

Supplemental Material 1

Assessing number order-effects

Given that the participants completed both associations (self = 2 and self = 8) in Experiment 1, we included a follow-up analysis to investigate whether there were any order of learning effects. We regrouped participants as a function of whether they learned associations with the number 2 first (mean age = 26.38 years, s.d. = 5.90, range = 19-40, 27 men) or the number 8 first (mean age = 24.3 years, s.d. = 4.15, range = 18-39, 31 men) irrespective of whether the number was presented as a neutral, ordinal, or a negative number, as our main analysis did not evidence a difference as a function of number type. A 2(Association, within-group: Self, Stranger) x 3(Symbol, within-group: 2, 8, Pseudo) x 2(first block, between group: 2 first, 8 first) mixed ANOVA was applied to main outcome measures of d' and RT.

d' .

For d' , only the main effect of association was significant, $F(1, 87) = 78.84, p < .001$, partial $\eta^2 = .475$. Consistent with our main analysis, d' measures were higher for self-assigned than stranger assigned numbers. The three-way interaction between association, order, and symbol was not significant, $F(1.01, 53.55) = 1.65, p = .199$, partial $\eta^2 = .019$. There were no other significant main nor interaction effects.

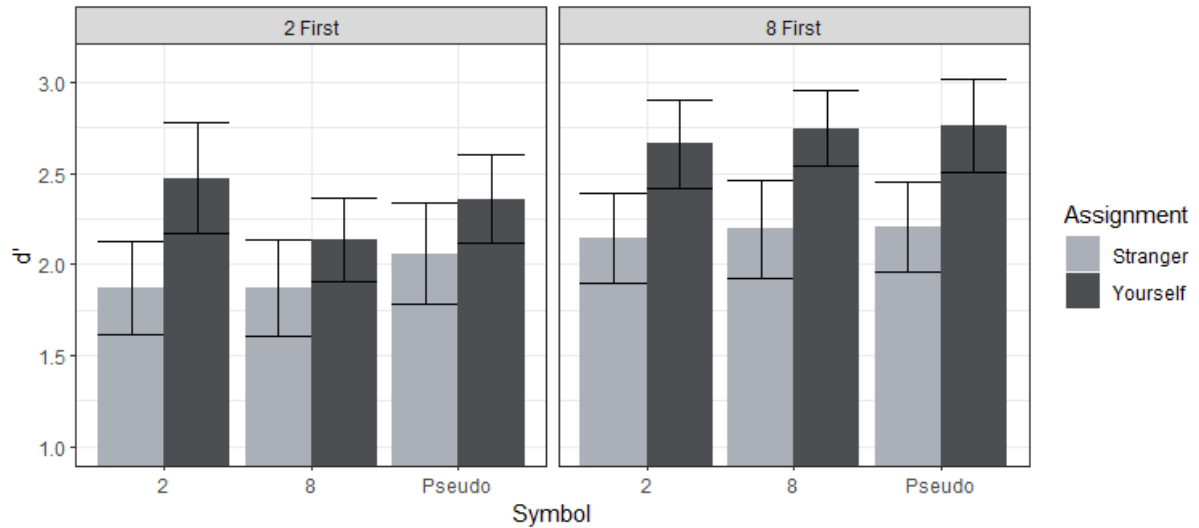


Figure 1A. Plot of d' by relative order of conditions. Error bars are 95% confidence intervals.

Relative RT

Consistent with d' measures, we still get a significant main effect of association $F(1,87) = 98.96, p = .001$, partial $\eta^2 = .532$. For relative RTs the three-way interaction between symbol, association and order was also significant, $F(1.72, 149.73) = 4.56, p = .016$, partial $\eta^2 = .050$. When the number 2 was assigned to the self-first, responses to the stranger-associated 8 were significantly faster than to the stranger-associated pseudo-stimulus (M difference = -1.78, $SE = 0.50, p = .002$). This effect was still significant when followed-up with a paired Wilcoxon Signed rank test, $W = 820, p = .002, n = 45$. No difference between stranger-associated 8 and the stranger-associated pseudo-stimulus emerged when 8 was paired with the self-first, M difference = -.42, $SE = 0.51, p > .999$. For stranger-paired 8, relative RTs were quicker if 2 was paired with the self-first, as compared to when 8 came first, M difference = 1.44, $SE = 0.66, p = .032$. However, this difference was not significant in an independent samples Wilcoxon rank test, $W = 1228, p = .082, n = 90$.

