Beyond the physical divide of Greek Cypriots and Turkish Cypriots: Social and political variables shape geographical estimates

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Abstract

Many non-geographic factors influence spatial judgments of real-world locations, which implies that spatial representations are not metrically veridical. We investigated the influence of social and political factors in the geopolitical context of Cyprus–an island divided since 1974 into the Turkish Cypriot and Greek Cypriot communities in the north and south, respectively. Participants from each community (249 Greek Cypriots, 322 Turkish Cypriots) indicated their familiarity with 19 towns (town knowledge task), and estimated the locations of those towns (location estimation task) and the straight-line distance between them (distance estimation task). They also rated their attitudes toward the other community. Cypriots underestimated distances and contracted the placement of towns within the other community more so than within their own community. Moreover, those more willing to live together with Cypriots from the other community (i.e., perceiving less social distance) underestimated distances between towns, whereas those less willing to live together overestimated distances. The results support the notion that representations of global-scale environments have multi-faceted origins, which include social factors (e.g., ethnic identity, political attitudes) that are not usually associated with spatial representations.

Keywords: cognitive map; geographic knowledge; spatial judgments; interethnic conflict; ingroup-outgroup bias

Introduction

People acquire knowledge about spatial aspects of the geographical world across their lifespan. Yet much of this knowledge is imperfect. One reason for imperfections in spatial knowledge is that representations of world cities are divided into psychological regions based on a variety of factors that are both spatial (e.g., beliefs about the locations of geographic landmarks such as the poles, continents, and oceans) and non-spatial (e.g., beliefs about mean temperatures; administrative and political borders; political and religious beliefs). Thus, not all geographical knowledge is spatial, either in its origin or in its representation.

In view of this, Friedman, Brown, and their colleagues (Friedman & Brown, 2000a,b; Friedman et al., 2002) developed a *plausible-reasoning framework* to account for how people represent geographical information. In this framework, people coordinate and weigh different kinds of information, both spatial and non-spatial, which they retrieve from their full or partial geographic knowledge. This coordination and weighing results in systematic biases when making spatial judgments. For example, if you have experienced or know about the harsh winters of New York City in contrast to the mild winters of Athens, Greece you might be biased to think that New York City is located further north than Athens, when in fact the two cities are at about the same geographical latitude (see Friedman et al., 2002). The framework, thus, captures the idea that conceptual information can systematically bias geographic estimates.

In the present research, we used the plausible-reasoning framework to investigate how social attitudes associated with ethnic identity, as well as the semantic clustering of regions based on ethnic and political factors, would influence geographic estimates. There is already evidence that the influence of a politically-driven spatial boundary can be moderated by non-spatial factors, such as social attitudes. Carbon and Leder (2005) found that Germans in contemporary reunified Germany were more likely to overestimate the distance between cities when these were on different sides of the former border between East and Western Germany, compared to when the cities were on the same side of the former border. Importantly, this effect held more strongly for individuals who had negative attitudes towards reunification, suggesting that social factors moderated estimates of spatial distance.

In the present study, we examined the joint influence of geographical, and political, and social factors on spatial reasoning in a unique geographical, political, and social environment: Cyprus. Our investigation goes beyond that of Carbon and Leder (2005) by leveraging the unique local context of Cyprus: an island that continues to be divided, with inhabitants of each side belonging to distinct ethnic communities, who have varying levels of contact with the spatial environment and the inhabitants of the "other" side. We had participants from each ethnic community complete spatial judgment tasks involving cities from the two communities. Participants also answered questionnaires about their social and political attitudes. To our knowledge, this study is unique in its examination of spatial judgments by participants in two communities with longstanding and continued interethnic conflict.

