

# Exploring How People Collaborate with a Stranger:

## Analyses of Verbal and Nonverbal Behaviors in Abstract Art Reproduction

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**Abstract.** We explored human-to-human communication when two people collaboratively attempt to reproduce an abstract painting. We examined the effects of friendship (i.e., stranger versus friend) and the task's three phases (i.e., first, second, versus third) on verbal and nonverbal behaviors. In our experiment, pairs of strangers ( $n = 24$ , 12 pairs) and friends ( $n = 24$ , 12 pairs) reproduced three abstract paintings. We measured the duration of their conversations, gestures, and painting behaviors, and the behaviors were labeled based on Traum (1994). The results showed that the amount and the functions of painting differed as a function of friendship. Since friends seemed more likely to focus on the efficient completion of the task, painting functions as a means of communicating images to partners. On the other hand, since strangers attempt to minimize conflicts with their partners, they start painting after discussing what to paint next.

**Keywords:** Collaboration · Friendship · Time-series change · Nonverbal behaviors · Abstract art reproduction

## 1 Introduction

Human-to-human communication is constructed by sharing information by voice, gestures, facial expressions, and so forth (e.g., Mehrabian, 1971). Mutual communication between two agents occurs in every scene of daily life. Especially in the context of human care, the importance of how caregivers or counselors communicate with their clients is increasing due to aging worldwide societies (United Nations, 2012). In such a context, caregivers or counselors often repeatedly do multiple tasks with clients who might express abstract information that is not easily understood through verbal or gestural messages. Even though we use verbal (i.e., contents of utterances), vocal (i.e., intonation), and gestural information

(i.e., body movement) to share ideas with others, such abstract information as images and impressions can be communicated more effectively by drawing on a canvas (Åkerman et al., 2010). In other words, drawing or painting provides additional information to support vocal and gestural information. In the present study, we show that painting with a partner is one useful way for sharing abstract ideas between two agents.

Caregivers or counselors may experience another problem at their first meeting with clients: the difficulty of performing collaborative tasks with a stranger. Even if the first collaboration with the stranger did not go well, conflicts can generally be eliminated by repeatedly doing the task (e.g., Fujiwara et al., 2010). By comparing communication transitions in strangers and acquaintances (or friends) by repeating tasks, we propose appropriate strategies for communicating with new clients at first meetings.

In the present study, we conducted a basic study to obtain clinical implications in caregiver-and-client communication, particularly in sharing abstract impressions or images. Through collaborative reproduction tasks, we explored how two university students communicated impressions and/or images about an abstract painting to each other. We examined the effects of friendship (friends versus strangers) and the task's repetition (i.e., phases: first, second, third) on the participants' verbal (i.e., conversation), gestural, and painting behaviors. By analyzing the contents of conversation and painting, we identified the functional differences in communication between strangers and friends.

## 2 Method

### 2.1 Participants

A total of 48 graduate and undergraduate students from ages 18 to 23 ( $M = 20.52$ ,  $SD = 1.29$ ) participated in the experiment and were assigned to a stranger ( $n = 24$ ; 12 pairs) or friend pair ( $n = 24$ ; 12 pairs). Pairs of strangers obviously did not know each other before the experiment; each of the friend pairs had had close relationships for at least one year. For each group, we set six same-sex and six different-sex pairs.

### 2.2 Stimuli

As experimental stimuli to be presented to the participants, we chose three abstract paintings based on our preliminary experiment in which non-art majors reproduced art and evaluated the task's difficulty. We used three paintings by Cubist painter Georges Braque (1882–1963): *Nude Reclining on the Pedestal* (1931), *Still Life with Guitar* (1935), and *The Window Shade* (1954). In Cubist art, objects are depicted fragmentarily, and images and impressions are very subjective (Dohi, 1984).

### 2.3 Procedure

In the experiment, each participant concentrated for one minute on an abstract painting and had three minutes to reproduce it from memory on A4-sized Kent paper using pastel crayons. Participants memorized the paintings by themselves but reproduced the work completely in collaboration with their partner. The task was repeated three times in which the presentation order of the paintings was counter-balanced. We video-taped the upper torso of all participants and their paintings by three digital video cameras (HDR-XR550V, Sony).