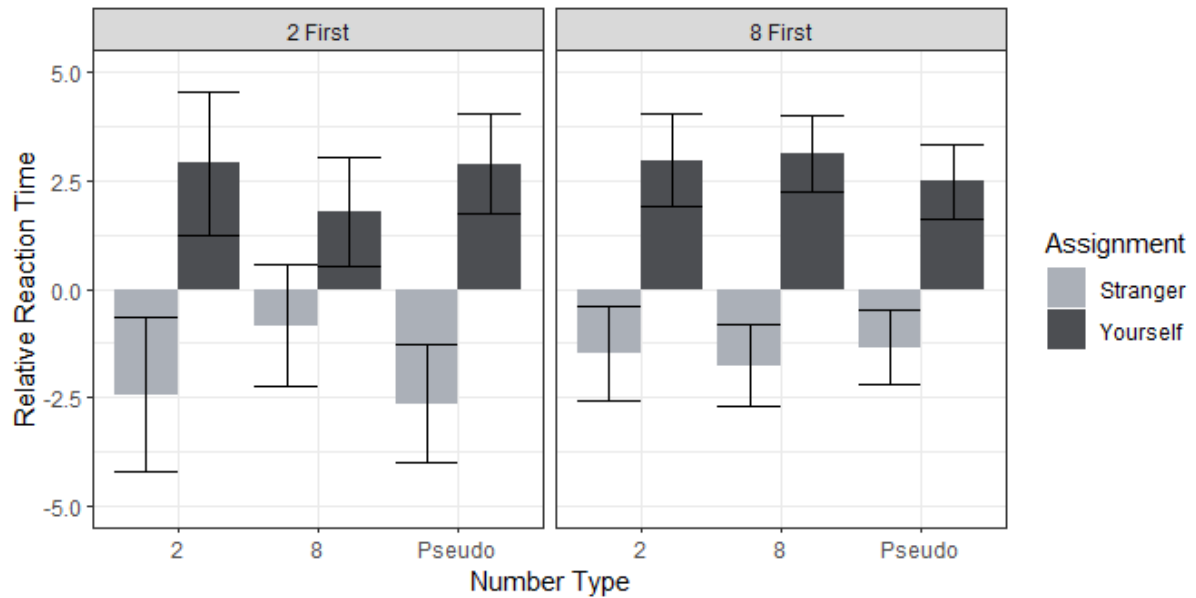


Figure 2A. Plot of relative RT by which block came first. Error bars indicate 95% confidence intervals.

While there was evidence for significant number order effects, the main effect of association was still significant supporting our main hypothesis (1) that there was a significant advantage for self- versus stranger-paired information in d' and relative RT. However, the order effects are interesting with regard to our second hypothesis. There was an advantage in RT to stranger-associated 8 when 8 was associated with the stranger first (i.e., self = 2), versus when 8 was paired with the self-first. Furthermore, if '2' was paired with the self-first, participants were significantly faster on stranger-associated 8 versus the stranger-associated pseudo-symbol.

These findings imply that there may be an advantage for the association of 8 with stranger. However, if the self was paired with 8 first, the salient association self-8 may have destructively interfered with performance on the later block where the stranger-8 pairing was used – effectively cancelling out the default advantage for the 8-stranger pairing. A possible advantage for the stranger-8 pairing is interesting, because it is the converse of what we predicted, and the opposite of the interaction found in Experiment 2 where there was an

advantage for small numbers paired with the stranger compared to large numbers paired with the stranger.

There may have been congruence advantages when participants assigned 8 to the stranger. This might reflect some symbol-specific properties of ‘8’ (e.g. its symmetrical shape or the phonological form associated with it). Alternatively, it may be possible that, by default, participants adopted an ordinal perspective on numbers (2nd being better than 8th). This may have been reversed in Experiment 2, because numeric magnitude was needed to perform the task (e.g., because, given their meaning, it is not intuitive to frame ordinal numbers as larger, or smaller, than a quantity).