The Case of Cyprus

Cyprus is, de facto, a divided island. Since 1974, Cyprus has been divided in two parts, each of which is inhabited, for the most part, by distinct ethnic communities: Greek Cypriots and Turkish Cypriots. Between 1963-1967, intergroup conflicts became increasingly tense; thousands of Turkish Cypriots fled their homes to enclaves with Turkish Cypriot majorities, facing violence from Greek Cypriot paramilitaries that

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sought unification with Greece (*Enosis*). These events were followed by a Greek-backed coup d'état led by Greek Cypriot nationalists on July 15, 1974 and the subsequent military invasion by Turkey on July 20th and August14th 1974, which resulted in the division of the island. During these intergroup conflicts, people from both communities were internally displaced either to the south or north. The geographic south of Cyprus comprises the areas under the de facto sovereign control of the Republic of Cyprus, where most Greek Cypriots reside. The geographic north of the island comprises the areas of the "Turkish Republic of Northern Cyprus" (or "TRNC", legally recognized only by Turkey), where most Turkish Cypriots reside. The two communities are separated by a UN buffer zone. Nicosia remains the last divided capital in the world.

There had been virtually no contact among the members of the two communities until 2003, when crossing restrictions across the UN buffer zone were lifted. There is thus natural variation in Cypriots' experience with the other community: some individuals have never crossed the buffer zone to visit the other side, some have crossed only a few times, others cross and interact with members of the other community regularly. Similarly, the attitudes of Cypriots towards the other community and toward reunification vary. This natural variation in experience and attitudes affords an opportunity to examine biases in judging spatial distance as a function of both spatial and sociopolitical factors.

Study Overview and Predictions

We assessed the geographic knowledge of Greek Cypriots and Turkish Cypriots through a series of tasks. Participants rated their familiarity with a set of towns in Cyprus (*knowledge task*), they estimated the locations of these towns (*location estimation task*), and the distance between pairs of towns (*distance estimation task*). Additionally, they completed self-report questionnaires that assessed their attitudes toward and contact with the other community.

We predicted greater overestimation of distances between locations across the UN buffer zone than within either community. This is in line with previous work demonstrating that physical boundaries increase subjective distance judgments, such that distances of locations are overestimated when they are categorized as belonging to a different hierarchy (Hirtle & Jonides, 1985; McNamara, 1986).

Additionally, consistent with Carbon and Leder (2005), we predicted that the differentiation between the two spatial regions would depend on individual attitudes and experience with the other community. People with more negative attitudes toward the other community should overestimate distances across the UN buffer zone to a greater extent.

Because participants made location and distance judgements about cities in both their own ethnically populated region and in the "other group's" region, we also expected to obtain reference point effects (e.g., Holyoak & Mah 1982, Friedman et al. 2012, Maki 1981). A geographical reference point is usually "close" to where a participant is located. The discriminability of spatial locations in the region of the reference point is generally increased. For example, Holyoak and Mah (1982) showed that Californians rated the east-west distance between two cities close to the Pacific Ocean to be greater than that between cities closer to the Atlantic, even though the distances were actually equal. Similarly, Friedman, Mohr, and Brugger (2012) found that western Canadians estimated the distance between cities in the west to be larger than distances between cities in the east, whereas eastern Canadians did the opposite. Thus, if there are reference point effects in the present study, then in addition to overestimating distances across the border, we expect that the location estimates of cities in participants' "own side" will be more discriminable (larger scale parameter ϕ from the bidimensional regression) than for cities on the "other side".

Method

Participants

We collected data from 263 residents of the geographic south and 342 residents of the geographic north. Since we wanted to focus on ethnic Greek Cypriots and Turkish Cypriots, we excluded from analysis data from residents of other ethnicities or nationalities. The final dataset included 249 Greek Cypriots (159 female, 90 male) and 322 Turkish Cypriots (163 female, 156 male, 3 did not report their gender). The two samples were similar in terms of key demographics. The mean age of Greek Cypriots was 31.00 (SD = 15.64, range: 18-89) and of Turkish Cypriots 33.30 (SD = 13.37, range: 18-84). 9.2% of Greek Cypriots and 8.1% of Turkish Cypriots were internally displaced; 49% of Greek Cypriots and 51.9% of Turkish Cypriots had at least one parent that was internally displaced during the 1963/1974 incidents. Greek Cypriots were recruited from all 5 districts under de facto sovereign control of the Republic of Cyprus. Turkish Cypriots were recruited from 5 of the 6 districts of the "TRNC".

