



Kinship effect on subjective temporal distance of autobiographical memory

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ABSTRACT

Autobiographical memory bias in favor of kin was examined through individuals' subjective temporal estimations of past events. In two studies, participants recalled past pleasant and unpleasant experiences (Study 1) and competitive events in which there was a clear winner and loser (Study 2) and rated their temporal judgments of these experiences. Generically unpleasant events and events potentially resulting in interpersonal conflicts were recalled as occurring in the more distant past when involving kin than involving non-kin. This kin-serving episodic temporal judgment bias may be part of the human cognitive architecture partly responsible for altruistic behaviors toward kin.

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1. Introduction

Kin altruism as activated by conscious awareness or lexical identifications of genetic relatedness has been widely observed. Studies based on real-life observations (Betzig & Turke, 1986; Bowles & Posel, 2005; Hames, 1987), experiments involving hypothetical (Burnstein, Crandall, & Kitayama, 1994; O'Gorman, Wilson, & Miller, 2005; Stewart-Williams, 2007) or real situations (Madsen et al., 2007) have all shown that people are more altruistic when consciously dealing with relatives than when their interacting partners are non-relatives. When helping others, people feel more empathetic (O'Gorman et al., 2005) and subjectively closer (Neyer & Lang, 2003) toward kin than non-kin. Empathetic concern predicts helping behavior only toward kin but not non-kin when such egoistic concern as raising one's own affect state was controlled (Maner & Gailliot, 2007). Apart from altruistic behavior and emotion, information processing about kin vs. non-kin also exhibits a kin-serving bias. For example, people attribute success to relatives more than non-relatives when assessing cooperative experiences (Ackerman, Kenrick, & Schaller, 2007).

What drives kin altruism? Recent research based on inclusive fitness theory (Hamilton, 1964) points to a computational mechanism that, as part of our evolved cognitive architecture, regulates altruism and sexual aversion in response to different degrees of genetic relatedness (DeBruine, 2005; Lieberman, Tooby, & Cosmides, 2007; Tooby & Cosmides, 2005). Following this research direction, we propose an autobiographical memory bias that, in response to

kinship awareness, alters subjective feelings of temporal distance about past events to facilitate future altruism.

Memories of positive and negative past events help one to repeat successes and to avoid mistakes when most life events usually repeat themselves. One such recurring life event in the ancestral past is that genetically related individuals almost always co-reside with one another (Hrdy, 1999; Williams & Williams, 1957) so that people have fewer choices to discontinue interactions with kin than with non-kin (Fehr & Fischbacher, 2003). Mechanisms that reduce the chance for negative interpersonal experiences to be carried over into future interactions will be adaptive for maintaining harmonious relationships among close-knit social groups. A kin-serving bias in autobiographical memory (memory about personal experiences) will serve this adaptive function. Consistent with the general principle that memory of past events is reconstructed to achieve congruence with current life goals (Conway & Pleydell-Pearce, 2000; Ross & Wilson, 2003), there may be a specific kin-related memory bias so that negative experiences are felt temporally more distant to the present when they involve kin rather than non-kin. This reasoning is in part supported by recent data showing semantic memory (memory about facts and concept-based knowledge) as a possible target under the selection pressure for survival (Nairne, Pandeirada, & Thompson, 2008; Nairne, Thompson, & Pandeirada, 2007). We speculate that autobiographical memories favorable of kin may be felt temporarily closer to the present and memories disfavoring kin may temporarily be pushed farther back from the present.

A proximal explanation of our hypothesis derives from considering the characteristics of episodic memory (memory about happenings in particular places at particular times) in the context of the wide-ranging observations of kin altruism. One function of

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episodic memory is to guide appraisals of (Klein, Cosmides, Tooby, & Chance, 2002) and behaviors toward others (Pillemer, 2003). Episodes of personal past that enhance self-esteem are felt closer in time, whereas those that are inconsistent with current life goals are felt more remote, independent of the actual timing of the past events (Ross & Wilson, 2002). Autobiographical memory may also be reconstructed in various ways, including alterations of temporal feelings toward past events (Ross & Wilson, 2002, 2003) to achieve congruence with current life goals (Conway & Pleydell-Pearce, 2000). Because individuals are more altruistic toward kin than non-kin, their autobiographical memory may be altered accordingly to be consistent with their kin altruistic goals and behaviors.

