Understanding the Link Between Spatial Distance and Social Distance

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Published in 2011; *Social Psychology, 42(3)*, 185-192.

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Abstract

Why do people use spatial language to describe social relationships? In particular, to what extent do they anchor their thoughts about friendship in terms of space? Three experiments used drawing and estimation tasks to further explore the conceptual structure of social distance using friendship as a manipulation. In all three experiments, participants read short narratives and then drew what they imagined happening during the narrative and estimated passing time. Overall, the results of these exploratory studies suggest that the conceptual structure of friendship is linked to thought about space in terms path drawing. Results are discussed in light of social distance and inter-character interaction.

Keywords: spatial language, spatial reasoning, imagery, drawing, social distance, friendship.

On the Path to Understanding the Link Between Spatial Distance and Social Distance

In any given language there are countless ways to describe spatial relations, including the distance between objects. People routinely use words such as *near, close,* and *by* to describe spatial relations that are proximal, and words such as *far, away*, and *beyond* to describe spatial relations that are distal. They use these same spatial terms to describe other kinds of distance, including distance in social relationships. In communicating about friendship, for instance, they use spatial language to express how they feel close to or far from others. They convey loyalty, concern, and fondness with spatial language that refers to proximity, such as *I'll stand by your side*, *You can lean on me in hard times,* and *We're close friends.* They imply rejection, betrayal, or waning interest with spatial language that refers to distance, as in *He turned his back on me*, *You seem distant lately,* and *We are drifting apart*. Surprisingly, little work has investigated the extent to which people actually conceptualize space when they are thinking about friendship or other social relationships. The goal of our research is to investigate this connection and provide new insights into social distance in the realm of friendship.

Social scientists have often discussed social behavior in terms of physical space. Some of this work has focused on the attitudes that members of one group hold toward members of another group. This is aptly reflected in the term *social distance*, which describe the "distance" that exists between two or more social groups (Bogardus, 1933). Social distance can affect how comfortable one group feels interacting with another group. For example, individuals in some racial groups may be reluctant to interact with individuals in other racial groups. African-Americans tend to feel *close* to other African-Americans, but *far* from people of Asian or European ancestry (Hoxter & Lester, 1995). People of Southeast Asian descent (e.g., Laotian, Vietnamese) feel *close* to members of their own group, but desire *close* ties with Caucasians

(Lee, Templer, Mar, & Canfield, 2002). Social distance can also influence decisions made by social groups, including choices related to selection of educational attainment (Akerlof, 1997) and even the ease with which people learn a second language (Schumann, 1976). It may also refer to the strategic use of language to create distance to exhibit power or control (Shepard, Giles, & Le Poire, 2001), and it can be used to make others feel excluded (Riggins, 1997). Social distance can also refer to physical distance between individuals while they are interacting (Hall, 1966). It can also influence how people reason about space. In one study, Americans with negative attitudes toward Mexicans estimated that Mexican cities were farther south than they actually are, and Americans with negative attitudes toward Canadians estimated that Canadian cities were father north than they actually are (see Kerkman, Stea, Norris, & Rice, 2004).

More generally, this sort of psychological distance has also been studied with regard to how people think about everyday objects and events. For instance, construal level theory (CLT) holds that when thinking about events, people naturally think about temporally distant events (e.g., a birthday party next year) in more abstract ways (e.g., celebrating, eating cake) while temporally proximate events (e.g., a birthday party tomorrow) will be thought of in a more concrete fashion (e.g., dancing with friends, eating chocolate cake) (see Liberman, Sagristano, & Trope, 2002). This type of mapping has also been applied in other domains such as procrastination, politeness, self-control, and representations of the self (McCrea, Liberman, Trope, & Sherman, 2008; Stephan, Liberman, & Trope, 2010; Fujita, Trope, Liberman, & Levin-Sagi, 2006; Wakslak, Nussbaum, Liberman, & Trope, 2008; Trope & Liberman, 2010). More specifically, studies have hinted at a systematic relationship between social distance and physical distance. When asked to either indicate the spatial location of a presented word or verify a word's presence, people respond more quickly when "we" is displayed in a spatially proximate

versus spatially distant location, and when "others" is displayed in a spatially distant versus a spatially proximate location (Bar-Anan, Liberman, Trope, & Algom, 2007). This suggests that social distance and physical distance are conceptually related.