Tasks and Materials

Town Selection We conducted a pilot study to assess the degree of familiarity of Cypriots (N= 120; 86 Greek Cypriot, 34 Turkish Cypriot) with 51 Cyprus towns. We selected 19 towns with relatively high ratings of familiarity in terms of both their name and location. Of these, 1 town spanned both communities (Nicosia), 9 were in the North, and 9 were in the South; all district capitals were included. Since one of the tasks involved estimating the distances between towns, we took into consideration the distances between different types of pairs (North-North, South-South, and North-South pairs[1];

[1]For the 17 towns ultimately used in analyses, North-North (M = 60.69, SD = 34.94 km) and South-South pairs (M = 64.19, SD = 35.37 km,) did not significantly differ in their distances (difference = 3.50 km, 95% family-wise confidence level [-19.43, 26.43], p = .93). South-South and North-South pairs (M = 78.25, SD = 41.03 km) did not differ in their distances (difference = -14.05 km, 95% family-wise confidence level [-34.32, 6.21], p = .23). North-North pairs had numerically shorter distances than North-South pairs, but this was not a significant difference (difference = -17.56 km, 95% family-wise confidence level [-1.01, 36.14], p = .07).

within vs. across community pairs)[2] .

Town Knowledge Task Participants were presented with the name of each town one-by-one on a computer display, and were prompted to rate their knowledge about it. They entered their response in an open text field using a 10-point scale ranging from 0 to 9 (0= absolutely no knowledge to 9= excellent knowledge of the town).

Distance Estimation Task On each trial, a pair of town names appeared on the screen as text and participants had to estimate their aerial distance (Wender et al., 1997), defined as "the straight-line distance, as the crow flies" between the two towns in kilometers, without taking into account the roads connecting the towns or the elevation. There was no time limit to make this judgment.

The order of the trials was randomized and, across participants, the placement of the town names of a given pair (Town 1 – Town 2) was counterbalanced.

For data analyses, we excluded trials with Nicosia, which is located in both communities, consistent with Carbon and Leder's (2005) exclusion of Berlin. We also excluded trials with a town in the south whose reference was ambiguous (there are towns with that name in two districts). Therefore, from the 171 trials completed, we analyzed 136 trials: 36 North-North, 28 South-South, 72 North-South pairs. These categories were re-coded relative to the participant's community, such that a trial involved a judgment about towns "across communities" (the 72 North-South pairs), "within one's own community" or "within the other community".

For each trial, we computed two dependent measures of error: (a) signed error ((estimated - correct distance) / correct distance), which indicates whether the participant overestimated or underestimated the distance between a pair of towns (i.e., positive or negative error), and (b) absolute error (| (estimated - correct distance) | / correct distance), which indicates the deviation from accurate responding without considering the direction of the bias.

Location Estimation Task Participants indicated the location of each town one-by-one. They viewed a blank computer display containing only two visual cues: two vertical lines on the left and right side of the screen indicating the length of the island (East to West). They were asked to imagine the map of the island spanning the length marked by the two vertical lines. On each trial, the name of one of the 19 selected towns appeared in the bottom center of the screen and the participants' mouse cursor was reset to be at the center of the screen. Participants were asked to use their mouse cursor to click on the location they thought the town was at. Each town name appeared once. The order in which each town appeared was identical to the randomized order in which town names appeared for that participant in the Town Knowledge Task. The estimated locations given by the participants were recorded in pixel units.

Spatial distortion on the location estimation task was quantified using bidimensional regression analysis (Friedman & Kohler, 2003). The dependent measures we focus on are: (a) the bidimensional correlation coefficient squared (R^2), which captures the proportion of variance in the spatial configuration of the participant's placement of towns that can be explained by the actual configuration of the towns, and (b) the scale parameter (ϕ), which indicates the magnitude of contraction or expansion. We again excluded from analyses Nicosia and the town whose referent was ambiguous. We computed these parameters for the subsets of towns in the North (N= 9) and the South (N= 8).