In two studies, we asked participants to recall and rate their temporal feelings toward two past events, one involving a cousin and the other involving a friend. In Study 1, half of the participants recalled pleasant experiences and the other half recalled unpleasant experiences. A kin-related autobiographical memory bias should make negative past experiences feel temporally more distant from the present when they involve kin rather than non-kin. In contrast, positive past experiences may be felt temporally closer to the present when they involve kin rather than non-kin.

Hypothesis 1. Memories of generic negative social experience involving kin are recalled as temporally more distant than those involving non-kin, whereas memories of generic positive social experience involving kin are recalled as temporally closer than those involving non-kin.

In Study 2, we examined temporal estimations of past experiences in winning or losing in a competition. Existing research has shown that positive, pleasant and successful experiences are stored temporally closer to the present (Dickson & Bates, 2005; Ross & Wilson, 2002). However, the positive experience of winning over kin is not expected to render the same effect of temporal closeness because competition may distance and alienate the two competing parties and is thus incongruent with kin altruistic behaviors. The same can be said about losing to kin. In both situations, an autobiographical memory bias in the direction of distancing or pushing back the competitive experience would aid continued affiliation with and altruism toward kin. Thus, memories of past events about winning over or losing to kin should be recalled as temporally more distant than those about winning over or losing to non-kin.

Hypothesis 2. Memories of past events about winning over kin are recalled as temporally more distant than those about winning over non-kin, and memories of past events about losing to kin are recalled as temporally more distant than those regarding a loss to non-kin.

2. Study 1

2.1. Participants and procedures

Forty undergraduates (24 females, average age = 21.16, $SD = 2.72$) participated in the study. They were randomly assigned to one of two experimental conditions: recalling pleasant or unpleasant events. For each condition, participants were asked to recall two events that occurred during their high school years, one involving a cousin and the other involving a friend. This temporal boundary was set to reduce variation in event dates, which would make it difficult to compare subjective temporal feelings toward the events. The order of the two events was random. Taking the pleasant condition as an example, participants were asked to think back to their high school days and recall a pleasant event happening between the participant and a cousin (or a friend) at

that time. Participants were asked to write down the event in a few sentences and to rate “how far away does the event feel to you?” (subjective temporal distance, STD) on a 10-point-scale (from 1 = *feels far away* to 10 = *feels like yesterday*). Thus, a higher number represents closer subjective temporal distance. At the end of the experiment, participants were asked to write down, as accurately as possible, the year and month in which the recalled event happened. This variable was estimated temporal distance (ETD) and was later coded into the number of months between the present time and when the event happened. To control for emotional valence of these recalled events, a separate group of 10 undergraduate students served as judges to evaluate the emotional intensity of the recalled events on a 7-point scale ranging from 1 = *not at all intense* to 7 = *extremely intense*. For each event, the mean rating over the 10 judges served as an estimate of the emotional valence of the event and is hitherto referred to as event emotionality.

2.2. Results and discussion

Events recalled by participants were generically pleasant or unpleasant. These reported pleasant events could be grouped into several categories, including playing and entertaining together (45%), sharing good times (17.5%), chatting (12.5%), receiving gifts (10%), and other (15%). Unpleasant events included being hurt or blamed (27.5%), quarreling (20%), scolding (12.5%), tension in the relationship (15%), upsetting situations (12.5%) and others (12.5%).

In a 2 (event: pleasant vs. unpleasant) \times 2 (person: cousin vs. friend) randomized block design, event was a between-subject condition and person was a within-subject condition. The ANOVA results for ETD showed no main effects or interaction effect. For pleasant events, $M = 43.05$ months ($SD = 35.19$) under the cousin condition and $M = 38.50$ months ($SD = 19.83$) under the friend condition. For unpleasant events, $M = 41.45$ months ($SD = 25.71$) under the cousin condition and $M = 41.50$ months ($SD = 19.23$) under the friend condition. The correlation between ETD and STD was not significant under either condition ($r = -0.07$, $p > 0.05$, under cousin condition; $r = -0.15$, $p > 0.05$, under friend condition).