To summarize, this analysis indicates that the order of learning the associations in our paradigm may have obscured a true interaction of association and number. Future research should therefore adopt a between-groups design where each stimulus is only assigned to one label. Furthermore, task demands (e.g., whether there is a need to compare numbers to one another) may modulate the direction of symbol-specific advantages. For example, future research may test self-biases on a magnitude comparison task which relies on ordinal numbers (e.g., is 2nd earlier in line than 5th?).

Effects of number Type in Experiment 1. Also, Experiment 1 incidentally found that number type had an effect on d' . Participants were more accurate overall when responding to natural and negative numbers as compared to ordinal numbers. The participants generally exhibited processing advantages for stimuli that signal losses as compared to rewarding or neutral stimuli (e.g. Ashby et al., 2018; Kim et al., 2023; Yechiam & Hochmann, 2013). As negative numbers frequently signal losses in real life, this may explain a processing advantage for negative as compared to other numbers. Similarly, ordinal numbers and negative numbers tend to be acquired later in life than natural numbers (Colomé & Noël, 2012) and may depend on processes dissociable from natural number processing

(Lyons et al., 2016; Rubinstein & Sury, 2011). Speculatively, the absence of consistent differences between natural and negative numbers in Experiment 1 may reflect a trade-off between the lesser familiarity of negative numbers and their representational loss-related attentional advantage.

Supplemental Material 2

Experiment 2: Controlling for order effects. As participants completed both associations (self < 5 and self > 5), it is possible that there may have been an effect of the order in which the association were learnt. To test for this possibility, we conducted a 2 (association, within-group: self, stranger) x 2 (order, between group: small is self-first vs. big is self-first) x 2 (quantity, within-group: smaller than 5, larger than 5) mixed ANOVA. The results are presented in Figure 5A-C. Fifteen participants experienced the pairing small-self first (mean age = 24.60 years, s.d. = 3.52, range = 20-31, 8 men) and 15 participants were first exposed to the big-self pairing (mean age = 26.13 years, s.d. = 3.52, range = 21-36, 6 men) d' .

For d' , including the between-participants factor did not change the pattern of results. The only significant effect was the main effect of association, $F(1, 28) = 68.34, p = .001$, partial $\eta^2 = .700$. There were no other significant main or interaction effects.

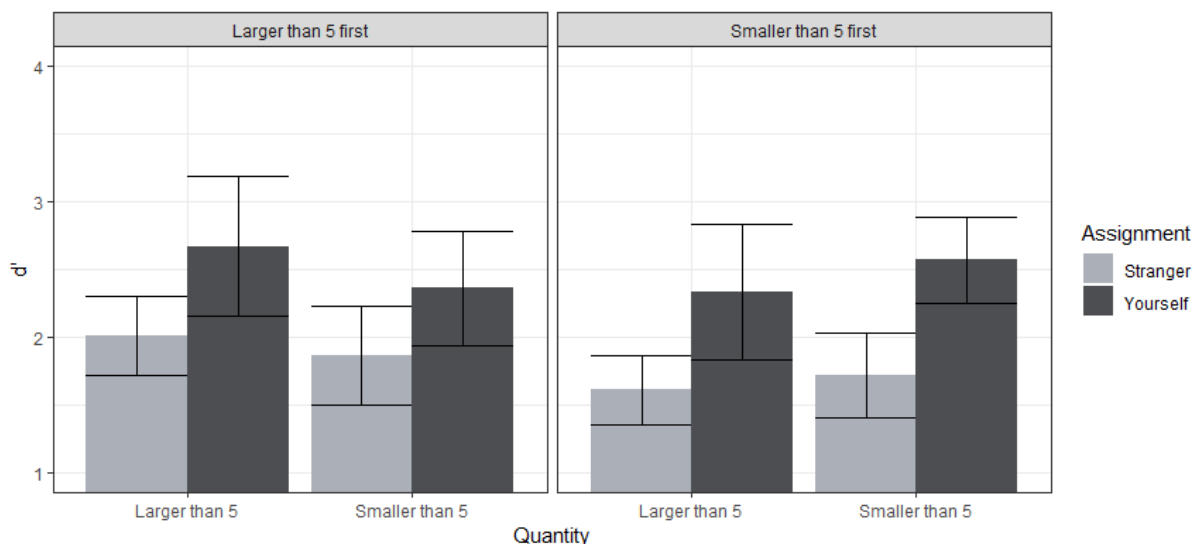


Figure 3A. Plot of d' time by which block came first. Error bars are 95% confidence intervals.