Demographics and Social Attitudes Questionnaire We used items from a larger survey developed to examine intergroup relations in Cyprus (Lytras et al., 2011). The questionnaire included basic demographic questions, questions about participants' contact with the other community (7 items on a 5-point Likert scale), their feelings of warmth toward the other community (rated on a Feeling Thermometer scale with 10° increments, where 0° indicated feeling "very cold or negatively" and 100° "very warm or positively"), their perception of cultural distance from the other community (5 items rated on a 5-point scale from the Cultural Distance Index; Babiker et al. 1980), their perception of social distance from the other community (6 items on a 4-point scale from the Bogardus Social Distance Scale; Bogardus 1947), their perception of symbolic and realistic threats toward their own community (5 items rated on a 4-point scale based on Stephan & Stephan 2013), and their attitudes towards solving "the Cyprus problem" (5 items rated on a 10-point scale).

We performed Principal Component Analysis on participants' responses, which revealed the following factors: Factor 1: willingness to live together/social distance, Factor 2: threat concerns/symbolic and realistic threats, Factor 3: quantity of friendly relationships/contact, Factor 4: proximity between the two sides/cultural distance, and Factor 5: intergroup trust. We examined these factors as predictors of biases in spatial estimates.

Procedure

Participants provided informed consent and were offered the option to complete the study in Greek, Turkish, or English. All participants completed the Town Knowledge Tasks first. Next, they completed the Location Estimation and Distance Estimation Tasks in a counterbalanced order across participants. Finally, participants completed the questionnaire on demographics and social attitudes.

Participants were debriefed and compensated for their participation if they participated for monetary compensation. Sessions lasted approximately 45 minutes. The data collection in the North and South was performed by experimenters

[2]For the 17 towns ultimately used in analyses, within community pairs (grouping North-North and South-South trials together; M = 62.22, SD = 34.89) did involve shorter distances overall than across community pairs (i.e., North-South pairs), $t(134) = 2.44$, $p = 0.02$. Given this difference, in the computation of the dependent measures (proportion of signed and absolute error) we scaled for the actual distances between towns.

from that community, who spoke Turkish or Greek, respectively, and typically interacted with participants in the local language variety (Cypriot Turkish or Cypriot Greek, respectively). The computer-based tasks performed on the laptops that were provided to participants by the experimenters. The questionnaire was administered as a hard copy.

Data and code sharing

Our OSF repository for the project (https://osf.io/tgp2y/) includes our study materials (including stimulus lists), Open Sesame scripts, experimental protocols, de-identified raw data files, and analysis code.

Results

Distance Estimation Task

First, we examined whether the presence of a physical boundary (the UN buffer zone) would influence Cypriots' spatial estimates. Specifically, we examined whether biases in distance estimates would differ according to the type of town pair participants made judgments about. We fitted linear mixed effects models using the *lme4* package (Bates et al., 2015) in R, modeling as fixed effects participants' community (Greek Cypriot vs. Turkish Cypriot), the location of the towns relative to the participant (town pair: within the participant's community, within the other community, across communities), and their interaction. Random effects were participant identity and the identity of town pairs in a given trial (i.e., Town 1 - Town 2, without regard to their order in the left - right arrangement on the screen). Through model comparison, which involved assessing the conditional R^2 and Akaike's Information Criterion (AIC), we selected the models with fixed effects for town pair and participant community (without their interaction) as the best fit to the data[3].

Participants underestimated distances between pairs of towns within the other community and across communities, compared to towns within their own community (see negative sign of signed error in Table 1). As shown in Table 2, pair type was a significant predictor of signed error in estimated distances. Post-hoc contrasts revealed that signed errors differed significantly for town pairs within one's own community and those within the other community (unstandardized regression coefficient B= .15, SE = .02, z = 7.51, p <.0001). The participants' community did not significantly influence the signed error of their distance estimates (see Table 2), although Turkish Cypriots numerically underestimated distances (M = -.11, SD = .54) more than Greek Cypriots (M = -.08, SD = .54).

[3]The R syntax for these models was: lmer(error ~1 + pair_type + (1+ pair_type |participantID) + (1 |townpairID))

Table 1: Means (and SDs) of Percentage of Signed Error (in km) across the 2 communities and 3 types of town pairs in the Distance Estimation Task.