Language theorists have also investigated spatial thinking and social relationships, especially in the realm of metaphor. Spatial metaphors, ubiquitous in all languages and cultures, can help people understand relatively abstract things in terms of more concrete things (see Gibbs, 1994; Lakoff, 1987; Lakoff & Johnson, 1980). For example, people often structure their understanding of time, a relatively abstract domain, in terms of physical space (Boroditsky, 2000; Clark, 1973; Gentner, 2001; McGlone & Harding, 1998; Nunez, Motz, & Teuscher, 2006), This is evident in descriptions of the passing of time, for instance, *June comes before July* and *The meeting goes until noon* (see Matlock, Ramscar, & Boroditsky, 2005). People also think about space when processing information about numbers (Dehaene, 1977; Lakoff & Nunez, 2000), the alphabet (Matlock, Ramscar, & Srinivasan, 2005), and the internet (Maglio & Matlock, 1999). They also talk about friendship in terms of space, as in, *Our friendship has come a long way* and *We are drifting apart* (Kovecses, 1995).

Based on research on social distance, construal theory, and conceptual metaphor, it is difficult to deny that there is a basic connection between the conceptualization of human relationships and that of physical space. Still, many questions remain about what types of relationships and how the connection is realized. Do people conceptualize closer physical space when they are thinking about friends versus strangers? In the current work, we explore this issue using a novel offline approach designed to capture people's implicit sense of distance and friendship while doing a goal-directed spatial activity. Three experiments combine drawing and time estimation to address the hypothesis that spatial reasoning is related to thought about

friendship (for related work, see also Matthews & Matlock, 2007, 2008). In each experiment, participants first read narratives about traveling through a park to deliver a package and passing other figures (strangers or friends) along the way. Then they drew a line on a map of the park to represent the route they would take to accomplish the goal. Next they estimated how long the trip took. If conceptualizing friendship is related to thinking about spatial distance, information about a stranger or friend in the narrative should influence the way people think spatially. In particular, people should draw their routes closer to the figures in the map when those figures are thought to be friends. They may also estimate that the trip will take longer when they are thinking about friendship (versus when they are thinking about strangers) because they may imagine spending more time near the figure or taking more time to interact with the figure.

Experiment 1

Will thinking about friends influence how people complete a spatial task any different from thinking about strangers? After participants read a short narrative about walking past friends or strangers through a park to deliver a package, they drew the route they would follow on a map and made an estimate about how long the trip would take. Included on this map were figures incidentally designated as friends or strangers (in the narrative). If friendship includes thought about physical distance, participants should differ in how they conceptualize space between themselves and strangers or friends. Participants should conceptualize greater distance with strangers than friends, and this should be revealed in drawings and estimates.

Method

Participants. A total of 263 University of California, Merced undergraduate students (159 women; Age M=18.49, SD=1.09) enrolled in either a Cognitive Science or a Psychology course participated for partial course credit.

Stimuli and Procedure. The task appeared on a single page in a booklet that consisted of unrelated experimental materials. Participants read a narrative about delivering a package by going through a park. The narrative mentioned traveling past a figure, who was either a friend or a stranger, in the park. The narrative was written in the second person (*you, your*) to encourage people to imagine making the delivery themselves. Half the participants read a passage that included figures who were strangers: "Imagine you need to deliver a package. Along the way, you walk through a park and pass by different people. You *do not know* these people. They are *strangers*." And half of the participants read a passage that includes figures who were friends: "Imagine you need to deliver a package. Along the way, you walk through a park and pass by different people. You *know* these people well. They are *your friends*." Critically, the narratives did not mention anything about physical distance from the figures. Nor did they mention anything about the possibility of interacting with these figures. The emphasis of the task was on delivering the package. (For the full set of stimuli used in all experiments reported in this paper, see Table 1).