### 2.4 Parameters

From the 9-min recordings per participant, we extracted verbal and nonverbal behaviors using annotation software called ELAN (EUDICO Linguistic Annotator; Lausberg and Sloetjes, 2009). We measured the duration of each conversation, gesture, and painting based on the following criteria:

**Conversation (in Sec).** We measured the duration of both participants' utterances, which were sandwiched between more than 500-ms silent intervals. Such fillers as ums, laughter, and mumblings to themselves were removed.

**Gestures (in Sec).** We extracted both participants' representational gestures that spatially expressed target objects (e.g., McNeill, 1987). We included finger movements on paper as gestures through which they attempted to express an object's shape and/or size.

**Painting (in Sec).** We measured the painting durations, which were sandwiched between more than 500-ms non-painting behaviors. They were defined as the duration that pastel crayons touched and moved on the paper; static (non-moving) states were excluded even if the crayon touched the paper.

### 2.5 Functions of Conversation and Painting

We classified each of the three parameters into one of the following tags (Table 1) according to Traum's grounding theory (1994). That work focused on discourse, but we also applied tags to the painting, in line with Takeoka, Shimojima, and Katagiri (2003).

The second author conducted these classifications, and two volunteers independently reclassified them, confirming the high reliability of these measurements (Cohen's  $\kappa$ s = .625 and .629). Furthermore, we categorized the functions of repair, req repair, req ack, cancel A, and cancel B in the conversations into adjustment functions, because they are used in conversation when the pair participants adjusted or summarized their own ideas.

**Table 1.** List of tags attached to each participant’s conversation and painting behaviors.

Tag	Definition
Init	Initial presentation of information
Cont	Continuation of previous act by same person
Ack	Acknowledgment of partner’s presenting actions and/or information, such as okay, yes, and all right
Repair	Correction of information presented with init
Req repair	Request for a correction to partner
Req ack	Request for an acknowledgment by partner
Cancel A	Rejection of information from partner
Cancel B	Rejection of one’s own suggestion
Ack-init	Acknowledgment occurring with Initiation
Other	Others

