many of the relevant effects remained significant even when reference persons' self-ratings replaced participants' perceptions of their emotions makes it difficult to explain these findings in terms of affect-congruent misperceptions of the other persons' emotions.

Not only were participants' emotions influenced by the other person's simultaneous emotions but also by the other person's emotion as experienced at an earlier time-point. Although the direction of causality operating in simultaneous relationships between own and

other emotions is uncertain, these delayed effects suggest that the other person's emotion was influencing the participant's emotion rather than (or as well as) vice versa. However, because T1 ratings were collected retrospectively rather than at the time when the decision was first considered, there remains some possibility of biased reporting (e.g., Bonanno & Keltner, 2004).

This study also provides the first consistent evidence for the operation of social appraisal processes among adults in everyday situations. We found significant effects of the other person's emotion on own appraisals even after controlling for own emotion, suggesting that participants took the other person's feelings into account when evaluating and interpreting the decision situation. Further, the effect of the other person's anxiety on own anxiety at the time of decision-making (T2) was partly mediated by appraisal. The apparent absence of similar effects in previous research (e.g., Totterdell, 2000) may have been a consequence of the indirect measures of appraisal used in these earlier studies, their focus on generalised mood rather than affective reactions to events, or the group rather than interpersonal setting (as discussed in the Introduction above). The present findings suggest that when two adults are both focused on a common object, their appraisals of that object and affective reactions to it often become calibrated.

However, all effects of other anxiety and excitement on own anxiety and excitement remained significant after controlling for all measured appraisals, providing evidence consistent with a separate role for automatic processes such as emotion contagion in explaining emotion transfer, and supporting Totterdell's (2000) earlier conclusions. Further, many but not all effects of other's emotions on appraisals became non-significant after removing the effect of emotion contagion by controlling for own emotion. In other words, the other person's emotions seemed to affect participants' emotions partly by having contagious effects that in turn led to changes in

appraisal, and partly by changing appraisals more directly. The fact that some of the obtained transfer effects operated independently of participants' perceptions of the other's emotion makes it even more likely that some form of implicit emotion contagion took place. The present studies therefore provide clearer evidence of emotion contagion than previous diary studies because they control for appraisals of events in addition to the events themselves, and for perceptions of others' emotions as well as others' self-reports of those emotions.

However, it is important to acknowledge that the evidence for emotion contagion reported here and in earlier studies is indirect. Like previous investigators (e.g., Neumann & Strack, 2000; Totterdell, 2000), we reached the conclusion that emotion contagion was operating by controlling for another potential explanation for affective transfer, in this case social appraisal. The fact that emotion transfer was not fully mediated by appraisals of events also argues against interpretations in terms of common exposure to affectively relevant events (since these events would normally require appraisal before affecting emotion). However, other possible routes whereby another person's emotion may affect our own might still account for appraisal-independent emotion transfer.

For example, seeing an anxious face or hearing someone speaking in anxious tones may present an intrinsically unpleasant stimulus configuration that brings direct effects on the perceivers' affect. Conversely, excited face and voices may directly activate arousal and pleasure in perceivers. Appraisal-independent affect transfer may therefore have depended on expressions serving as emotion elicitors rather than emotion messengers (in Ruys & Stapel's 2008 terms) in this and other studies (e.g., Neumann & Strack, 1990). One way of distinguishing between direct emotion elicitation and emotion contagion in future research would be to compare responses to the same expressions in different people. Emotion elicitors should bring equivalent

effects regardless of the relationship between participants, but emotion contagion is usually assumed to be dependent on factors such as relative power and interpersonal warmth (Hatfield et al., 1994).

Some forms of empathic response may depend on registering the meaning of others' verbal statements rather than being directly influenced by facial or vocal expressions. Unlike in our laboratory studies (Parkinson, Simons & Trombello, under review), the present method did not permit us to control the channels of affective communication between participants and reference persons, so it is likely that explicit verbal communication was one of the channels whereby affect was communicated. When reference persons told participants about their anxiety or excitement, this may have led participants to feel anxious or excited vicariously (Kelly & Barsade, 2001). However, such an account cannot easily explain the fact that correlations between reference persons' and participants' emotions remained significant even after controlling for participants' perceptions of reference persons' emotions. Indeed, we believe that affect transfer based on explicit communication of emotional information is more likely to depend on social appraisal than emotion contagion.

