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PEER-REVIEWED ARTICLE

How Topographic Maps Affect: Experiencing Washington, DC through the Maps of the "Other"

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Does the type of map we use affect how we engage with a place in situ*? This paper describes a creative activity that aimed to explore how the use of different topographic maps affects our engagement with an urban environment. Three groups of participants explored the neighbourhood surrounding the Gelman Library at George Washington University, each using an extract from a different map (all with street-level detail of the area) as a guide: (1) a contemporary selection from OpenStreetMap; (2) a United States Geological Survey (USGS) map from 1965; and (3) a Soviet military plan from 1975. The 32 participants recorded their experiences by taking photographs and uploading them to a shared online bulletin board (Padlet). After gaining feedback via group discussion, the resulting 108 images were classified, interpreted and mapped. The findings indicate that the groups' engagement with their environment varied with the specific map used, and was possibly influenced by their interpretation of its function, although differences in individual perceptions and responses were more pronounced than between-map differences. The activity provides a starting point for understanding the role topographic maps play in the relationship between emotions and environment and offers some avenues for further research.*

KEYWORDS: topographic maps; affect; emotion; landscape; playful geographies

INTRODUCTION

The aim of topographic mapping is to provide a detailed, reliable, and authoritative portrait of the landscape that is usually derived from survey, i.e., the direct observation and precise measurement of features. Topographic maps are usually (though not exclusively) produced by a national mapping organization on behalf of the state. The character of the national landscape is expressed through the standardized portrayal of a chosen set of features, which serves the state's interests. Although they are intended to be objective and definitive representations, topographic maps provide a "good view" of the national landscape (Kent 2008) and maintain formal aesthetic traditions of cartography that result in the persistence of national styles (Kent and Vujakovic 2009; Chilton and Kent 2016). Elements of these styles are recognized by some users (Ory et al. 2015) and revered by others. Parker, for example, even describes the therapeutic effect of topographic maps: "When all else around you is going psychotic, you can still depend on a map, and some of us can waste happy hours lost in its calm infallibility. Even the crisp smell of an Ordnance Survey provides its own instant Rescue Remedy" (2010, 2).

For national mapping organizations, topographic maps are almost sacred texts; their cartographic style preserves something of the enduring spirit of the national landscape. Their symbologies resist modernization and the pace of their evolution—at least in terms of cartographic design—is slow. Yet, mapping technologies are advancing rapidly. The emergence of new, globalized, comprehensive mapping initiatives (whether driven by commercial or community interests), and their proliferation through web map services (WMS), has renewed critical engagement with the relevance and currency of state topographic mapping. National mapping organizations are continually responding to these challenges to ensure their products remain relevant, for example by investing in design upgrades that preserve the essence of national styles (e.g., Ory et

al. 2015) or maintain the trust of users (Skarlatidou et al. 2011). This aim becomes especially pertinent in societies where alternative mapping platforms with street-level detail are freely and readily available.

If cartography has the potential to arouse the senses, evoke emotions, and stimulate the imagination (Gardener 2017), producers of topographic maps should expand their awareness of how emotion influences the design and use of their products. Research in the gaming industry, for example, has shown that the intensity, brightness, and saturation of a video game environment produce an emotional effect on players, with particular values correlating with joy, sadness, fear, and serenity (Geslin, Jégou, and Beaudoin 2016). The aesthetics of maps, including topographic maps, can likewise influence feelings and attitudes toward the places they portray (Fabrikant et al. 2012; Muehlenhaus 2012; Kent 2005). However, if the richness of detail that topographic maps provide enables their users to engage more with the places they depict, it is therefore important to consider how users respond emotionally to topographic maps. Whether produced by states or communities, they invite the construction of a personal connection that draws on our imagination and experience of landscape.

Topographic maps do more than merely connect people with places, however; the landscape being remade is personal and we therefore approach each map through the lens of our own experience (Kent 2018). The rich symbology of topographic maps also encourages the free play of imagination and enables the creative manipulation of our experience of places, and therefore our memories of them. Through memory, space becomes place, as topographic maps generate, recall, and renew these emotional associations, enriching our knowledge and understanding of place. This is clearly implied in Harley's autobiographical example of deep mapping, through his personal copy of a six-inch Ordnance Survey sheet of Newton Abbot: "I am able to read it as a text whose image has meaning because it brings to the mind's eye landscapes, events, and people from my own past" (1987, 18). Each place is unique and each culture idiosyncratic (Pánek et al. 2018), yet these individual emotions and memories escape the process of homogenization that is inevitably imposed through a standard cartographic specification. Indeed, Harley's map is "interpreted through the private code of memory" (1987, 20). The emergence of deep mapping (where our understanding of places is deepened by perceptions, memories, and the emotions associated with them) and post-representation (where maps comprise de-ontologised visions that we re-make each time they are used) have accompanied developments in biometric technologies and social media that enable emotional responses to be mapped, shared, and interpreted.