On the page that participants completed, the following instructions appeared below the narrative: "Please draw the route you take through the park using a continuous line". Below the instructions was a map of the park that contained "Start" at the bottom and "Finish" at the top. Between these two points were three horizontal rows of trees and/or fencing with a figure at the end of each tree/fence row (see Figure 1). Maps were constructed so a single path from start to finish served as the only solution to the task. This was intended to force participants to pass by the three friends or strangers mentioned in the narrative. To depict their delivery route through the park, participants drew a continuous line from "Start" to "Finish". After the drawing task, participants provided written estimates of elapsed time: "Using your best guess, how much time

(in minutes) did it take you to walk through the park?" The same procedure and stimuli were used in the other three studies reported in this paper except for mode of transportation (walking, driving a car, riding in a taxi).

Each participant who volunteered for the experiment was randomly assigned to the friend condition or to the stranger condition, and each completed only one task.

Results and Discussion

We analyzed both drawings and time estimates. The same coding and analysis procedures were used in the three other studies reported in this paper.

Drawing data. We coded each drawing by measuring (in millimeters) the absolute distance from the three figures to the closest point in the route drawn. We did this for the bottom, middle, and top figure in the scene. We also averaged these three scores for an overall average distance score.[1]

Overall, participants' routes came closer to friend figures (M=14.54, SD=12.60) than to stranger figures (M=22.76, SD=15.68), $t(261) = -4.68$, $p < .001$, as shown in Figure 2. A closer analysis of the three figures revealed the same trend for bottom (M=13.73, SD=12.93; M=21.14, SD=16.03), middle (M=15.63, SD=16.08; M=24.55, SD=18.19), and top (M=14.25, SD=12.35; M=22.59, SD=16.95) positions on the map, Wilks' λ=.92, p<.001; $F_{bottom}(1,259)=17.66$, p<.001, η^2=.06; $F_{middle}(1,259)=16.90$, p<.001, η^2=.06; and $F_{top}(1,259)=19.26$, p<.001, η^2=.07.[2]

[1] To ensure the coding was reliable in these experiments, a total of 110 path drawings were randomly selected from each condition and coded by a second coder, blind to condition. Interrater reliability was satisfactory for path-figure distances: $r_{bottom}(108)=.99$, p<.001, $r_{middle}(108)=.99$, p<.001, and $r_{top}(108)=.99$, p<.001. Kappa values for coding of path-figure intersections were also satisfactory: .97 (Cohen, 1960).

[2] To provide as much information as possible, we included the analysis with bottom, middle, and top positions segregated. In addition, in some experiments reported in this paper, the top, middle, and bottom figure-path distances were inconsistent and were thus independently analyzed.

For a secondary distance measure, we analyzed whether participants intersected (drew a line through) the figures in the scene. Overall, participants intersected a figure more times when it was a friend (10%) than a stranger (1.5%), $\chi^2(1,N=263)=8.82$, $p=.003$ (see Table 2).

Estimate data. Prior to the analysis, all the time estimates provided by participants were converted to minutes. Participants who imagined walking past friends while delivering a package estimated that it took more time to walk through the park overall ($M=19.43$, $SD=14.19$) than participants who imagined walking past strangers ($M=11.56$, $SD=7.01$), $t(257)=5.67$, $p<.001$ (see Figure 3). Estimates from four participants were removed prior to the analysis because they fell beyond three standard deviations from the respective group mean.

Together, these results indicate that information about social relationships can influence the way people conceptualize physical space. In particular, imagining friends resulted in closer physical distance than did imagining strangers. People came closer to the figures, in some cases even intersecting them, when they were imagined to be friends. Friendship also resulted in longer travel time estimates, suggesting that people may have imagined interacting with the figures when they were friends.

Experiment 2

Here we were interested in further exploring the conceptual link between friendship and space. In Experiment 1, closer lines, more intersecting lines, and longer time travel estimates could have arisen because participants imagined talking to figures when they were friends. What will happen if the participants imagine riding in cars past other figures in cars? Delivering the package in a car should make it especially difficult to imagine interacting with others in cars.