One of our significant affect-transfer effects presents problems for social-appraisal, emotion-contagion, and direct emotion-elicitation accounts. The significant impact of T1 other excitement on T2 own excitement was not mediated by measured appraisals and remained significant even after controlling for T1 own excitement and T2 other excitement. Why then were our participants more excited when making their decisions if another person was more excited when the decision was first considered? Despite the evidence against mediation by importance, risk, or outcome probability, it remains possible that these effects were mediated by other unmeasured appraisals. Indeed, our appraisal measures were selected to be more directly

relevant to anxiety than excitement. It is therefore possible that the time-lagged effects on own excitement depended on unmeasured appraisals concerning positive expectations, which may be only loosely correlated with the negative expectations that we assessed. In short, participants' hopes may have been heightened by the other person's initial enthusiasm or dampened by the other's initial anxiety, even when a sense of risk remained.

Along similar lines, participants' excitement at T2 may have been related to their anticipations of the other person's response as well as the direct consequences of the decision for the self (cf. Ajzen and Fishbein's, 1977, distinction between attitudes and subjective norms). The other person's original emotional response may have been an influential factor in shaping these anticipations. In short, their excitement may have been tempered by the perception that the other person did not unambiguously share their feelings. Thus, when evaluating decision situations, people may not only wonder "how do you feel about it?" but also "how do you appraise it" and "how will it affect your feelings?" Unlike contagion effects, it seems possible that these implications of another person's emotion for appraisal or for the other person's anticipated reaction to the decision may take time to be fully appreciated.

Some affect transfer effects reported here depended on the nature of the other person's involvement in the decision. In particular, when the other person was a co-decision maker, there was a stronger correlation between excitement levels of the two parties at T1. This finding supports the common perception that enthusiasm can be infectious. Further, it is consistent with the idea that sharing a common orientation towards a decision outcome leads to reciprocal and possibly escalating interpersonal effects of emotion. For example, one person's excitement about a joint decision may intensify the other person's excitement which in turn may in turn re-intensify the first person's excitement (and so on).

The findings reported here relate to the interpersonal transfer of two specific affective reactions, namely anxiety and excitement, selected partly because we expected them to produce corresponding rather than complementary or contrasting emotions in close others. Anxiety and excitement are likely to be contagious because they signal threats and opportunities in the social environment, respectively.[4] However, other varieties of emotion may have less consistent effects. For example, registering someone else's anger may make us more angry if we share the angry person's orientation towards the target of this emotion, but may induce fear if it is directed at us (cf. Ruys & Stapel, 2008). More generally, we believe that affect transfer is most likely when interactants are pursuing common goals and have a close relationship or a common social identity (see also Walter & Bruch, 2008). Future research should compare the interpersonal effects of different emotion presentations in different relational contexts.

In sum, the present results suggest that convergence of interpersonal emotions sometimes depends on social appraisal processes and often also involves contagion or other empathic responses (Tiedens, Sutton, & Fong, 2004). Thus, neither social appraisal nor emotion contagion can provide an all-purpose theory of interpersonal emotional influence, and the challenge facing future research is to specify when and how each of these processes operates and how the two processes might interact with each other.

The diary method used in the present research offers some advantages over previous experimental research on this topic, because they allow sampling of real-life emotionally involving situations and permit assessment of processes that unfold over time. For example, the decision-based time-frame used in the present research allowed us to show how the other person's emotions when first considering the decision impacted on own emotions when the decision was subsequently taken. However, fuller understanding of the unfolding relations

between other's emotions and own emotions and appraisals requires a tighter time-frame and measures with a greater degree of temporal resolution (see Scherer, 1993). Only by intensively studying real-time processes of emotion coordination and discoordination can we begin to appreciate the intricacy and complexity of interpersonal interaction.

This study also suggests ways of extending existing research into emotional influences on risk perception. In addition to assessing informational and priming effects of own affect on judgements of risk and decision-making in risky situations (e.g., Loewenstein et al., 2001), the present results demonstrate that is profitable to consider how other people's affect might contribute to these processes, either by shaping own affect or by otherwise influencing risk appraisals. Few of our everyday decisions are made in a social vacuum (Joffe, 2003). It therefore seems important to understand how our own feelings interact with those of close others when evaluating action options.