Relative Reaction Time.

For relative RT, there was still a main effect of association, $F(1, 28) = 95.50, p < .001$, partial $\eta^2 = .773$. As in the main analysis, the interaction of symbol and assignment approached significance, $F(1, 28) = 3.85, p = .060$, partial $\eta^2 = .121$. This reflected quicker responses to between small versus large quantities assigned to the stranger, M difference = 2.49, $SE = .924$, $p = .012$. There was no such difference for self-assigned quantities, M difference = .45, $SE = 1.20, p = .709$.

The interaction of association and first block, $F(1, 28) = 4.09, p = .053$, partial $\eta^2 = .122$, also approached significance. However, there was no significant difference in RT to self-assigned stimuli if big numbers were presented first, M difference = -1.03, $SE = 1.64, p = .534$, nor was there such a difference for stranger-associated stimuli, M difference = -.815, $SE = 1.66, p = .628$. There was no three-way interaction of first block, association and quantity, $F(1, 28) = 0.09, p = .761$, partial $\eta^2 = .003$. No other effects were significant.

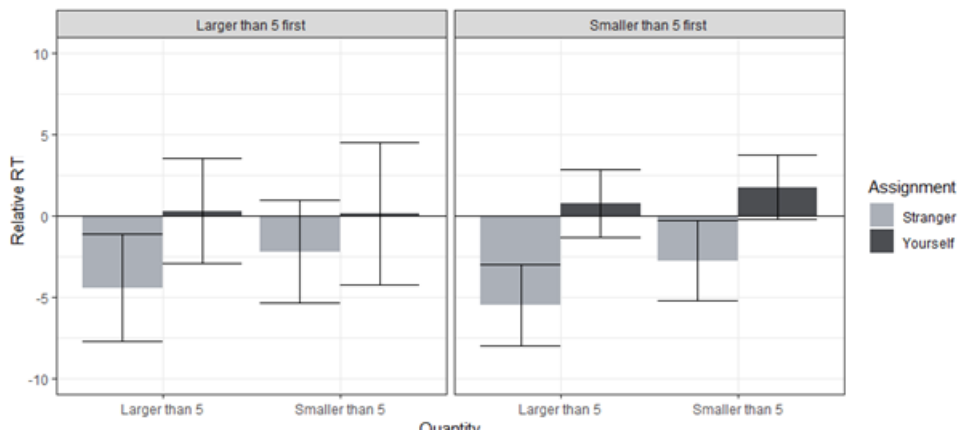
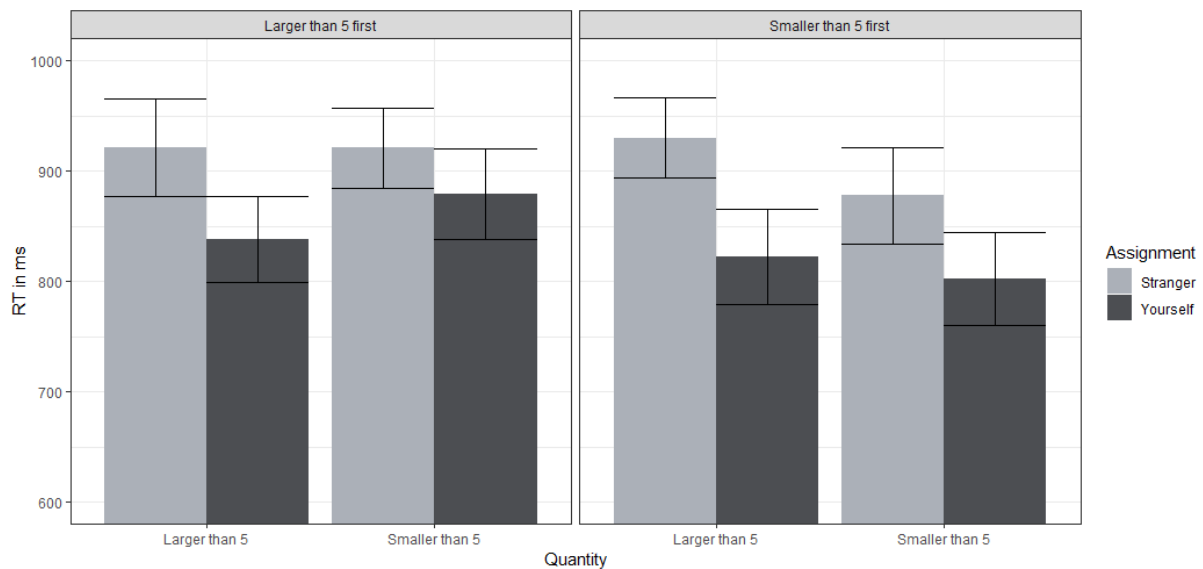