Method

Participants. A total of 324 University of California, Merced undergraduate students (199 women; Age M=20.33, SD=2.72) enrolled in either a Cognitive Science or Psychology course participated for partial course credit.

Stimuli and Procedure. The stimuli were adapted from Experiment 1. The narrative was about driving a car to deliver a package. Figures were friends' or strangers' cars. Participants followed the same procedure as Experiment 1.

Results and Discussion

Drawing data. Overall, participants drew their driving routes closer to friends' cars (M=16.16, SD=14.20) than to strangers' cars (M=22.36, SD=14.44), $t(322) = -3.87$, $p < .001$. Closer analysis showed this was also true in the bottom (M=15.82, SD=15.73; M=21.22, SD=15.46), middle (M=16.97, SD=17.33; M=23.39, SD=16.91), and top (M=15.69, SD=16.94; M=22.47, SD=16.52) positions; Wilks' λ=.94, p<.001; F_{bottom} (1,320)=12.86, p<.001, η^2=.04; F_{middle}(1,320)=14.87, p<.001, η^2=.04; and F_{top}(1,320)=18.30, p<.001, η^2= .05. On average, people intersected figures more often when they believed those figures were friends (23.8%) versus strangers (10.5%), χ^2(1,N=324)=10.30, p=.001 (see Table 2).

Estimate data. Participants who imagined driving past friends estimated that it took more time to drive through the park (M=16.57, SD=13.70) than participants who imagined driving past strangers (M=9.34, SD=7.32), t(318)=6.06, p<.001 (see Figure 3). Estimates from four participants were discarded because they fell three standard deviations from the respective group mean.

These results are consistent with Experiment 1. Once again, they indicate that social relationship information affected the way people drew routes and estimated time. The results

show that even when interacting with the figure would be more difficult (in this case, in a car), participants still came closer to the friend figures.

Experiment 3

This experiment used the approach described in Experiments 1 and 2, but here we were interested in how people might conceptualize distance while conceptualizing a passive type of movement. Here participants imagined delivering a package by riding in a taxi through a park. In this scenario, it would be exceedingly difficult or impossible to interact with a friend along the way. Would our participants still draw paths closer to the friend figures?

Method

Participants. A total of 190 University of California, Merced undergraduate students (115 women; Age M=19.11, SD=1.67) enrolled in either a Cognitive Science or Psychology course participated for partial course credit.

Stimuli and Procedure. The materials were adapted from Experiment 1. The narrative was about riding in a taxi past friends or strangers to deliver a package, and the map included taxis. Participants followed the same procedure as Experiment 1.

Results and Discussion

Drawing data. Overall, participants drew taxi routes closer to friends (M=16.76, SD=14.16) than to strangers (M=21.82, SD=13.22), $t(188) = -2.54$, p=.012. They did this in the bottom (M=15.67, SD=14.40; M=19.69, SD=15.35), middle (M=17.32, SD=15.68; M=23.93, SD=14.83), and top (M=17.29, SD=16.67; M=21.83, SD=15.00) positions; Wilks' λ=.96, p=.048; $F_{bottom}(1,186)=3.05$, p=.08, η^2=.02; $F_{middle}(1,186)=7.78$, p=.006, η^2=.04; and $F_{top}(1,186)= 2.71$, p=.10, η^2=.01. People were also more likely to draw a line through a vehicle when they believed

the vehicle was occupied by a friend (22.1%) than when they believed the vehicle was occupied by a stranger (7.4%), $\chi^2(1,N=190)=8.21$, $p=.004$ (see Table 2).

Estimate data. Participants estimated that it took more time to make the delivery when they believed they were passing friends in the park ($M=17.13$, $SD=14.35$) than strangers ($M=11.21$, $SD=8.11$), $t(184)=3.45$, $p=.001$ (see Figure 3). Data from four participants were removed because they were over three standard deviations from their respective group mean.

The results are consistent with Experiments 1 and 2. People conceptualized closer distance when they believed the figure was a friend (versus a stranger). They did so even when it would be difficult to talk with that individual.