Community	Within Own	Within Other	Across
Greek Cypriots	.02 (.52)	-.17 (.57)	-.08 (.53)
Turkish Cypriots	-.03 (.52)	-.20 (.56)	-.12 (.54)
Total	-.01 (.52)	-.18 (.56)	-.10 (.53)

Table 2: Analysis of Deviance Table (Type III Wald chi square tests) for the two linear mixed models with (1) signed error and (2) absolute error in the distance estimation task as the dependent variables.

	Signed Error			Absolute Error	
Fixed Effects	R^2 = 55.83			R^2 = 18.30	
	AIC = 69742.2			AIC= 21397.7	
	df	χ^2	p	χ^2	p
Intercept	1	3.17	.07	4698.9832	<.001
Community (GC vs TC)	1	3.42	.06	.07	.79
Town Pair (across, within own, within other)	2	**56.35**	**<.001**	**104.41**	**<.001**

Table 3: Means (and SDs) of Percentage of Absolute Error (in km) across the 2 communities and the 3 types of town pairs in the Distance Estimation Task.

Community	Within Own	Within Other	Across
Greek Cypriots	.41 (.31)	.50 (.31)	.43 (.30)
Turkish Cypriots	.41 (.31)	.50 (.30)	.45 (.30)
Total	.41 (.31)	.50 (.30)	.44 (.30)

The pattern of results for absolute error was similar (see Table 3). Participants made the smallest absolute error when estimating distances between town pairs within their own community, larger absolute errors when estimating the distances of town pairs across communities, and the largest error for distances of pairs within the other community. The type of town pair was a significant predictor of absolute error (see Table 2). Post-hoc contrasts for the effect of the type of town pair showed that all pair types differed significantly from one another (across vs. within one's own: unstandardized regression coefficient B= .03, SE = .01, z = 3.00, p <.01; across vs. within other: B= - .06, SE = .01, z = -5.19, p <.0001; within one's own vs. other: B= - .09, SE = .01, z = -10.14, p<.0001). As with signed error, the participant's community did not have a significant effect on the absolute error of distance estimates. Importantly, entering the town knowledge ratings (specifically, the lowest rating of a town in a given pair) as a covariate did not eliminate the effect of town pair on either signed or absolute error.

Location Estimation Task

Performance on the location estimation task provided converging findings, with Cypriots exhibiting more distortion for towns located on the other side than in their own. As illustrated in Figure 1, Greek Cypriots distorted the location of towns in the other community (in the North) more so than their own (in the South), by contracting their relative locations. Similarly, Turkish Cypriots exhibited distortion and contraction of towns in the other community (in the South vs. the North). This is illustrated in the means of both R^2, capturing distortion (see Table 4), and the scale parameter ϕ, capturing contraction (see Table 5).