References

Adelmann, P.K., & Zajonc, R.B. (1989). Facial efference and the experience of emotion. *Annual Review of Psychology, 40*, 249-280.

Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin, 84*, 888-918.

Anderson, C., Keltner, D., & John, O. P. (2003). Emotional convergence between people over time. *Journal of Personality and Social Psychology, 84*, 1054-1068.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173-1182.

Barrett, L.F., & Barrett, D.J., (2001). An introduction to computerized experience sampling psychology. *Social Science Computer Review, 19*, 175-185.

Barsade, S. G. (2002). The ripple effect: Emotional contagion and its influence on group behavior. *Administrative Science Quarterly, 47*, 644-675.

Bonanno, G., & Keltner D. (2004). The coherence of emotion systems: Comparing "on-line" measures of appraisal and facial expressions, and self-report. *Cognition and Emotion, 18*,

431-444.

Bower, G. H. (1981). Mood and memory. *American Psychologist, 36*, 129-148.

Consolvo, S., & Walker, M. (2003). Using the experience sampling method to evaluate Ubicomp applications**.** *IEEE Pervasive Computing Mobile and Ubiquitous Systems: The Human Experience*, 2, 24-31.

Doherty, R. W. (1997). The Emotional Contagion Scale: A measure of individual differences. *Journal of Nonverbal Behavior, 21*, 131-154.

Evers, C., Fischer, A. H., Rodriguez Mosquera, P. M., & Manstead, A. S. R. (2005). Anger and social appraisal: A "spicy" sex difference? *Emotion, 5*, 258-266.

Feinman, S., & Lewis, M. (1983). Social referencing at ten months: A second-order effect on infants' responses to strangers. *Child Development, 54*, 878-887.

Fischer, A. H., Manstead, A. S. R., & Zaalberg, R. (2003). Social influences on the emotion process. *European Review of Social Psychology, 14*, 171-201.

Fischer, A. H., Rotteveel, M., Evers, C., & Manstead, A. S. R. (2004). Emotional assimilation: How we are influenced by others' emotions. *Cahiers de Psychologie Cognitive*, *22*, 223-245.

Frijda, N. H. (1994). Varieties of affect: Emotions and episodes, moods, and sentiments. In P. Ekman & R. J. Davidson (Eds.), *The nature of emotion* (pp. 59-67). New York: Oxford University Press.

Hatfield, E., Cacioppo, J. T., & Rapson, R. L. (1994). *Emotional contagion*. New York: Cambridge University Press.

Hertenstein, M. J., & Campos, J. J. (2004). The retention effects of an adult's emotional displays on infant behavior. *Child Development, 75*, 595-613.

Hockey, G. R. J., Maule, A. J., Clough, P. J., & Bdzola, L. (2000). Effects of negative mood states on risk in everyday decision-making. *Cognition and Emotion, 14*, 823-855.

Hornik, R., Risenhoover, N., & Gunnar, M. (1987). The effects of maternal positive, neutral, and negative affective communication on infant responses to new toys. *Child Development, 58*, 937-944.

Ilies, R, Wagner, D. T., & Morgeson, F. P. (2007). Explaining affective linkages in teams: Individual differences in susceptibility to contagion and individualism-collectivism. *Journal of Applied Psychology, 92*, 1140-1148.

Isen, A. M. (1984). Toward understanding the role of affect in cognition. In. R. S. Wyer & T. K. Srull (Eds.), *Handbook of social cognition* (Vol 3, pp. 179-236). Hillsdale, NJ: Lawrence Erlbaum Associates.

Joffe, H. (2003). Risk: From perception to social representation. *British Journal of Social Psychology, 42*, 55-73.

Johannes, C. B., Crawford, S.L., Woods, J., Goldstein, R. B., Tran, D., Mehrotra, S., Johnson, K. B., & Santoro, N. (2000). An electronic menstrual cycle calendar: Comparison of data quality with a paper version. *Menopause – The Journal of the North American Menopause Society, 7*, 200-208.

Jones, F., & Fletcher, B. (1996). Taking work home: A study of daily fluctuation in work stressors, effects on moods, and impacts on marital partners. *Journal of Occupational and Organizational Psychology, 69*, 89-106.