General Discussion

We conducted three experiments to investigate the link between type of social relationship (friend, not friend) and spatial distance. In all studies, participants were primed to think about a friend or a stranger relationship before drawing a line to depict a route they would take through a park to deliver a package. In all cases, social relationship influenced how participants reasoned about physical distance and time.

All three experiments support the notion that social distance, defined here as friendship, and physical distance are conceptually linked. Like previous work by Bar-Anan et al. (2002) suggests, psychological distance (defined here using social group memberships: friend and stranger) and physical distance (defined here using route-figure distance) seem to draw on similar processes where, friends are conceptualized as proximate and strangers as distant. This finding is in-line with current work and complements findings of other studies using CLT as a platform for investigating the link between social distance and physical distance where the effect was elicited in a simple but novel drawing task.

In Experiment 1, participants were encouraged to imagine walking through a park past friends or strangers to deliver a package. When figures were imagined to be friends, they drew a line closer to them and provided higher estimates for travel time. They were also more likely to intersect a figure when it was a friend. In Experiment 2, participants imagined driving a car. In this case, they drew routes closer to other cars, were more likely to intersect other cars, and provided higher time estimates when they believed the other cars belonged to friends (versus strangers). In Experiment 3, participants imagined riding in a taxi. Again, they drew routes closer to other cars, were more likely to intersect other cars, and estimated that it took more time when they believed the other cars belonged to friends.

Using a novel spatial task, this research examined the interplay between social distance and spatial distance, two concepts that have been studied largely by independent groups of researchers. The assumption that "distance" in relationships is analogous or metaphorical appears to be motivated by thought about actual space. These distance and time effects were still present when inter-character interaction was made increasingly more difficult by changing the mode of transportation used in the package delivery task. One could argue that distance effects are driven by people "simulating" interaction with friends but not strangers, but Experiment 2 and Experiment 3 show that even when interaction is nearly impossible, people still draw routes closer to friends (compared to strangers) and estimate longer travel time in the presence of friends (compared to strangers) suggesting the "simulation" hypothesis needs to be readdressed. The current work was preliminary and many intriguing questions remain. Is it possible that differences in figure-path distances are a consequence of heightened emotions or increased desirability? For instance, participants in our studies may have felt more positive about figures they believed were friends, and this alone could have caused them to draw their lines closer to

them. And what about familiarity? Perhaps the mere presence of a figure that implied familiarity (i.e., a friend versus a stranger) could have resulted in shorter figure-path distances. The answers to these questions are clearly still facets of friendship and space, and they deserve close examination. There are also questions around the action of drawing itself. How might participants' attitudes change toward the friend or stranger figure *after* drawing themselves spatially proximate or distal? Can feelings of "closeness" be influenced by simply *drawing* yourself closer to others? Such questions are also worth further exploration. In addition, it would be informative to explore magnitude effects using this approach. Will people draw lines closer to the figures when the figures are close friends than when they are acquaintances? And how might rate of movement affect figure-path distances? In the current set of studies, we examined movement on foot, driving a car, and riding in a car. We cannot yet determine how this variability may have influenced the results. And importantly, how might these results vary across cultures? No doubt this will be a rich area to explore in depth. Future research should also address how reasoning about space in the construal of relationships unfolds in time, including collecting information regarding travel speed. When people pass by a friend, will they slow down, and if so, how much? Future explorations could also include manipulations based on social categories, such as including race, sexual orientation, and gender.

The results reported here are preliminary, but they have implications for research on social distance and the conceptualization of space. They have also set the stage for rich, follow-up research on the link between spatial thinking and social relationships. For now, the hope is that we are one step closer to understanding how people conceptualize friendship and space.

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Acknowledgments

We would like to express our appreciation to Yarrow Dunham, Robert Levine, Daniel Montello, Michael Spivey, Michelle Greenwood, and Michael Romano for insights regarding the findings of this project. We would also like to thank Samantha Bryant, Danielle Birkley, Dawn Felton, Kimberly Williams, Marina Bañuelos and Daniel Titcher for their assistance with coding and data entry.

Table 1. Figures and narratives presented to participants by mode of transportation.