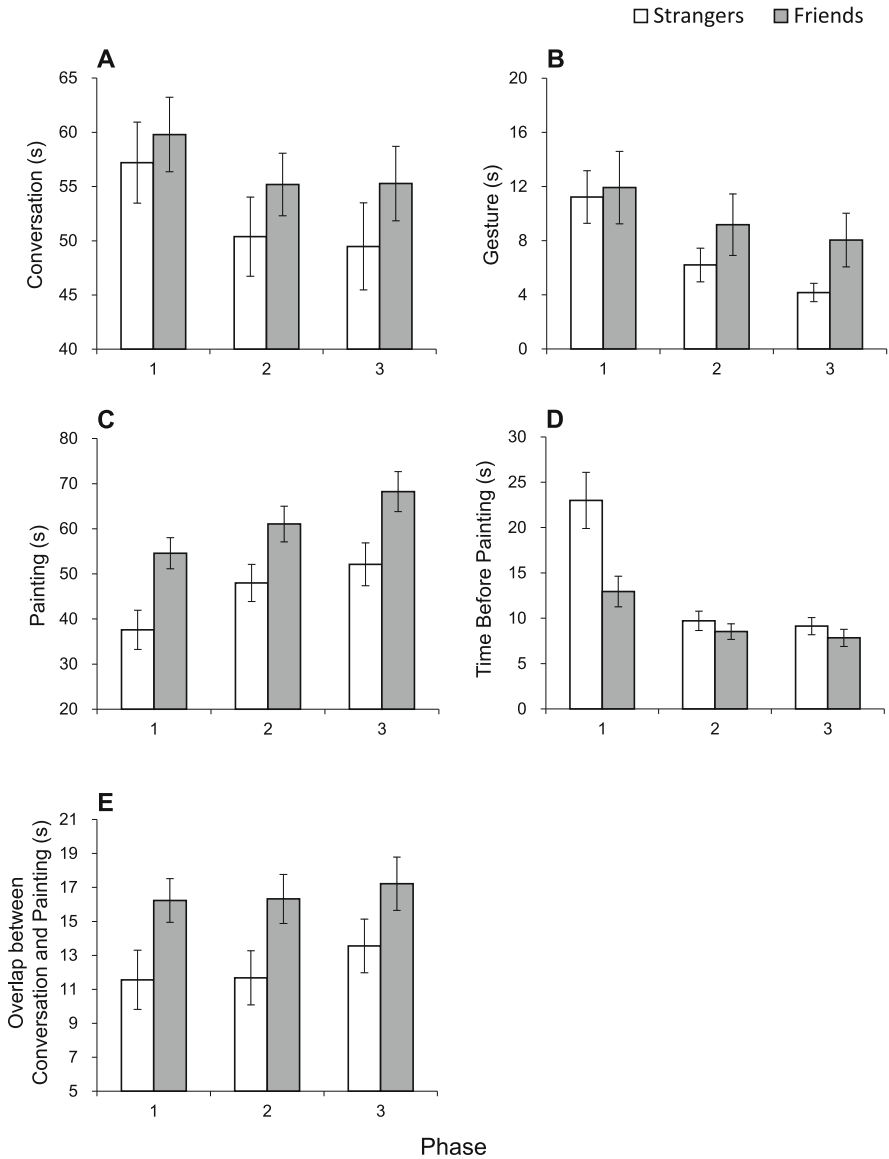
### 3 Results

#### 3.1 Duration of Conversations, Gestures, and Painting

Figure 1 shows the mean duration of each parameter, computed for pairs of strangers and friends in each phase. The time length before painting and the painting duration with conversation were also computed. Friends appear to paint more (Fig. 1C) and talk more while painting (Fig. 1E) than strangers. The conversation (Fig. 1A) and gesture (Fig. 1B) amounts appear to decrease, but painting appears to increase as a function of the task’s phase.

To confirm the above results, we conducted a 2 (friendship as a between-subject factor) × 3 (phase as a within-subject factor) mixed analysis of variance for each parameter. For each conversation and gesture (Fig. 1A, B), the main effect of the phase was significant, but those of friendship and two-way interaction were not significant, conversation:  $F(1, 46) = 0.90, p = .35, \eta_p^2 = .02$  (friendship),  $F(2, 92) = 8.50, p < .001, \eta_p^2 = .16$  (phase),  $F(2, 92) = 0.49, p = .62, \eta_p^2 = .01$  (friendship × phase); gestures:  $F(1, 46) = 1.12, p = .30, \eta_p^2 = .02$  (friendship),  $F(2, 92) = 12.47, p < .001, \eta_p^2 = .21$  (phase),  $F(2, 92) = 1.06, p = .35, \eta_p^2 = .02$  (friendship × phase). Post-hoc *t*-tests with Bonferroni’s correction showed that participants took more time in the first phase than in the second (conversation:  $p = .004$ ; gesture:  $p = .002$ ) and third phases (conversation:  $p = .004$ ; gesture:  $p < .001$ ). The differences between the second and third phases were not significant (conversation:  $p = 1.00$ ; gesture:  $p = .30$ ).

For painting (Fig. 1C), the main effects of friendship and phase were significant but the two-way interaction was not,  $F(1, 46) = 8.96, p = .004, \eta_p^2 = .16$  (friendship),  $F(2, 92) = 15.03, p < .001, \eta_p^2 = .25$  (phase),  $F(2, 92) = 0.32, p = .73, \eta_p^2 = .007$  (friendship × phase). As shown in Fig. 1C, friends spent more time painting than strangers. Post-hoc *t*-tests with Bonferroni’s correction showed



**Fig. 1.** Mean duration computed for each pair of strangers and friends in each phase for conversation (A), gestures (B), painting (C), time length before painting (D), and overlap between conversation and painting (E). Error bars indicate standard errors.

that participants spent less time painting in the first phase than in the second ( $p = .006$ ) and third phases ( $p < .001$ ). No significant difference was found between the second and third phases ( $p = .14$ ).