Kelly, J. R., & Barsade, S. G. (2001). Moods and emotions in small groups and work teams. *Organizational Behavior and Human Decision Processes, 86*, 99-130.

Keltner, D., Ellsworth, P. C., & Edwards, K. (1993). Beyond simple pessimism: Effects of sadness and anger on social perception. *Journal of Personality and Social Psychology, 64*, 740-752.

Kessler, R. C. (1987). The interplay of research design strategies and data analysis procedures in evaluating the effects of stress on health. In S. V. Kasl & C. L. Cooper (Eds.), *Stress and health: Issues in research methodology* (pp. 113-140). New York: Wiley.

Latané, B., & Darley, J. M. (1968). Group inhibition of bystander intervention in emergencies. *Journal of Personality and Social Psychology, 10*, 215-221.

Lazarus, R. S. (1991). *Emotion and adaptation*. New York: Oxford University Press.

Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, N. (2001). Risk as feelings. *Psychological Bulletin, 127*, 267-286.

Manstead, A. S. R., & Fischer, A. H. (2001). Social appraisal: The social world as object of and influence on appraisal processes. In K. R. Scherer, A. Schorr, & T. Johnston, (Eds.), *Appraisal processes in emotion: Theory, methods, research* (pp. 221-232). New York: Oxford University Press.

Morris, W. N. (1992). A functional analysis of the role of mood in affective systems. *Review of Personality and Social Psychology, 13,* 256-293.

Mumme, D. L., Fernald, A., & Herrera, C. (1996). Infants' responses to facial and vocal emotional signals in a social referencing paradigm. *Child Development, 67*, 3219-3237.

Naqvi, N., Shiv, B., Bechara, A. (2006). The role of emotion in decision making: A cognitive neuroscience perspective. *Current Directions in Psychological Science, 15*, 260-264.

Neumann, R., & Strack, F. (2000). Mood contagion: The automatic transfer of mood between persons. *Journal of Personality and Social Psychology, 79*, 211-223.

Parkinson, B. (2005). Do facial movements express emotions or communicate motives? *Personality and Social Psychology Review*, *9*, 278-311.

Parkinson, B. (2008). Emotions in direct and remote interpersonal interaction: Getting through the spaces between us. *Computers in Human Behavior, 24*, 1510-1529.

Parkinson, B., Simons, G., & Trombello, J. (under review). Facing uncertainty: Video access to partners' expressions in a collaborative quiz-game. Oxford University, UK.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods (2nd edition).* Thousand Oaks, CA: Sage.

Ruys, K. I. & Stapel, D. A. (2008). Emotion elicitor or emotion messenger?: Subliminal exposure to two faces of facial expressions. *Psychological Science, 19,* 593-600.

Schachter, S. (1959). *The psychology of affiliation*. Stanford, CA: Stanford University Press.

Scherer, K. R. (1993). Neuroscience projections to current debates in emotion psychology, *Cognition and Emotion, 7*, 1-41.

Schwarz, N., & Clore, G. L. (1988). How do I feel about it? Informative functions of affective states. In K. Fiedler & J. P. Forgas (Eds.), *Affect, cognition, and social behavior* (pp. 44-62). Toronto: Hogrefe.

Simons, G., & Parkinson, B. (under review). Time-dependent observational and diary methodologies for assessing social referencing and interpersonal emotion regulation. Oxford University, UK.

Sinaceur, M., & Tiedens, L. Z. (2006). Get mad and get more than even: When and why anger expression is effective in negotiations. *Journal of Experimental Social Psychology, 42*, 314-322.

Smith, C. A., & Lazarus, R. S. (1993). Appraisal components, core relational themes, and the emotions. *Cognition and Emotion*, *7*, 233-269.

Sorce, J. F., Emde, R. N., Campos, J., & Klinnert, M. D. (1985). Maternal emotional signaling: Its effect on the visual cliff behavior of 1 year olds. *Developmental Psychology, 21*, 195-200.

Tiedens, L. Z., Sutton, R. I., & Fong, C. T. (2004). Emotional variation in work groups: Causes and performance consequences. In L. Z. Tiedens & C. W. Leach (Eds.), *The social life of emotions* (pp. 164-186). New York: Cambridge University Press.