Figure 4A. Plot of relative RT by which block came first. Error bars are 95% confidence intervals.

Absolute Reaction Time.

111 There was a significant main effect of association, $F(1, 28) = 98.33, p < .001$, partial $\eta^2 = .778$.
 112 Furthermore, there was a significant interaction of symbol and association, $F(1, 28) = 4.216, p$
 113 $= .049$, partial $\eta^2 = .131$, reflecting quicker RTs to stranger-paired small numbers versus large
 114 numbers, M difference $= -26.445, SE = 10.15, p = .015$, while there was no such difference for
 115 self-assigned numbers, M difference $= 10.75, SE = 15.59, p = .493$.
 116 There was neither an interaction of association and first block, $F(1, 28) = 3.51, p = .071$,
 117 partial $\eta^2 = .111$, nor a three-way interaction of first block, association and quantity, $F(1, 28)$
 118 $= 0.07, p = .794$, partial $\eta^2 = .002$.



119

120 *Figure 5A.* Absolute RT by which block came first. Error bars are 95% Confidence intervals.

121

122 **Supplemental Material 3**

123 **Descriptive statistics of covariates.**

124 Table 1A. Means (SD) for personal distance and empathy measures in Experiment 1

	Natural	Negative	Ordinal	Total
Personal distress	12.1 (5.43)	15.33 (4.89)	13.06 (5.52)	13.50 (5.40)
Perspective taking	19.03 (4.62)	20.00 (3.90)	19.24 (4.34)	19.43 (4.27)
Fantasy	16.57 (5.36)	19.80 (4.47)	17.83 (4.84)	18.07 (5.03)
Empathic concern	19.40 (4.01)	21.23 (3.81)	19.28 (4.41)	19.98 (4.14)
Self-friend distance	18.99 (14.82)	16.63 (14.98)	20.21 (15.90)	18.59 (15.14)
Self-stranger distance	63.11 (27.60)	68.30 (25.53)	62.23 (27.86)	64.58 (26.84)
Friend-stranger distance	55.46 (25.48)	56.05 (19.26)	54.16 (22.74)	55.20 (22.39)

125

126 Table 2A. Means (*SD*) for personal distance and empathy measures in Experiment 2

	<i>M (SD)</i>
Personal distress	14.13 (5.28)
Perspective taking	19.73 (2.88)
Fantasy	19.77 (4.24)
Empathic concern	20.80 (4.25)
Self-friend distance	18.8 (16.76)
Self-stranger distance	63.91 (24.03)
Friend-stranger distance	55.79 (22.66)

127

Supplemental Material 4.Table 3A. Pearson's correlation between outcome measures and covariates in Experiment 1 for negative numbers. $N = 30$