The 2×2 mixed ANOVA on STD showed a significant event \times person interaction ($F(1, 38) = 4.73$, $p < 0.05$, $\eta^2 = 0.11$). The results are reported in Fig. 1. Unpleasant events involving cousins were felt as more distant than those involving friends, whereas there was no difference in STD between pleasant events involving cousins and friends. There were also significant main effects for event ($F(1, 38) = 4.31$, $p < 0.05$, $\eta^2 = 0.10$) and for person ($F(1, 38) = 6.26$, $p < 0.05$, $\eta^2 = 0.14$), showing that participants felt

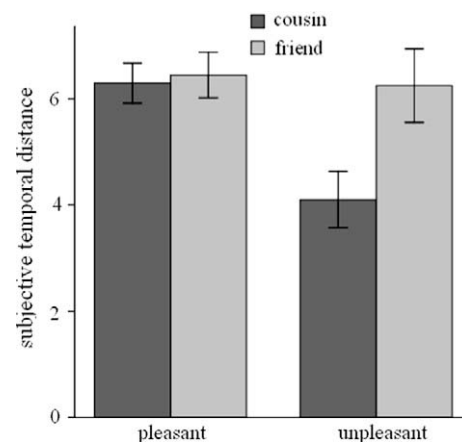


Fig. 1. Means of subjective temporal distance from pleasant vs. unpleasant and cousin vs. friend conditions.

closer to pleasant events than unpleasant events and to events involving friends than cousins.

A mixed ANOVA using event emotionality as the dependent variable yielded no significant interaction between person and event ($F(1, 38) = 0.36, p > .05$) or a significant person effect ($F(1, 38) = 3.17, p > .05$). There was a significant main effect for event ($F(1, 38) = 40.80, p < 0.001$). Across cousins and friends, pleasant events were rated as higher in emotional valence than unpleasant events. These results suggest that recalled events involving cousins and friends have similar emotional valence. ANCOVA controlling event emotionality as the covariate yielded results ($F(1, 37) = 4.52, p < 0.05$ for the person \times event interaction; $F(1, 39) = 5.37, p < 0.05$ for the main effect of persons) that were similar to the ANOVA results reported earlier.

These results partially support our first hypothesis. As hypothesized, unpleasant experiences involving kin were recalled as temporally more distant than those involving non-kin. Contrary to our hypothesis, memories of positive experiences had no temporal difference between kin and non-kin. One possible explanation is that, because positive social interactions with either kin or non-kin facilitate future interactions, there should not be a kin-serving mechanism to pit these two fitness-enhancing past experiences against each other or to favor one over the other. It is also possible that gaining or losing in inclusive fitness may cause an asymmetrical response. It is widely reported in economic psychology that people are more inclined to prevent loss than to promote gains (Kahneman & Tversky, 1979). Study 1 examined generically positive and negative past experiences. In the next study, we used the evolutionarily recurring context of competition to demonstrate that the hypothesized altering of temporal feelings about past personal experiences occurs beyond the surface meaning of what is deemed to be pleasant or unpleasant.

3. Study 2

3.1. Participants and procedures

Thirty-nine undergraduates (19 females, average age = 21.35, $SD = 2.46$) were included; none had participated in Study 1. The procedures and designs were the same as in Study 1 with the exception that the between-subject condition involved winning vs. losing in a competition. Similar to Study 1, the within-subject cousin and friend conditions were randomly ordered among participants. STD and ETD were measured and calculated in the same way as Study 1. Similar to Study 1, a separate group of 10 students rated the emotional valence of each event to provide an event emotionality measure.

3.2. Results and discussion

Competitive events included academic rivalry and competition (32%), athletic competition (27%), playing games (26%) and other (15%). The same 2 (event: winning vs. losing) \times 2 (person: cousin vs. friend) mixed design was used. The ANOVA results on ETD showed neither main effects nor interaction effects. For winning competition, $M = 53.83$ months ($SD = 33.67$) under the cousin condition and $M = 53.39$ months ($SD = 16.12$) under the friend condition. For losing competitions, $M = 58.06$ months ($SD = 36.67$) under the cousin condition and $M = 57.38$ months ($SD = 27.26$) under the friend condition. ETD did not correlate with STD under the cousin ($r = -0.16, p > 0.05$) or friend condition ($r = 0.04, p > 0.05$).