Totterdell, P. (2000). Catching moods and hitting runs: Mood linkage and subjective performance in professional sports teams. *Journal of Applied Psychology, 85*, 848-859.

Van Kleef, G. A., De Dreu, C. K. W., Pietroni, D., & Manstead, A. S. R. (2006). Power and emotion in negotiation: Power moderates the interpersonal effects of anger and

happiness. *European Journal of Social Psychology, 36*, 557-581.

Walter, F., & Bruch, H. (2008). The positive affect spiral: A dynamic model of the emergence of affective similarity in work groups. *Journal of Organizational Behavior, 29*, 239-261.

Footnotes

1. Some theorists (e.g., Kelly & Barsade, 2001) prefer to restrict the term "emotion contagion" to processes specifically based on mimicry and feedback (i.e. "primitive emotion contagion" in Hatfield et al's account). Our own usage is more inclusive and incorporates other kinds of implicit influence, such as the process that Neumann and Strack (2000) describe as "mood contagion."

2. Full details of the question schedule and response formats are available from the authors on request.

3. Statistics for model fit are based on a more limited number of observations than the fixed effects estimates because those participants who reported only one decision or who rated all reported decisions identically are excluded from these analyses.

4. It may be worth noting that detecting someone else's fear may induce pleasure and detecting someone else's excitement may induce displeasure in certain kinds of antagonistic situation, so the present findings should not necessarily be generalised beyond the close co-operative relationships that were mainly sampled in this study.

Author Note

This research was supported by the Economic and Social Research Council (ESRC), UK as part of the Social Contexts and Responses to Risk (SCARR) network. Thanks go to Christiane Schwald, Kelly King and Irma Kurniawan, who assisted with the running of the study and with data management.

Figure 1

Two processes of interpersonal affect transfer

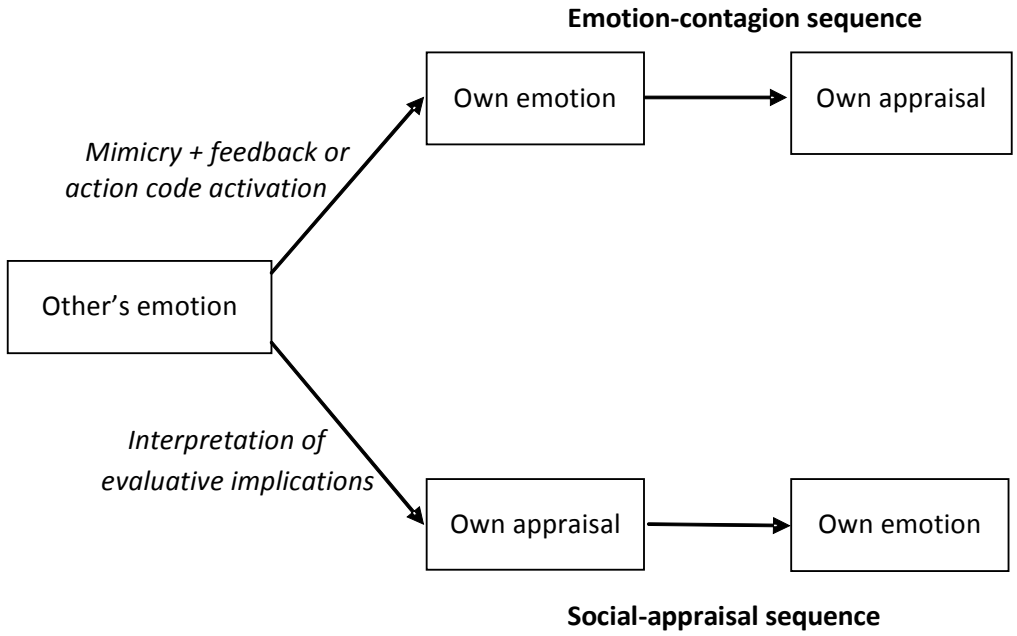

Table 1

Examples of Reported Decisions

Decision category (and frequency)[1]	Decision example	Options 1 and 2 and their potential negative consequences
Financial (16%)	Whether to opt out of a pension scheme	1) Opting out: I will not get any benefits as a result once I retire 2) Staying: I might loose the money I put in the pension scheme once I leave the UK
Emotional/ social (35%)	Whether to confront my friend about her aggressive behavior	1) Distance myself a bit: We may become less close as friends and the issue won't be resolved. 2) Confront her: She'd get angry and our relationship would be sacrificed. She might be hurt.
Physical (9%)	Whether to slim down with the help of pills my friend has also taken	1) Not to take the pills: No negative ones. Probably only that I won't be able to slim down. 2) Start taking the pills: They could have a negative influence on my health.