Nevertheless, as Feeney (2017) notes, while the power of maps to enrich our experience and understanding of place by drawing on our emotions is significant, it remains under-researched. One reason for this is that the relationship between maps, emotion, and landscape is inherently complex. The experience of place is unique to each individual (Poplin 2017, 292) and measuring a person's emotional state is one of the most vexing problems in affective science (Mauss and Robinson 2009, 209). Emotions are usually conceptualized and described according to two different perspectives: the dimensional and the discrete. The dimensional perspective, which is more widely adopted, classifies emotions according to underlying states such as valence (positive/negative), arousal (level of intensity of feeling), and motivation (approach/avoidance). Each of these dimensions contrasts different emotional states, for example: pleasure versus displeasure (e.g., happy versus sad); high versus low arousal (e.g., surprise versus sleep); attraction versus repulsion (e.g., excitement versus anxiety). These dimensions form the axes of what has been termed the circumplex model (Russell 1980; Barrett and Russell 1999), which arranges affective concepts in a circle (Figure 1). In contrast, the discrete perspective contends that each emotion (e.g., anger, sadness, contempt) corresponds to a

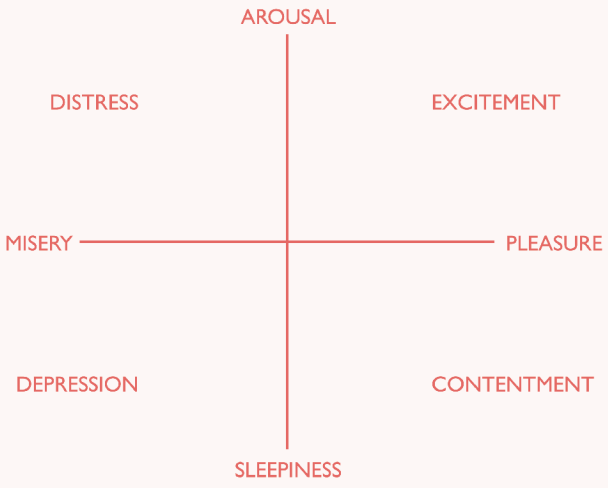

Figure 1. *The circumplex model of affect (redrawn from Russell 1980), which organizes emotional states according to the two axes of valence (horizontal) and arousal (vertical).*

unique profile in experience, physiology, and behaviour (Mauss and Robinson 2009, 211). Although it is possible to see how these approaches might converge (anger may have negative valence, high arousal, and high approach motivation), the dimensional perspective tends to capture the most variance in emotional responses (Mauss and Robinson 2009, 226).

Since affect and emotion provide knowledge that contributes to our understanding of place, it is important to consider the relationship between cognitive and emotional responses to maps. Some, for example, have indicated that the visually simple maps provided by satnavs generate minimal emotional response (Speake and Axon 2012) and others (e.g. Meng 2005) suggest that cognitive abilities are linked to emotional abilities, so that minimizing the cognitive load of a map therefore also limits the "emotional dimensions we associate to places, maps and mapping devices" (Caquard 2015, 228). In contrast, topographic maps are visually complex, with a simultaneous presentation of various themes in detail (such as terrain, vegetation, hydrology, transport, and settlements) that places a greater cognitive load on the map reader. Therefore, they should have greater potential to stimulate the reader's emotional ability and response. By contrast, using more simplified maps may limit the emotional dimensions we associate with places (Meng 2005).

If maps are continually re-made every time someone engages with them (Rossetto 2012, 32), it should be possible to examine how this remaking stimulates creative responses to an environment and to compare those responses. The aim of our research was therefore to explore how the use of different topographic maps *in situ* influenced their users' engagement with an environment and potentially their emotional responses. This paper describes an empirical activity that sought to compare how participants responded to an urban environment depending upon the topographic map they used. We explored whether the type of topographic map, as characterized by its original purpose or its level of detail, can influence these responses, and we critically discuss the extent to which this approach can reveal new insights into the relationship between topographic maps and emotions.

ACTIVITY

The activity was conducted during the first afternoon of a two-day "Maps and Emotions" workshop (jointly organized by three Commissions of the International Cartographic Association: Art and Cartography, Cognitive Issues in Geographic Information Visualization, and Topographic Mapping), held at George Washington University, Washington, DC, on July 1st and 2nd, 2017. The wider aim of the workshop was to explore different methodologies for how affects and emotions can be characterized and mapped.

Existing studies of emotions generated by different cartographic designs (Fabrikant et al. 2012; Griffin and McQuoid 2012; Muehlenhaus 2012) and by different places (Hauthal and Burghardt 2013; Klettner et al. 2013) have provided some directions for exploring the relationship between maps and emotion. Examinations of this intersection tend to fall into two distinct approaches: quantitative methods, which aim to measure participants' emotional responses to stimuli (e.g., Nold 2009; Fabrikant et al. 2012), and qualitative methods, which seek to capture participants' expressive output (e.g., Littman 2012).