For the time length before painting (Fig. 1D), the main effect of the phase was significant and those of friendship and two-way interaction approached significance,  $F(1, 22) = 3.91, p = .06, \eta_p^2 = .15$  (friendship),  $F(2, 44) = 10.31, p < .001, \eta_p^2 = .32$  (phase),  $F(2, 44) = 2.38, p = .10, \eta_p^2 = .10$  (friendship  $\times$  phase). For two-way interaction, we conducted post-hoc *t*-tests with Bonferroni's correction and showed that strangers took more time than friends before starting to paint in the first phase ( $p = .06$ ), but no such differences were found in the second ( $p = .56$ ) and third phases ( $p = .52$ ).

For the overlapping duration between conversation and painting (Fig. 1E, i.e., the painting duration while talking with one's partner), the main effect of friendship was significant, but those of phase and two-way interaction were not,  $F(1, 46) = 5.53, p = .02, \eta_p^2 = .11$  (friendship),  $F(2, 92) = 1.33, p = .27, \eta_p^2 = .03$  (phase),  $F(2, 92) = 0.16, p = .85, \eta_p^2 = .003$  (friendship  $\times$  phase). As shown in Fig. 1E, friends talked more while painting than strangers.

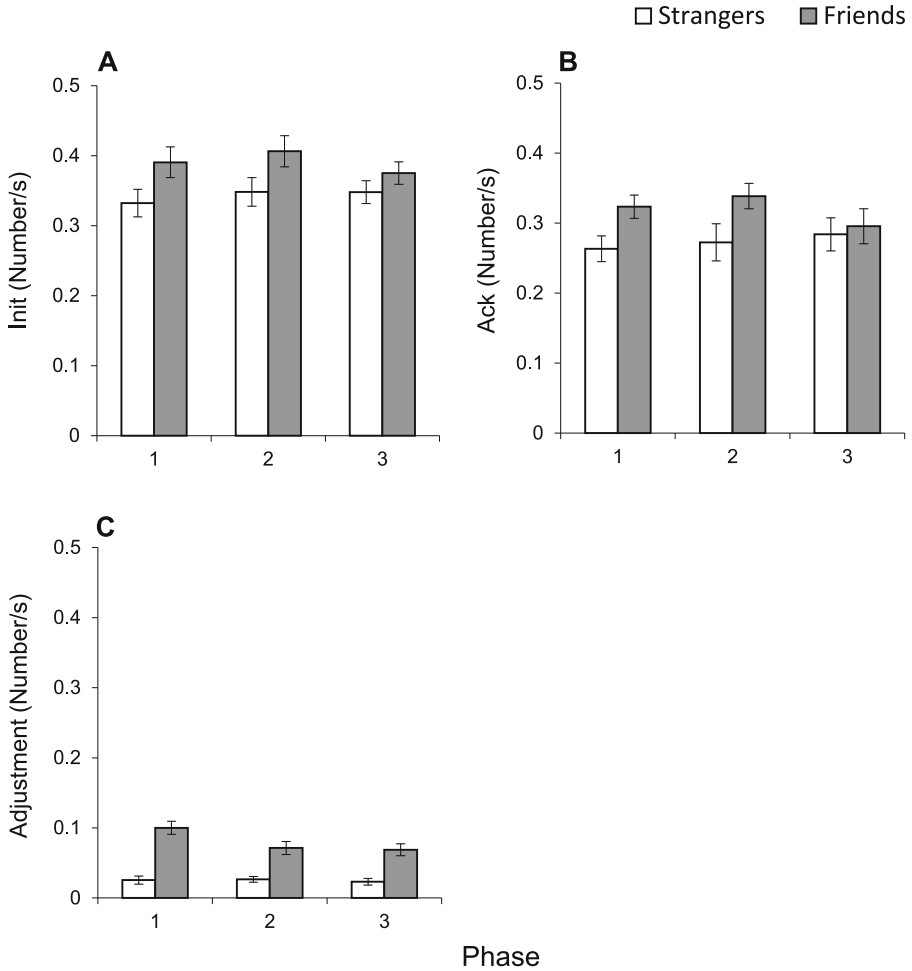
These results indicate that both friends and strangers talked more and made more gestures and painted less in the first than the following two phases. The effects of friendship were shown for painting-related behaviors. Friends painted more while talking than strangers. Friends only took more time before starting to paint in the first phase only, indicating that strangers discussed how to conduct the task before painting. Such a strategy went unused in the subsequent two phases.