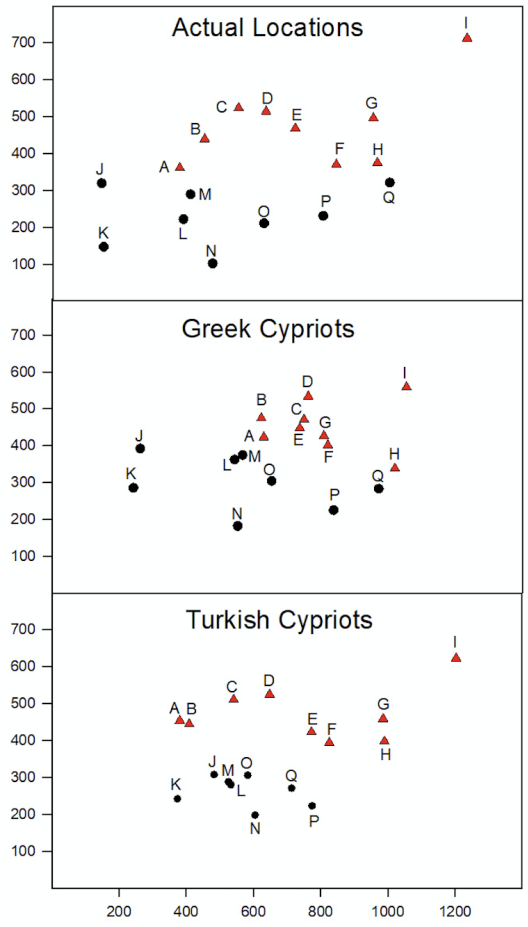

Figure 1: The 17 towns (indexed A - Q) used for analyses in the Knowledge, Location, and Distance Estimation tasks. Towns in the Greek Cypriot community are in blue and in the Turkish Cypriot community in red. Top panel shows actual locations, bottom two panels show the estimated locations for the 9 north and 8 south Cyprus cities by Greek Cypriots and Turkish Cypriots in the location estimation task. A = Lefka, B = Morphou, C = Lapithos, D = Kyrenia, E = Kythrea, F = Lysi, G = Trikomo, H = Famagusta, I = Rizokarpaso, J = Polis, K = Pafos, L = Platres, M = Kakopetria, N = Limassol, O = Lefkara, P = Larnaca, Q = Paralimni.

Table 4: Means (and SDs) of the bidimensional regression coefficient squared (R^2) across the 2 communities and 2 subsets of towns (own vs. other) in the Location Estimation Task.

Community	Own	Other
Greek Cypriots	.749 (.243)	.403 (.258)
Turkish Cypriots	.795 (.173)	.352 (.293)

Table 5: Means (and SDs) of the scale parameter (ϕ) across the 2 communities and 2 subsets of towns (own vs. other) in the Location Estimation Task.

Community	Own	Other
Greek Cypriots	.863 (.297)	.534 (.290)
Turkish Cypriots	.974 (.250)	.475 (.316)

In linear mixed effects regressions[4], there was a significant interaction between participants' community and the subset of towns we considered (towns in the South vs. North) for both R^2 ($\chi^2(1)$= 1136.89, p <.0001) and ϕ ($\chi^2(1)$ = 933.40, p <.0001). The location estimates of Greek Cypriots and Turkish Cypriots were comparable; there was no effect of community (for R^2: $\chi^2(1)$= .02, p=.88; for ϕ: $\chi^2(1)$= 1.67, p=.20). Participants' estimates for towns in the South were more distorted and contracted than towns in the North, as indicated by a main effect of the subset of towns (for R^2: $\chi^2(1)$= 17.23, p <.0001; for ϕ: $\chi^2(1)$= 39.64, p <.0001).

The Effect of Attitudes on Spatial Estimates

To examine the extent to which attitudes toward the other community biased spatial estimates, we entered the factors that emerged from applying PCA analyses on the questionnaire data as covariates to the linear mixed effects models evaluated in the previous sections. We will focus on Factor 1, which broadly captures social distance: the responders' willingness to live together with the other community.

As shown in Figure 2, Cypriots who were more willing to live together with people from the other community (higher values in Factor 1) perceived town pairs as being closer than they actually were (indicated by the negative values for the percentage of signed error). In contrast, Cypriots who were less willing to live together overestimated distances between towns (indicated by the positive values of signed error). Factor 1 was a significant predictor of the signed error of distance estimation (B = -0.044, SE = 0.014, t = -3.230, p = 0.0013).

This factor was not a significant predictor of absolute error or of the measures obtained from the location estimation task (R^2 or ϕ). None of the other factors emerging from PCA were significant predictors of any of these dependent measures.

[4]These models included fixed effects for participants' community, the subset of towns (towns in the South vs. North), and the interaction of these factors, and participants as a random effect. The R syntax for these models was: lmer(BDR_parameter ~community * subset_of_towns + (1|participantID))

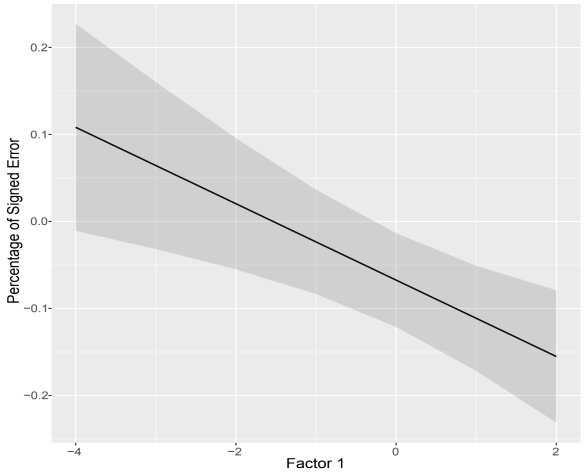

Figure 2: Factor 1, emerging from PCA of the social attitude questionnaires and capturing willingness to live together/social distance, is a significant predictor of the percentage of signed error in the Distance Estimation task.