Our approach falls into the latter category. We combined a free exploration of the urban landscape with volunteer-employed photography in order to interpret participants' immediate and creative responses to the environment while they used one of three different topographic maps. The basic hypothesis was that participants' level of stimulation and their perceptions of the environment—as reflected in the frequency and nature of their photographs—would differ according to the map they used. Taking photographs can help sharpen observational skills, as participants are more likely to take in and carefully analyse their surroundings through the narrow lens of a camera (Garrod 2008, 385). While the ontology of photography is intrinsically linked to performance (Levin 2009), photography is, like cartography, a socially constructed way of seeing and recording that attempts to construct idealized images that beautify the object being photographed (Urry 1990, 138–139). Indeed, the performance of photography focuses attention on particular subjects, and photographs can be read as the active play of a visual language: to "take" a photograph is active (Clarke 1997, 29). In turn, this offers the possibility of analysing and interpreting the resulting

images, letting us explore their takers' level of engagement with the environment and with which aspects of the environment they engaged.

Thirty-two workshop attendees of various ages and nationalities (including one resident of the area) participated in the activity (19 female and 13 male). They were divided into three groups (comprising 12, 10, and 10 participants), each of which was given a paper extract from a different topographic map: (1) a contemporary selection from OpenStreetMap; (2) a USGS map ("Washington West" quadrangle, 7.5 minute series); and (3) a Soviet city map (see Figures 2–4). Each map provided street-level detail of the neighbourhood surrounding the workshop venue at a similar scale. The use of one type of map per group aimed to ensure that participants received a consistent and immersive map-reading experience during the activity. The legends of the maps were not given, but each map included a scale bar, and we added a symbol (a green star) to indicate the location of the workshop venue to facilitate orientation. The absence of a defined navigational task aimed to provide greater freedom to explore and to respond to the environment; this can be particularly useful in an urban setting where the possibility of routes meets restrictions on mobility.

The choice of these three maps was intended to reflect a spectrum of topographic mapping in terms of producer, time, and interest: a contemporary map generated by a community of users (OSM, 2017), a state organization (USGS, 1965), and a culturally distant and potentially hostile "other" (Soviet General Staff, 1975). Nevertheless, if maps are remade as their users engage with them, this reinforces each map's method of portrayal and its use as an aesthetic lens for engaging with the environment. Each map was supplied as a paper copy, therefore preserving the level of detail and visual complexity that is inherent to topographic mapping. As suggested by Meng's (2005) linking of cognitive and emotional functions, the presentation of more detailed geographical information on paper placed a greater cognitive load on the user (e.g., to interpret the landscape and to orientate themselves within it), potentially stimulating participants in a way that resulted in a richer emotional response.