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. relRT, self 2	-	.20	.43*	-.71**	.06	-.38*	.28	.11	.24	-.23	-.08	.17	-.07	.07	.03	.14	.12	-.08	-.17
2. relRT, self 8		-	.66**	-.12	-.71**	-.42*	.13	.44*	.37*	-.18	-.10	-.19	-.03	.35	.09	-.01	-.03	-.10	.09
3. relRT, self pseudo			-	-.23	-.22	-.61**	.11	.27	.34	-.22	-.11	-.17	-.10	.39*	.18	-.05	.06	-.07	.01
4. relRT, stranger 2				-	.26	.66**	-.06	-.11	.06	.43*	.35	.12	.20	.08	.04	-.05	-.14	.15	.25
5. relRT, stranger 8					-	.47**	-.12	-.44*	-.14	.10	.08	.31	.22	-.08	.18	.26	.14	.18	-.03
6. relRT, stranger pseudo						-	.05	-.19	-.18	.45*	.38*	.18	.20	-.16	-.13	.04	-.11	.21	.19
7. d', self 2							-	.50**	.28	.56**	.64**	.29	-.13	-.21	-.07	.02	-.01	.01	-.01
8. d', self 8								-	.41*	.38*	.32	.12	-.12	-.15	-.21	-.18	-.33	-.15	.08
9. d', self pseudo									-	.25	.31	.58**	-.07	-.03	-.04	.02	-.09	-.15	-.15
10. d', stranger 2										-	.66**	.41*	-.10	-.24	-.03	-.07	-.31	-.05	.11
11. d', stranger 8											-	.41*	-.19	-.09	-.03	-.07	-.23	-.08	-.05
12. d', stranger pseudo												-	.12	-.14	-.09	.21	-.11	-.16	-.21
13. fantasy													-	.12	.25	.68**	-.05	-.31	-.36
14. personal distress														-	.23	-.10	.05	-.15	.02
15. empathic concern															-	.48**	.01	-.14	-.33
16. perspective taking																-	.05	-.21	-.38*
17. dis Self-Fr																	-	.56**	.28
18. dis Self-Str																		-	.72**
19. dis Fr-Str																			-

*. Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed).

relRT = relative RT, dis = distance, Fr = friend, Str = stranger

Table 4A. Pearson's correlation between outcome measures and covariates in Experiment 1 for ordinal numbers. $N = 29$

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. relRT, self 2	-	-.03	.44*	-.71**	-.13	-.33	.15	.34	.24	.10	.17	-.11	-.06	.00	.14	.27	-.29	-.03	.20
2. relRT, self 8		-	.17	.05	-.58**	-.29	-.32	.00	-.06	-.26	-.26	-.01	.14	-.23	-.41*	-.02	.51**	.19	-.11
3. relRT, self pseudo			-	-.32	-.17	-.77**	.05	-.09	.11	-.26	-.06	-.38*	.16	-.28	-.10	.21	-.03	.01	.28
4. relRT, stranger 2				-	.36	.16	-.45*	-.56**	-.34	-.39*	-.37*	-.10	-.06	-.23	-.27	-.34	.11	.12	-.18
5. relRT, stranger 8					-	.26	-.23	-.40*	-.27	.05	.04	-.14	-.23	-.14	-.03	-.16	-.11	-.13	-.05
6. relRT, stranger pseudo						-	-.15	.02	-.39*	.19	.00	.09	-.15	.20	.15	-.02	.06	-.06	-.09
7. d', self 2							-	.45*	.62**	.60**	.78**	.41*	-.40*	.19	.06	-.10	-.35	.00	.09
8. d', self 8								-	.54**	.63**	.42*	.55**	-.12	.29	.01	.12	-.11	-.05	-.03
9. d', self pseudo									-	.55**	.47*	.61**	-.31	.13	-.19	-.08	-.14	-.05	-.08
10. d', stranger 2										-	.71**	.65**	-.41*	.31	-.15	-.15	-.05	-.04	-.13
11. d', stranger 8											-	.43*	-.40*	.20	-.14	-.23	-.20	-.04	.06
12. d', stranger pseudo												-	-.42*	.24	-.16	-.10	.00	.00	-.22
13. fantasy													-	.11	.33	.22	.33	-.09	-.02
14. personal distress														-	.28	.14	.04	-.30	-.17
15. empathic concern															-	.42*	-.12	-.12	.10
16. perspective taking																-	-.14	-.22	.04
17. dis Self-Fr																	-	.06	-.26
18. dis Self-Str																		-	.66**
19. dis Fr-Str																			-

*. Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed).

relRT = relative RT, dis = distance, Fr = friend, Str = stranger

Table 5A. Pearson's correlation between outcome measures and covariates in Experiment 1 for natural numbers. $N = 30$

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. relRT, self 2	-	.02	.64**	-.82**	-.03	-.62**	.38*	-.05	.21	-.23	-.02	.00	.05	.29	-.28	.10	.11	.27	.22
2. relRT, self 8		-	.06	-.09	-.81**	.09	.12	.363*	.33	.02	.02	.18	-.17	.12	-.02	.00	-.08	-.08	.16
3. relRT, self pseudo			-	-.63**	-.18	-.73**	.17	.21	.06	-.11	-.12	-.28	-.03	.07	-.41*	-.08	.25	.38*	.29
4. relRT, stranger 2				-	.22	.56**	-.51**	-.33	-.32	-.09	-.16	-.23	-.01	-.45	.41*	.03	-.16	-.15	-.09
5. relRT, stranger 8					-	.06	-.30	-.60**	-.44*	-.02	-.25	-.34	.20	-.15	.36	.16	.18	.03	-.04
6. relRT, stranger pseudo						-	-.19	-.12	-.11	.01	.07	.05	.07	-.05	.29	-.14	-.25	-.44*	-.15
7. d', self 2							-	.39*	.61**	.25	.61**	.53**	-.15	.27	-.50**	-.05	.04	-.06	-.17
8. d', self 8								-	.50**	.55**	.44*	.47**	-.23	.12	-.42*	-.21	.01	-.16	-.16
9. d', self pseudo									-	.29	.53**	.73**	-.14	.28	-.24	.14	-.14	-.12	-.26
10. d', stranger 2										-	.44*	.33	.02	.10	-.02	.05	.07	-.19	-.16
11. d', stranger 8											-	.60**	-.03	.13	-.21	-.09	-.21	-.41*	-.43*
12. d', stranger pseudo												-	-.26	.20	-.15	-.07	-.03	-.27	-.40*
13. fantasy													-	.38*	.35	.15	.02	-.36	-.09
14. personal distress														-	.00	-.23	-.21	-.29	-.22
15. empathic concern															-	.42*	-.10	-.28	-.05
16. perspective taking																-	.15	.11	.08
17. dis Self-Fr																	-	.13	-.03
18. dis Self-Str																		-	.69**
19. dis Fr-Str																			-

*. Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed).

relRT = relative RT, dis = distance, Fr = friend, Str = stranger

Table 6A. Pearson's correlation between outcome measures and covariates in Experiment 2. N = 30

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. relRT, self small	-	.80**	.31	.38*	.44*	.09	.04	.28	.12	-.25	.10	-.18	.03	-.04	-.23
2. relRT, stranger small		-	.49**	.53**	.19	.17	.25	.44*	.20	-.15	.12	.03	-.16	-.04	-.05
3. relRT, self big			-	.68**	.01	-.24	.13	.02	.23	-.27	.09	.19	-.36*	-.13	.04
4. relRT, stranger big				-	-.07	-.39*	-.16	.06	.09	-.05	-.04	.12	-.19	-.18	-.14
5. d', self small					-	.34	.31	.32	.14	-.29	.17	-.06	.07	.15	-.15
6. d', stranger small						-	.68**	.34	-.08	.01	-.16	-.16	-.03	.36	.21
7. d', self big							-	.43*	.00	.04	.12	.01	-.32	.22	.20
8. d', stranger big								-	.06	.03	.21	-.15	-.13	.39*	.29
9. fantasy									-	-.16	.46*	.54**	.06	.03	.23
10. personal distress										-	.06	.12	.09	.09	.20
11. empathic concern											-	.42*	-.03	.03	.17
12. perspective taking												-	-.02	.05	.15
13. dis Self-Fr													-	.30	.05
14. dis Self-Str														-	.65**
15. dis Fr-Str															-

*Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed).

relRT = relative RT, dis = distance, Fr = friend, Str = stranger