Summary of Results

Cypriots exhibited systematic distortions in their geographic estimates. In the distance estimation task, Cypriots made smaller errors (signed and absolute error) when estimating town distances in their own community than in the other community. Cypriots *underestimated* distances in the other community, and this was not due to their familiarity with the towns. Similarly, in the location estimation task, Cypriots exhibited more distortion when estimating the locations of towns in the other community, contracting the relative location of towns. In both tasks, performance was similar for Greek Cypriots and Turkish Cypriots. Cypriots' attitudes toward the other community influenced judgments in the distance estimation task. Those who perceived less social distance from the other community underestimated the distances of towns more, while those with perceived greater social distance overestimated distances more.

Discussion

We documented that Cypriots' spatial judgments were influenced by the physical and psychological barriers associated with the UN buffer zone, as well as by their social attitudes toward the other community. The presence of the physical boundary influenced some aspects of spatial performance: Cypriots made larger absolute errors when estimating the distances between towns across the buffer zone than between towns within their own community. This is consistent with previous work demonstrating that physical boundaries increase subjective distance judgments (Hirtle & Jonides, 1985; McNamara, 1986; Carbon & Leder, 2005). However, the presence of the physical boundary did not influence the direction of the bias in distance estimates (signed error): distances between towns across communities were not overestimated compared to distances within a community (cf. Carbon & Leder, 2005).

Additionally, we found that Cypriots *underestimated* distances of towns within the other community compared to distances within their own community. They also distorted and contracted the estimates of locations in the other community more so than in their own. This finding is consistent with the reference point effect found by Maki (1981) and others (e.g. Friedman et al., 2012; McNamara, 1986). This finding is also reminiscent of the *outgroup homogeneity effect* (Quattrone & Jones 1980 and many others): applied to spatial reasoning, locations in the outgroup's region (rather than characteristics of the outgroup) are perceived as more similar / closer to one another compared to locations in the ingroup's region. The current data do not distinguish between the two possibilities– whether a reference point or an outgroup homogeneity effect is at play. In either case, distance underestimation in the other community was not due to lack of familiarity, as this was ruled out in analyses that took town knowledge into account.

Social attitudes toward the other community contributed to spatial biases, at least in the distance estimation task. Specifically, the "social distance" that Cypriots felt towards the other community moderated the bias in their distance estimates. Those more willing to live together with the other community underestimated distances more. And those less willing to live together overestimated distances more. This latter finding partially replicates Carbon and Leder (2005), who found that Germans with more negative attitudes toward reunification exhibited overestimation. However, in Carbon and Leder (2005), overestimation was specific to pairs that spanned across the former East-West border in Germany. In contrast, here, we document these biases across the board, for all town pairs (whether within or across communities). One possible explanation is that, in the case of Cyprus, those perceiving less social distance with others consider all Cypriots to be part of the same group and underestimate distances regardless of the presence of the UN buffer zone.

Consistent with the plausible-reasoning framework (Friedman & Brown, 2000a), the present work highlights that social attitudes (such as those associated with ethnic identity) and the semantic clustering of regions based on ethnic and political factors should be accommodated in accounts of how geographic knowledge is formed and used.

Conclusion

Our findings are in line with previous work showing that spatial representations have multi-faceted origins, including social, political, and ethnic factors that are not usually associated with spatial representations. It is not surprising that the interplay of these factors varies from one geopolitical context to another (e.g., from Germany to Cyprus). This variation underscores the importance of studying cognition in varied geopolitical contexts. Examining such variation systematically can shed light on the effect of intercommunal relations on how people represent and reason about their environment in regions experiencing conflict or division.

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