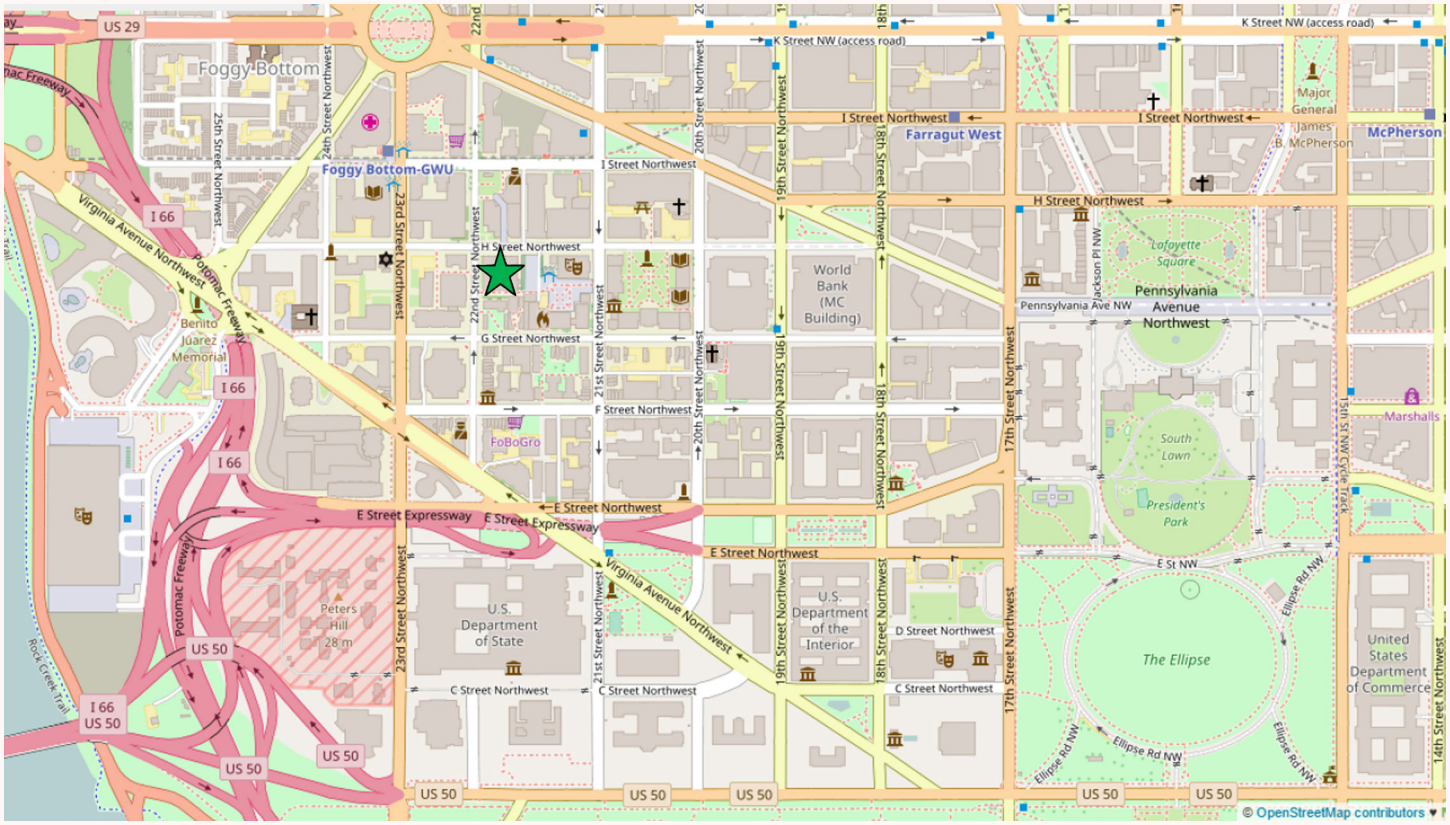

Figure 2. *Extract from OpenStreetMap, accessed August 31, 2017 (zoom level 16).*

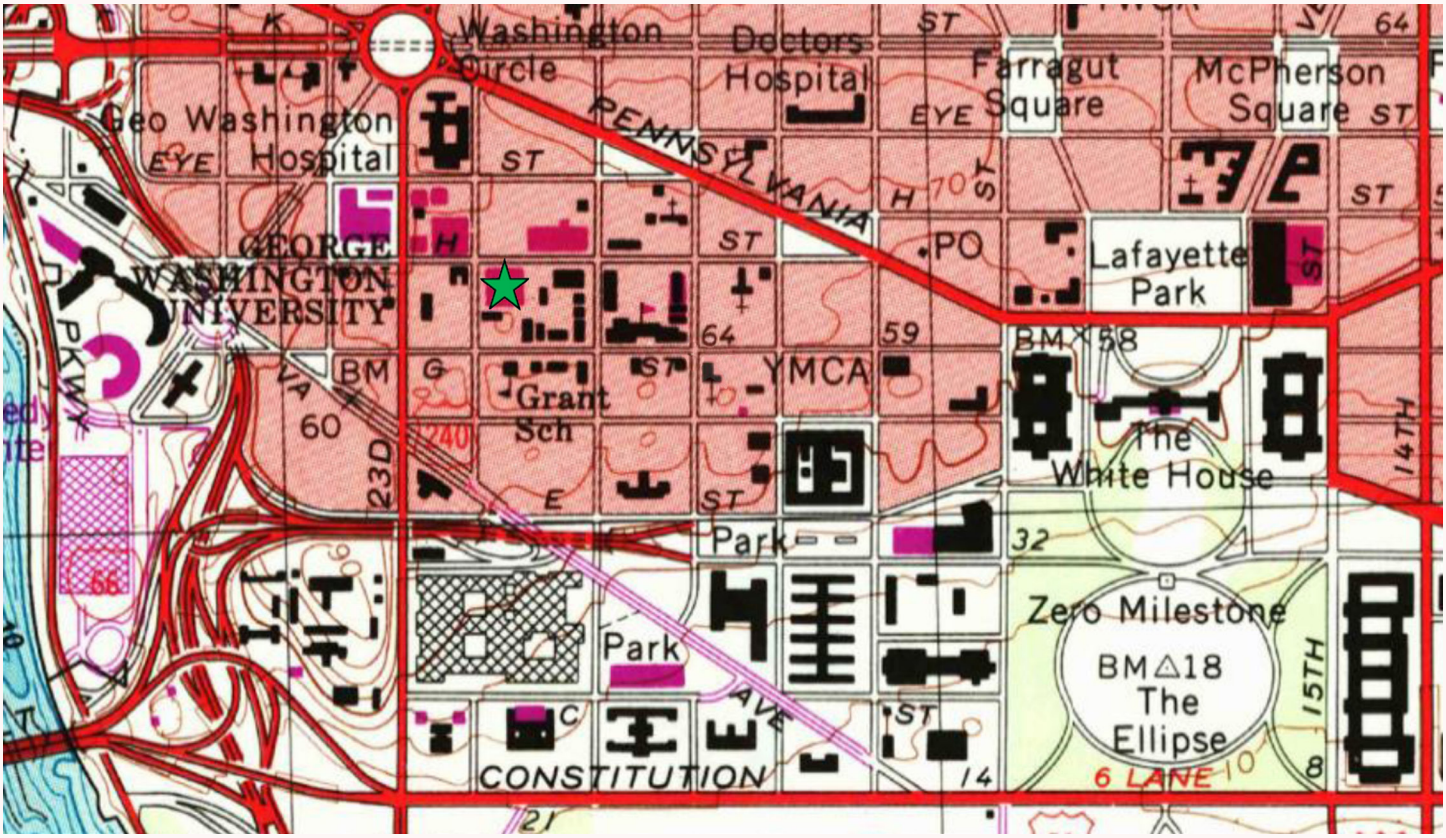

Figure 3. *Extract from a USGS 1:24,000 map (Washington West quadrangle, 7.5 minute series), from 1965.*