### 3.2 Functions in Conversation and Painting

**Conversation.** Figure 2 shows the mean number of init, ack, and the adjustment functions for pairs of strangers and friends in each phase. The values were standardized by the mean duration of the conversations. Friends appear to use each of these functions more than strangers.

We conducted a 2 (friendship as a between-subject factor)  $\times$  3 (phase as a within-subject factor) mixed analysis of variance for each function. For init and ack, the main effect of friendship approached significance, but that of phase and two-way interaction were not significant, init:  $F(1, 46) = 3.75, p = .06, \eta_p^2 = .08$  (friendship),  $F(2, 92) = 1.13, p = .33, \eta_p^2 = .02$  (phase),  $F(2, 92) = 1.09, p = .34, \eta_p^2 = .02$  (friendship  $\times$  phase); ack:  $F(1, 46) = 3.58, p = .06, \eta_p^2 = .07$  (friendship),  $F(2, 92) = 0.47, p = .63, \eta_p^2 = .01$  (phase),  $F(2, 92) = 1.50, p = .23, \eta_p^2 = .03$  (friendship  $\times$  phase). As shown in Figs. 2A and B, friends used init and ack more than strangers.

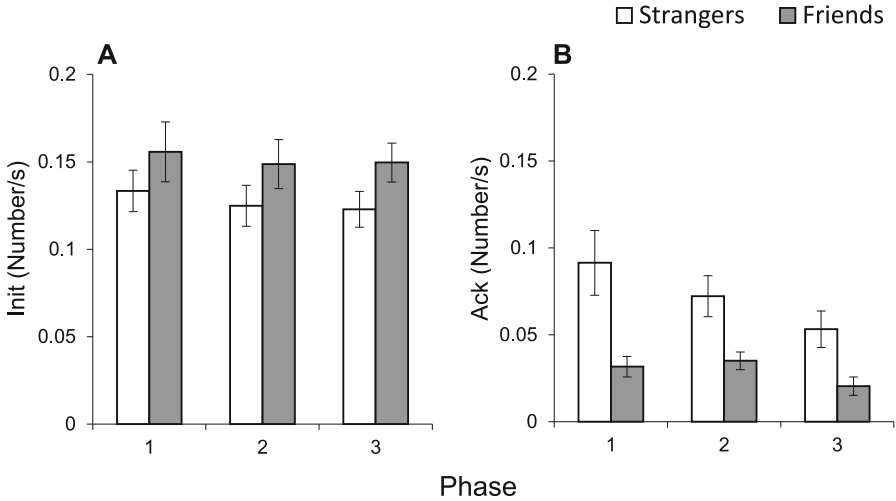
As for the adjustments, we found that the main effects of friendship and phase and the two-way interaction were all significant,  $F(1, 46) = 44.85, p < .001, \eta_p^2 = .49$  (friendship),  $F(2, 92) = 4.94, p = .009, \eta_p^2 = .10$  (phase),  $F(2, 92) = 4.44, p = .01, \eta_p^2 = .09$  (friendship  $\times$  phase). Post-hoc *t*-tests using Bonferroni's correction showed for each phase that friends used adjustment more than strangers ( $ps < .001$ ). These results indicate that friends engaged in more interactions than strangers for presenting new information (i.e., init), acknowledging their partner's ideas (i.e., ack), and adjusting ideas with their partner.



**Fig. 2.** Mean number of init (A), ack (B), and adjustment (C) in conversations. Number was standardized by mean duration of conversations. Error bars indicate standard errors.