Transportation	Figure	Friend Narrative	Stranger Narrative
Walking		Imagine you need to deliver a package. Along the way, you walk through a park and pass by different people. You know these people well. They are your friends.	Imagine you need to deliver a package. Along the way, you walk through a park and pass by different people. You do not know these people. They are strangers.
Driving		Imagine you need to deliver a package. Along the way, you drive through a park and pass by different people. You know these people well. They are your friends.	Imagine you need to deliver a package. Along the way, you drive through a park and pass by different people. You do not know these people. They are strangers.
Riding		Imagine you need to deliver a package. Along the way, you ride in a taxi through a park and pass by different people. You know these people well. They are your friends.	Imagine you need to deliver a package. Along the way, you ride in a taxi through a park and pass by different people. You do not know these people. They are strangers.

Note: Underlining added here for emphasis only.

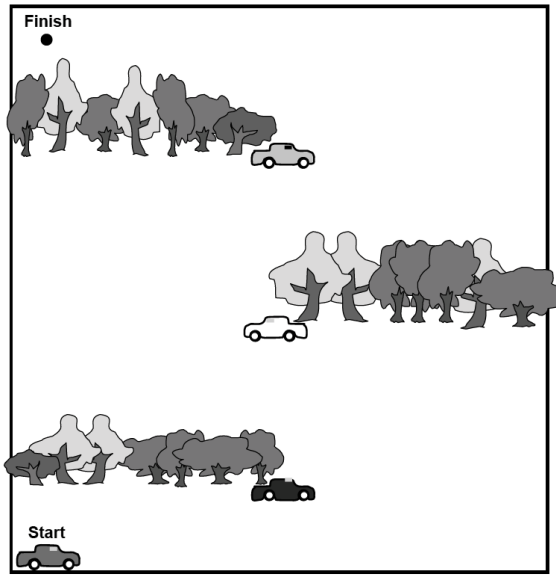
Table 2. Frequencies and Percentages of Route-figure Intersections by Transportation and Relationship

Transportation	Relationship	Intersected		X^2	*p*	N
		Yes	No			
Walk	Friends	13	117	8.82	.003	263
		10%	90%			
	Strangers	2	131			
		1.5%	98.5%			
Car	Friends	34	109	10.30	.001	324
		76.2%	23.8%			
	Strangers	19	162			
		10.5%	89.5%			
Taxi	Friends	21	74	8.21	.004	190
		22.1%	77.9%			
	Strangers	7	88			
		7.4%	92.6%			

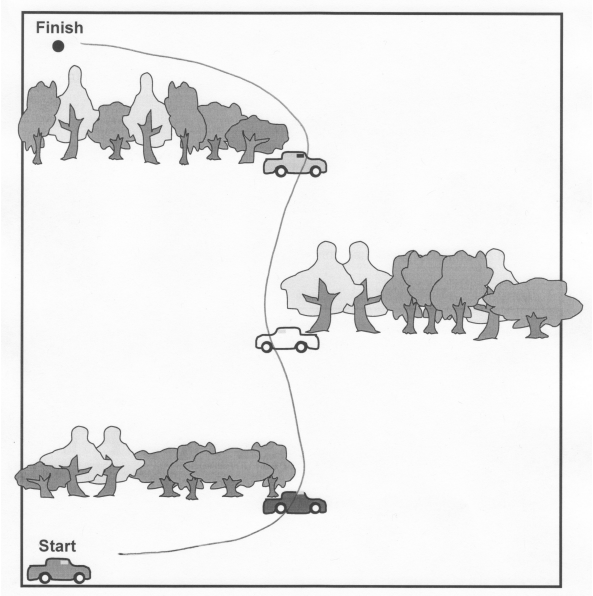
Note: percentages given are within relationship.

Figure 1. Examples: (A) visual stimuli presented to participants in the d*riving* condition. (B) participant drawings from the *friend/driving* condition, (C) participant drawing from the *stranger/riding* condition.