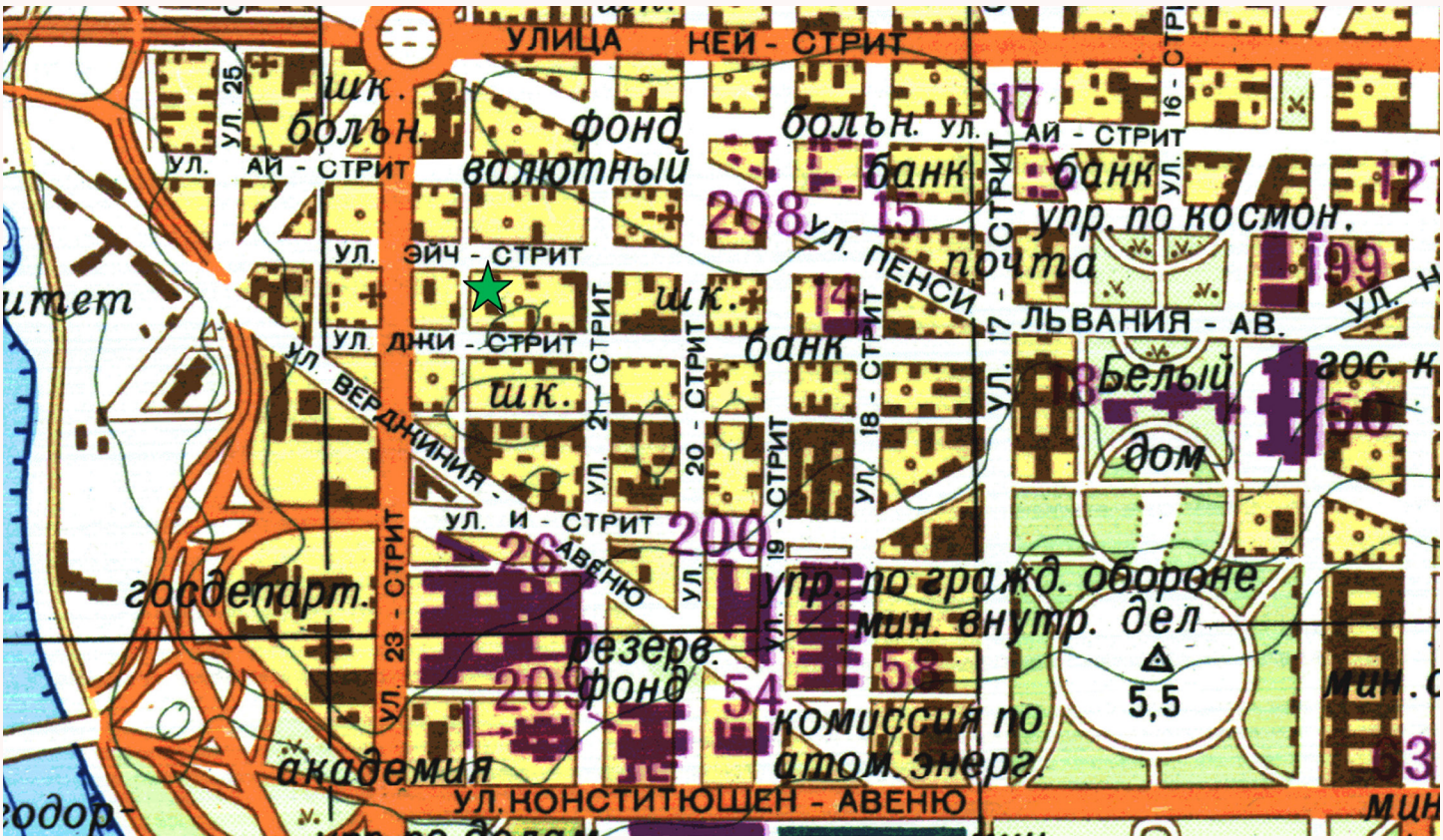

Figure 4. *Extract from a 1975 Soviet General Staff military 1:25,000 map of Washington, DC.*

Using the maps to navigate, each group was given one hour and was asked to take photographs (using their own camera phones) as and when they felt prompted in response to the environment. In addition to taking photographs, each group was encouraged to make observations regarding how each map affected their emotional responses within each neighbourhood. Participants' photographs were uploaded to Padlet, an online virtual bulletin board that allows the posting and sharing of files using a hidden space with a custom URL. Observations and comments could be uploaded as tags associated with the photographs.