**Painting.** Figure 3 shows the mean number of the init and ack functions for strangers and friends in each phase. The values were also standardized by the mean duration of painting. Interestingly, strangers appeared to use ack more but init less than friends.

To confirm this, we conducted a 2 (friendship as a between-subject factor) × 3 (phase as a within-subject factor) mixed analysis of variance for each function. For init, the main effect of friendship approached significance, but that of phase and two-way interaction were not significant,  $F(1, 46) = 3.16, p = .08, \eta_p^2 = .06$  (friendship),  $F(2, 92) = 0.36, p = .70, \eta_p^2 = .008$  (phase),  $F(2, 92) = 0.02, p = .98, \eta_p^2 < .001$  (friendship × phase). As shown in Fig. 3A, friends used init more than strangers.



**Fig. 3.** Mean amount of init (A) and ack (B) in painting. Number was standardized by mean duration of painting. Error bars indicate standard errors.

For ack, we found that the main effects of friendship and phase were significant, but two-way interaction was not significant,  $F(1, 46) = 16.56, p < .001, \eta_p^2 = .27$  (friendship),  $F(2, 92) = 3.40, p = .04, \eta_p^2 = .07$  (phase),  $F(2, 92) = 1.13, p = .33, \eta_p^2 = .02$  (friendship  $\times$  phase). According to Fig. 3B, friends used ack more than strangers. Post-hoc *t*-tests using Bonferroni’s correction showed that the amount of ack was less in the third than the first ( $p = .04$ ) and second phases ( $p = .07$ ). The ack amount did not differ between the first and second phases ( $p = 1.00$ ).

In painting, init means that one member of the pair starts to paint before obtaining acknowledgment from the partner; but ack functions occur generally after the partners discussed the next step in the painting. Thus, the results indicate that friends tended to start painting without discussing what to paint next, but strangers tended to reproduce the painting after such discussion.

## 4 Discussion

In the present study, we found communication differences between friends and strangers in terms of the duration they spent on painting, the overlapping duration of their conversation and painting, and the time they spent before painting. These results indicate that painting-relevant behaviors differed as a function of friendship.

Friends spent more time painting and talked more while painting. Our analyses of communicative functions show that friends used more inits in painting, suggesting that for them, painting presents information in a similar way as conversation and gestures do. The behavior of friends reflects their prior shared



experiences (Chelune et al., 1984). Even if something goes wrong with the task, they might have a strategy to solve the problem, or for most cases they actually share a relationship that permits mistakes by partners. Friends might use fewer cognitive resources to adjust their relationships with their partner, enabling them to focus on the efficient completion of tasks by directly expressing their ideas on paper.

On the other hand, strangers spent more time before starting to paint in the first phase and tended to paint after obtaining their partner's acknowledgment (shown in the ack function in painting), indicating that strangers are unlikely to use painting as a communication medium like friends. For strangers, painting is the output of verbal and/or gestural communication. According to Simons and Peterson (2000), relationship or emotional conflicts are perceptions of interpersonal incompatibility and typically include tension, annoyance, and animosity among group members. Such a relationship conflict is likely to occur when they lack adequate information about other members (Fujiwara et al., 2012). In our collaborative reproduction task, all of the pair members might have different impressions even if they were exposed to the same painting, due to the abstract nature of Cubist art. Even so, conflict among people sharing close relationships is easily solved (Fujiwara et al., 2012). However, strangers might experience such conflicts with their partners because they lack information about each other. To avoid conflicts, they are likely to verbally defend their own impressions in advance and acknowledge the entreaties of their partner by painting.

In conclusion, strangers and friends show different strategies in sharing the abstract information contained in Cubist paintings. Strangers tend to choose a style that emphasizes verbal question and painting answers (i.e., insisting that they remember verbally and start painting based on it) to avoid relationship conflicts. In contrast, friends tend to talk and paint together to efficiently complete tasks. These results suggest several implications for clinical applications. Turn-taking by talking and painting might be useful when a caregiver shares information at first meeting with clients. Future work will investigate whether this can be applied to real contexts.

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