As hypothesized, ANOVA on STD showed only a significant main effect concerning persons ($F(1, 37) = 7.27, p < 0.05, \eta^2 = 0.16$; see Fig. 2), suggesting that competitions with friends were felt closer in temporal distance than competitions with cousins independent

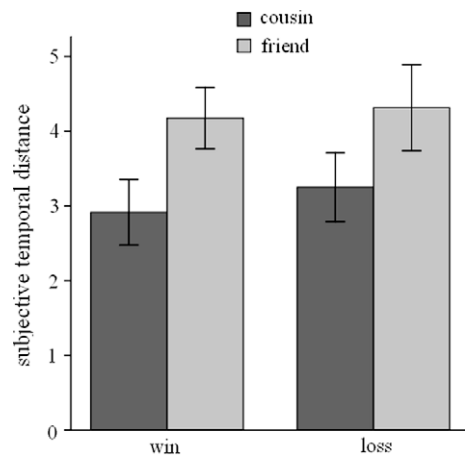


Fig. 2. Means of subjective temporal distance from win vs. loss and cousin vs. friend conditions.

of whether it was a winning or losing competition. ANCOVA controlling event emotionality as the covariate yielded similar results with only the main effect for person on STD being statistically significant ($F(1, 41) = 4.65, p < 0.05$).

These results support our second hypothesis that memories of past competitive winning or losing experience involving kin would be recalled as temporally more distant than winning or losing to non-kin. Unlike generic positive experience, which was equally remembered when involving kin and non-kin, the positive experience of winning over cousins was less remembered than that of winning over friends. This finding suggests that not all positive experiences are stored equally close in temporal distance as compared to negative experiences. Those experiences that are incongruent with kin affiliation, benevolence and altruism, although positive, are remembered as farther away from the present.

4. General discussion

This study reveals a kinship effect on subjective temporal judgment about past personal events. Events that may cause interpersonal tensions and conflicts are recalled as temporally more distant when they involve kin rather than non-kin. These include generically unpleasant events that arouse negative emotions and winning or losing competitions that distance the two competing parties. The present findings expand and may account for the existing observations about kinship effect, including kin-related altruism (e.g. Burnstein et al., 1994), kin-serving attributions (Ackerman et al., 2007), emotional closeness (Neyer & Lang, 2003) and empathy with kin (Maner & Gailliot, 2007), all of which were observed based on conscious or lexical awareness of genetic relatedness.

The findings are consistent with inclusive fitness theory (Hamilton, 1964). According to the theory, any features that enable altruistic allocations in response to genetic relatedness get selected over those that allocate altruism unconditionally. Mental and cognitive evolution is subject to the same inclusive fitness selection pressure (Lieberman et al., 2007). Kinship networks provide a long-lasting and stable context within which to develop human cognitive architecture including episodic memory, subjective temporal sense and mental time travel (Corballis, 2002; Suddendorf & Corballis, 1997; Tulving, 2002). It is adaptive within this kinship context to distort the timelines by which past events occurred so that altruism can be effectively allocated to kin rather than non-kin. Memories of social interactions involving kin should be stored closer or farther away in temporal distance than those involving

non-kin depending on whether the interactions aid or hamper the individual's fitness and inclusive fitness. Flexibility with the human construction of temporal distance may be selected to maximize our fitness and inclusive fitness.

It is worth noting that the kin/non-kin distinction was made only between cousins and friends, whereas finer distinctions among different genetic relatedness may provide a more rigorous test of a kinship effect on temporal judgment (Burnstein et al., 1994). However, because almost all of the participants were the only children in their families (due to China's single child policy), using only cousins makes a kin–non-kin comparison more uniform without the interference of sibling relationships. Another limitation is that people interact with cousins during childhood and may or may not continue the relationship as they grow older. Similarly, people make friends and may continue or discontinue their relationships at different times. These potential differences among the participants were not controlled. Future studies may include ways to control closeness of affiliation and time spent with the target person. Despite these limitations, this study provides an initial test of the kinship effect on a cognitive process and the finding of a kin-serving autobiographical memory bias provides a cognitive explanation for why people behave altruistically toward kin.

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