Category	Example	Total Images	% of Total
Buildings as Landmarks	Views of whole buildings	18	16.7
Plaques and Signs	Signs on signposts and building entrances	11	10.2
Street Furniture	Benches, signposts, newspaper dispensers	11	10.2
Pavements	Sidewalks and other external floor surfaces	10	9.3
Building Sites	Active construction sites	1	0.9
Plants and Trees	Flowers, leaves, whole trees	6	5.6
Sky/Weather	Clouds	3	2.8
Architectural Details	Particular features of buildings or their surfaces	9	8.3
Views of Street	A broad view along or down the street	13	12.0
Building Interiors	The inside of a café or other building	2	1.9
Monuments	Statues or permanent memorials	4	3.7
Group Members	Posed or casual photographs of other participants	16	14.8
Group Map	The map used in the activity	4	3.7

Table 1. *Categories of the main subjects of each image, and some examples.*

In this way, participants created their own photographic record of their experiences of the city, which could be analysed and interpreted to explore whether we could ascribe general characteristics to each group, such as subject matter or style of photography. The combination of free exploration with elements of ludic (or playful) geographies (in particular, the use of a formerly secret military Soviet map within a very different context to its original design and use), aimed to stimulate emotional responses to the environment (see Pánek et al. 2018). This enabled participants to engage as creatively and openly as possible, and emphasized their freedom to explore. The subsequent interpretation of photographs and field observations revealed the characteristics of each group, while a post-activity discussion established the extent to which the participants were conscious of the maps playing a role in shaping their perception of the environment and their emotional responses.

RESULTS

In total, 108 photographs were uploaded to Padlet by 19 participants (39.6%). In Group 1 (OSM), eight participants uploaded 46 images between them (ranked by the number uploaded per individual: 1, 2, 2, 4, 5, 5, 5, 22). In Group 2 (USGS), four participants uploaded 16 images (1, 2, 5, 8) and in Group 3 (Soviet), seven participants uploaded 46 images (1, 2, 3, 3, 10, 10, 17). Clearly, there are differences between the groups in the number of images uploaded (with Groups 1 and 3 each comprising almost three times the number of images as Group 2) and some participants uploaded more images than others. One person in Group 1, for example, contributed 22 images (47.8% of those in the group and 20.4% in the whole activity). The distribution in the number of images uploaded by individuals in each group also varied, with Group 3 having three individuals who contributed a far higher number of images than others in that group.

The 108 images uploaded to Padlet are compiled by group in Figures 5–7. These include a diverse range of subjects and include close-up photography as well as views along streets. The activity was somewhat overshadowed by a sudden torrential downpour that lasted for almost the whole duration of the outdoor exercise, which presented the groups with unforeseen challenges in the environment, such as finding shelter (and some participants were keen to record this experience). We categorized each image by its subject, generally the most prominent (and usually central) feature; our categories are described in Table 1.