Note: ([1]) Percentages are based on the categorization of the perceived negative consequences of option 1. In 24% of decisions the perceived negative consequences were categorized as a combination and in 16% of decisions as 'other' or nonexistent.

Table 2

Null Models for Outcome Variables

	-2 *LL		Fixed effect estimate	Fixed effect SE	Fixed effect *t*	Random effects variance
T1 own anxiety	2188					
		Intercept	55.26	2.38	23.22**	85.05**
		Level-1, R				669.53
T2 own anxiety	2193					
		Intercept	46.99	2.44	19.26**	93.23**
		Level-1, R				679.79
T1 own excitement	2170					
		Intercept	53.69	2.74	19.59**	162.55**
		Level-1, R				582.33
T2 own excitement	2173					
		Intercept	56.49	2.45	23.04**	105.34**
		Level-1, R				613.49
Importance	2121					
		Intercept	61.23	2.11	29.02**	72.30**
		Level-1, R				497.22
Risk	2187					
		Intercept	43.11	2.51	17.18**	109.67**
		Level-1, R				653.02
Outcome probability	2171					
		Intercept	58.59	2.39	24.53**	95.51**
		Level-1, R				612.40

Note. In all HLM Tables, LL = Likelihood deviance; SE = Standard Error; only significant or near significant results are reported; ** $p < .001$, *$p<.05$, $^{\dagger}p < .10$.

Table 3

Other Emotions as Single Predictors of Own Emotions

Outcome variable	Predictor	-2 *LL	Δ-2*LL	df	Variance source	Fixed effect estimate	Fixed effect SE	Fixed effect *t*	Random effects variance
T1 own anxiety	T1 other anxiety	2121	67.06**	3					
					Intercept	54.82	2.32	25.54**	113.66**
					Predictor	14.73	1.48	9.95**	24.41
					Level-1, R				471.69
T2 own anxiety	T1 other anxiety	2167	26.35**	3					
					Intercept	46.73	2.42	19.31**	104.81**
					Predictor	9.69	1.47	6.59**	6.68
					Level-1, R				593.85
	T2 other anxiety	2153	40.17**	3					
					Intercept	46.54	2.40	19.39**	113.32**
					Predictor	12.88	2.69	4.79**	83.08**
					Level-1, R				521.67
T1 own excitement	T1 other excitement	2123	47.01**	3					
					Intercept	53.33	2.79	19.11**	196.82**
					Predictor	13.15	1.77	7.43**	2.40
					Level-1, R				454.51
T2 own excitement	T1 other excitement	2139	34.10**	3					
					Intercept	56.33	2.53	22.26**	137.12**
					Predictor	11.51	1.72	6.59**	0.61
					Level-1, R				509.70
	T2 other excitement	2151	22.40**	3					
					Intercept	56.45	2.50	22.56**	127.15**
					Predictor	8.93	2.08	4.30**	3.71
					Level-1, R				542.32