(A)



(B)



(C)

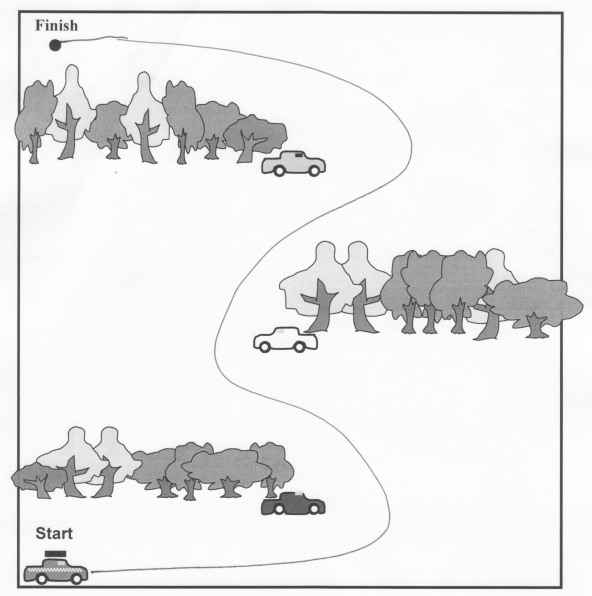


Figure 2. Average path-figure distances (mm) by mode of transportation and narrative type. Path-figure distance differences by friendship narrative type were found in all modes of transportation. Standard errors are represented by the error bars attached to each column.

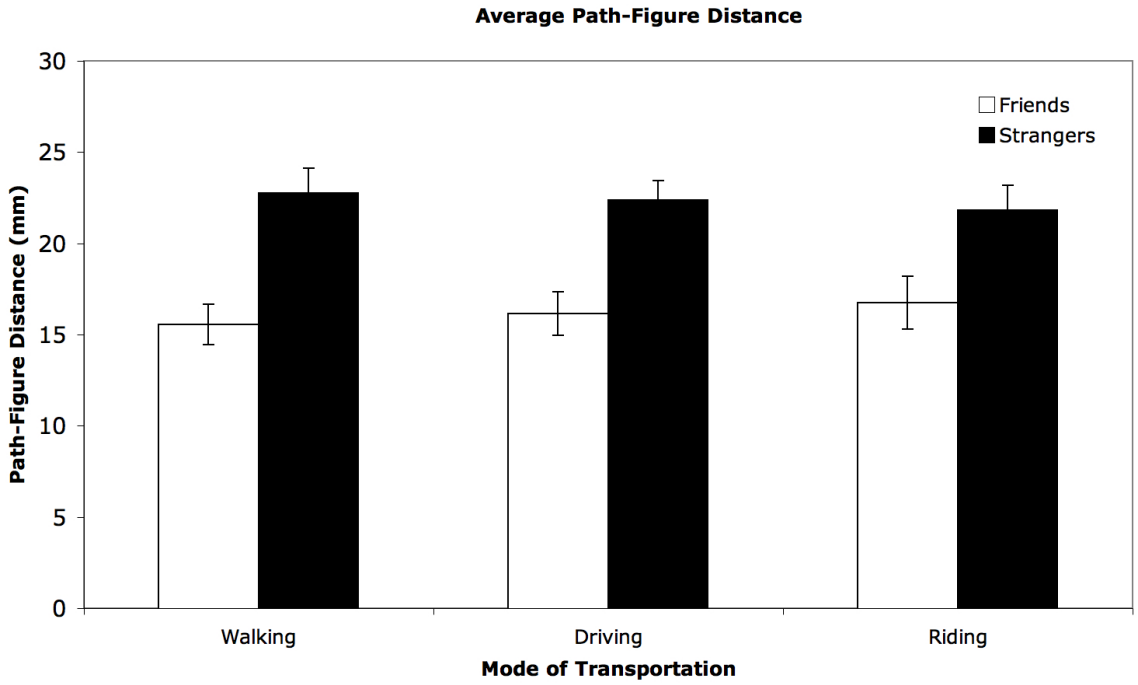


Figure 3. Temporal estimates (min) by mode of transportation and narrative type. Temporal estimate differences by friendship narrative type were found in all modes of transportation. Standard errors are represented by the error bars attached to each column.