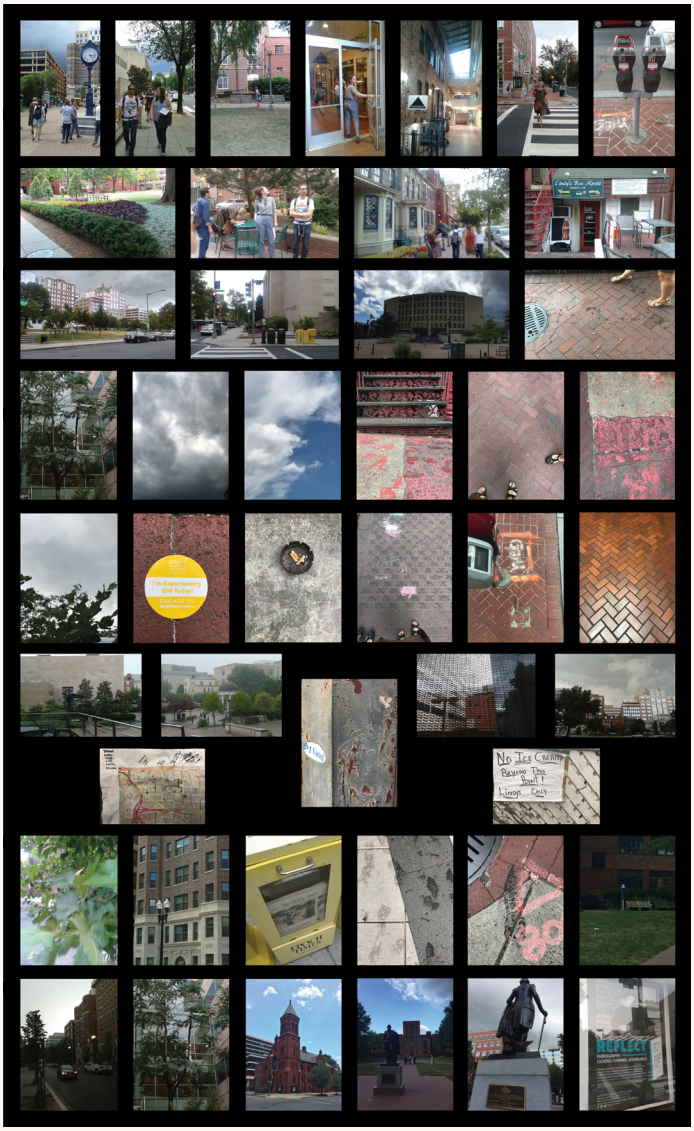

Figure 5. *The 46 images contributed by Group 1 (OSM).*

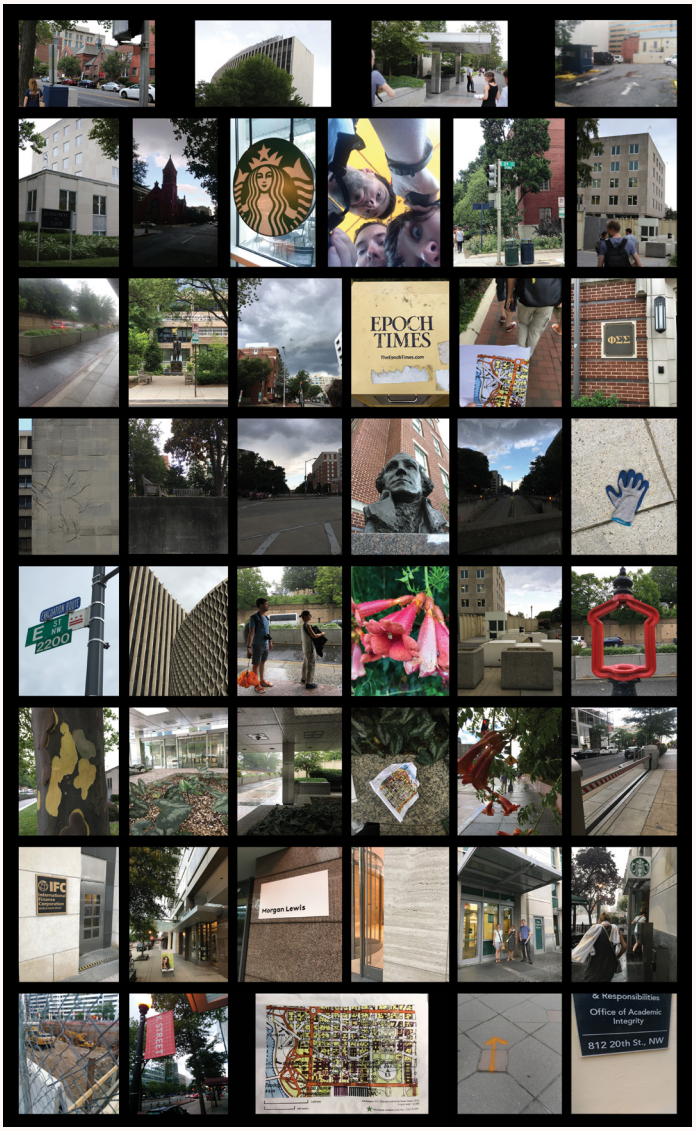

Figure 7. *The 46 images contributed by Group 3 (Soviet).*

Figure 6. *The 16 images contributed by Group 2 (USGS).*

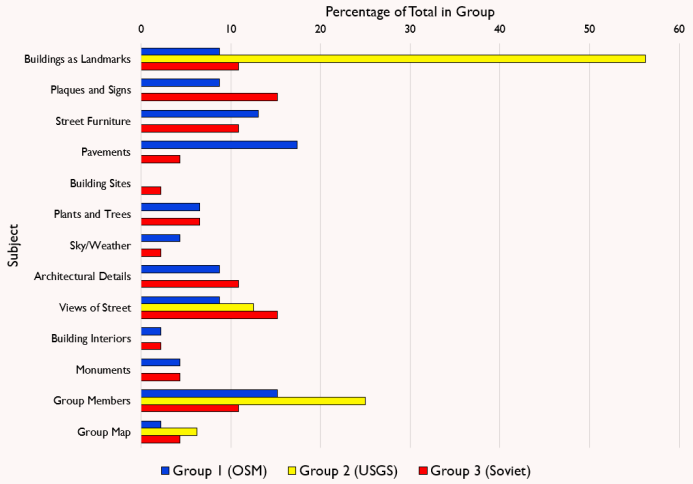

Figure 8. *Graph showing the relative balance of subjects in the uploaded images.*

A graph of the relative balance of these subjects, indicating the percentage of the total images uploaded by each group, is presented in Figure 8. This demonstrates that Groups 1 (OSM) and 3 (Soviet) tended to cover a similar range of subjects and using a similar number of images for each, while the images uploaded by Group 2 (USGS) were focussed on fewer subjects (i.e., Buildings as Landmarks, Views of Street, Group Members, and Group Map). Some examples of these subjects are given in Figures 9–11.

In addition to the subject material, the number and proportion of close-up images were calculated in order to provide more insights into the groups' varying levels of engagement with the environment. We considered the inclusion of a close-up image to imply that the participant responded to a more detailed aspect of the environment and deliberately excluded others, signifying a greater level of observation and possibly engagement (whether positive or negative) by that individual. In Group 1 (OSM), 18 close-up images were uploaded (39.1% of the total), with 14 of these contributed by one participant. In Group 2 (USGS), only one close-up was taken and in Group 3 (Soviet), 20 close-ups were taken (43.5% of the total), with 13 of these originating from one contributor (e.g., Figure 11). The subjects of close-ups included flowers and signs, pavements, architectural details and textures, and the maps given to the groups. It is also clear that some images were taken quickly (since they were blurred and not level), while others were more carefully composed.