Table 4

Other Anxiety and Excitement as Predictors of Importance and Risk Appraisals

Outcome variable	Predictors	-2 *LL	Δ-2*LL	df	Variance source	Fixed effect estimate	Fixed effect SE	Fixed effect *t*	Random effects variance
Importance	T1 other anxiety	2104	17.18**	3					
					Intercept	61.25	2.08	28.23**	77.42**
					Predictor	7.24	2.17	3.34**	42.84*
					Level-1, R				431.32
	T1 other anxiety +	2077	27.66**	4					
					Intercept	61.21	2.03	30.15**	81.04**
	T1 own anxiety				Predictor	1.54	2.07	0.74	31.48
					Mediator	9.86	1.53	6.44**	6.01
					Level-1, R				379.29
	T2 other anxiety	2106	15.28*	3					
					Intercept	61.07	2.07	29.47**	74.22**
					Predictor	6.93	1.55	4.46**	4.61
					Level-1, R				459.96
	T2 other anxiety + T2 own anxiety	2083	22.86**	4					
					Intercept	61.03	2.05	29.78**	77.51**
					Predictor	2.65	1.09	2.44*	0.28
					Mediator	9.32	1.18	7.88**	5.56
					Level-1, R				411.69
	T2 other excitement	2117	3.64	3					
					Intercept	61.22	2.10	29.09**	72.70**
					Predictor	3.56	1.57	2.27*	3.44
					Level-1, R				486.63
	T2 other excitement + T2 own excitement	2114	2.76	4					
					Intercept	61.23	2.09	29.34**	76.31**
					Predictor	3.65	1.41	2.59*	3.58
					Mediator	0.47	2.44	0.19	53.07
					Level-1, R				449.27

Risk	T1 other anxiety	2178.	8.89*	3					
					Intercept	43.24	2.49	17.37**	111.34**
					Predictor	5.95	1.87	3.18**	8.94
					Level-1, R				622.39
	T1 other anxiety + T1 own anxiety	2130	48.54**	4					
					Intercept	43.10	2.47	17.45**	132.79**
					Predictor	-1.65	1.74	-0.95	23.18
					Mediator	14.59	2.12	6.88**	1.21
					Level-1, R				479.87
	T2 other anxiety	2153	34.07**	3					
					Intercept	43.23	2.46	17.56**	121.81**
					Predictor	12.05	2.42	4.98**	52.08*
					Level-1, R				530.84
	T2 other anxiety + T2 own anxiety	2116	36.80**	4					
					Intercept	43.16	2.43	17.75**	137.24**
					Predictor	6.41	2.79	2.30*	80.02*
					Mediator	12.35	2.22	5.55**	32.65*
					Level-1, R				
	T2 other anxiety + T2 own anxiety	2142	25.10**	4					
					Intercept	58.37	2.37	24.63**	110.71**
					Predictor	-1.71	1.87	-0.92	19.36
					Mediator	10.48	1.64	6.35**	13.78†
					Level-1, R				505.24

Table 5

Appraisals as Predictors of Own Anxiety at T1 and T2

Outcome variable	Predictor	-2 *LL	Δ-2*LL	df	Variance source	Fixed effect estimate	Fixed effect SE	Fixed effect *t*	Random effects variance
T1 own anxiety	Importance	2138	50.61**	3					
					Intercept	55.16	2.35	23.47**	103.14**
					Predictor	12.67	2.13	5.95**	27.98
					Level-1, R				530.97
	Risk	2137	51.74**	3					
					Intercept	55.10	2.34	23.55**	103.92**
					Predictor	13.67	1.62	8.44**	0.60
					Level-1, R				517.76
	Outcome probability	2156	32.13**	3					
					Intercept	55.02	2.36	23.31**	106.32**
					Predictor	8.70	2.77	3.14*	97.74**
					Level-1, R				519.50
T2 own anxiety	Importance	2150	43.37**	3					
					Intercept	46.70	2.43	19.22**	107.73**
					Predictor	10.91	1.64	6.65**	0.47
					Level-1, R				578.05
	Risk	2143	49.98**	3					
					Intercept	49.70	2.46	20.20**	121.29**
					Predictor	13.53	1.58	8.56**	2.85
					Level-1, R				525.74
	Outcome probability	2166	26.98**	3					
					Intercept	46.84	2.46	19.04**	111.74**
					Predictor	9.60	1.98	4.85**	13.41
					Level-1, R				586.09

Table 6

Appraisals as Mediators of Other Anxiety's Effects on Own Anxiety

Effect	Potential mediators	-2 *LL	Δ-2*LL	df	Variance source	Fixed effect estimate	Fixed effect SE	Fixed effect *t*	Random effects variance
T1 other anxiety on T1 own anxiety	Importance	2086	51.87**	4					
					Intercept	54.96	2.33	23.59**	124.10**
					Predictor	12.31	1.34	9.19**	22.57
					Mediator	8.84	1.74	5.08**	6.58
					Level-1, R				412.92
	Risk	2076	44.98**	4					
					Intercept	54.89	2.37	23.16**	134.62**
					Predictor	12.65	1.38	9.17**	18.19
					Mediator	10.99	1.54	7.14**	3.30
					Level-1, R				374.99
	Importance + Risk	2058	63.06**	9					
					Intercept	54.96	2.36	23.29**	138.09**
					Predictor	11.87	1.40	8.49**	21.30†
					Mediator 1	5.01	2.05	2.44*	27.85†
					Mediator 2	8.70	1.89	5.65**	18.10**
					Level-1, R				345.89
T1 other anxiety on T2 own anxiety	Importance	2134	32.49**	4					
					Intercept	46.64	2.42	19.27**	114.73**
					Predictor	7.24	1.40	5.17**	3.98
					Mediator	8.81	1.54	5.72**	2.42
					Level-1, R				534.15
	Risk	2123	43.77**	4					
					Intercept	46.56	2.45	19.00**	129.99**
					Predictor	7.62	1.31	5.82**	1.98
					Mediator	11.96	1.42	8.42**	6.57
					Level-1, R				474.36

	Importance + Risk	2107	59.62**	9					
					Intercept	46.45	2.44	19.04**	131.07**
					Predictor	6.70	1.25	5.35**	2.14
					Mediator 1	4.30	1.99	2.16*	7.34
					Mediator 2	10.15	1.76	5.77**	9.71
					Level-1, R				458.54
T2 other anxiety on T2 own anxiety	Importance	2123	29.58**	4					
					Intercept	46.45	2.39	19.42**	117.65**
					Predictor	9.60	2.59	3.70**	67.99**
					Mediator	8.13	1.65	4.92**	4.80
					Level-1, R				484.20
	Risk	2121	31.46**	4					
					Intercept	46.45	2.44	19.01**	135.15**
					Predictor	8.69	2.52	3.45*	69.83**
					Mediator	10.21	1.38	7.36**	9.70
					Level-1, R				441.28
	Importance + Risk	2103	50.04**	9					
					Intercept	46.31	2.42	19.15**	134.30**
					Predictor	7.13	2.50	2.85*	67.62*
					Mediator 1	5.59	2.14	2.61*	25.34
					Mediator 2	8.31	1.73	4.80**	18.72
					Level-1, R				424.26

Table 7

Emotions as Mediators of Time-Lagged Effects

Time-lagged effect	Potential mediators	-2 *LL	Δ-2*LL	df	Variance source	Fixed effect estimate	Fixed effect SE	Fixed effect *t*	Random effects variance
T1 other anxiety on T2 own anxiety	T1 own anxiety	2095	1.10	4					
					Intercept	46.54	2.47	18.84**	146.82**
					Predictor	1.86	1.77	1.05	6.86
					Mediator	16.31	1.96	8.32**	22.52
					Level-1, R				403.07
	T2 other anxiety	2147	6.17	4					
					Intercept	46.53	2.41	19.31**	118.73**
					Predictor	3.55	1.64	2.15*	8.25
					Mediator	10.35	3.14	3.35*	95.75**
					Level-1, R				503.46
	T1 own anxiety + T2 other anxiety	2076	18.59*	5					
					Intercept	46.45	2.47	18.80**	159.08**
					Predictor	0.24	1.74	0.14	1.08
					Mediator 1	13.47	2.17	6.19**	43.68*
					Mediator 2	5.64	3.00	1.88†	112.37**
					Level-1, R				333.69
T1 other excitement on T2 own excitement	T1 own excitement	2079	59.63**	4					
					Intercept	56.10	2.66	21.09**	191.42**
					Predictor	15.04	2.10	7.16**	27.74
					Mediator	5.18	1.54	3.36**	3.85
					Level-1, R				352.42
	T2 other excitement	2137	1.91	4					
					Intercept	56.33	2.53	22.26**	138.52**
					Predictor	9.20	1.75	5.26**	1.76
					Mediator	3.25	1.77	1.84*	1.70
					Level-1, R				504.92

T1 own excitement + T2 other excitement	2078	0.65	5	Intercept	56.11	2.66	21.09**	191.79**
				Predictor	15.01	2.08	7.22**	26.21
				Mediator 1	3.43	1.75	1.96†	10.03
				Mediator 2	2.15	1.66	1.30	4.68
				Level-1, R				350.48