Immediately following the activity, all groups returned to the workshop venue to upload images and engage in a group discussion. This also gave participants the

Figure 9. *An image from the "Buildings as Landmarks" category, taken by a participant from Group 1 (OSM).*

Figure 10. *An image from the "Group Members" category, showing participants from Group 2 consulting their USGS map.*

Figure 11. A close-up image from the "Plants and Trees" category, taken by a participant from Group 3 (Soviet).

opportunity to add labels or comments on their images, but few participants used this option, adding text to only 13 out of 108 images (12.0%). The comments were as follows:

GROUP 1 (OSM)

"GWU Library: Starting point of our exercise"

"the passage"

"Starting point under the storm"

GROUP 2 (USGS)

"End of work => socialization process during the raining"

"Route of Group 2"

"building with flag in the map"

"black building in the map"

"red building in the map"

GROUP 3 (SOVIET)

"Group 3 under the umbrella"

"car park where purple building 14 was. . ."

"A street we could recognize on our map :-)"

"Did the Soviets shelter from the rain in Starbucks??"

"20 St Church"

The motivation behind adding comments seems to have been either to record specific features (e.g., buildings identified on the map) or to share the humorous experience of undertaking the activity (especially in the rain). In a plenary session, three questions were asked of all groups to allow the participants to reflect on the activity and to provide more insights into how the maps may have affected their experience:

- Did you use a map on your smartphone or just use the supplied map to navigate?
- Did you find the map prompted you to take photographs of anything in particular, or to take photographs in any particular way?
- How did the map you used affect your experience of Washington, DC?

All groups used the maps provided to navigate and reported that mobile phones were only used to take and upload the photographs. The use of Padlet enabled an interactive and visual comparison that, while accounting for individual preferences, also revealed some common patterns in the way that the environment was seen, felt and recorded. From these comparisons, some characteristics emerged of the role that the individual maps played in the activity.

Group 1 (OSM) remarked that their map was very functional. They explored the details marked on it just out of curiosity: for example, they followed a passage to find a nice courtyard. We asked if the activity had prompted the group members to feel inclined to make changes to OpenStreetMap during the exercise, but the group said that they did not.

Group 2 (USGS Map) reported that their map did not show enough labels for proper navigation and to identify buildings. They mentioned that it took some time to read the map, as a legend was missing. It was thought that some buildings on the map had disappeared or that new

buildings had been built since the map was produced in 1965.

Group 3 (Soviet Map) said that they had identified buildings and places that were important targets for the Soviet Union at the time of Cold War. They started to look at the surroundings from the viewpoint of possible targets. They noted all the gates and blocking features on the street as well as boundary markers. As most of the group could not read the map labels (which used the Cyrillic alphabet), the group used the contour lines and topography on the map for navigation.

After the exercise was completed, we mapped the location of where each image had been taken (Figure 12). Since the images were captured using smartphones, many had geographic coordinates embedded within. The locations of 47 images were plotted using GeoSetter software, while the locations of the remaining 61 images were identified using Google Street View. The distribution patterns indicate the extent to which the groups explored this area of the city and their relative clustering. Group 3 (Soviet) ventured the furthest from the starting point, with one image being captured over 1 km away from the workshop venue. The patterns are more tightly clustered in Groups 1 and 2, with members of the latter taking more images within a smaller area inside (and surrounding) a nearby shopping mall.

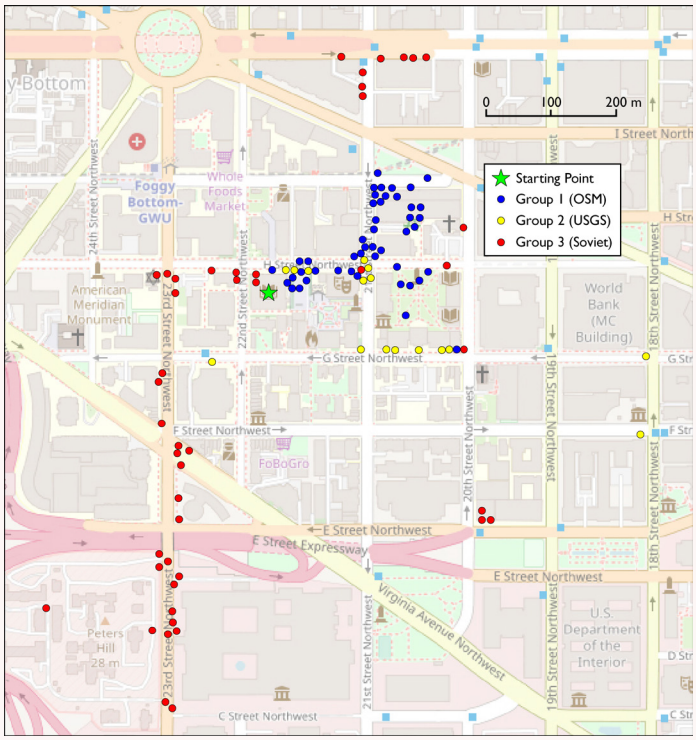

Figure 12. Map indicating the locations when images were captured. OSM is used as a base, since this is the most current of the three maps used in the study.

DISCUSSION

Together, the participants' images and comments reflect a range of experiences and responses to the environment that they encountered during the activity. Analysis of the subject matter and spatial distribution patterns indicates how varied these experiences and their associated emotions were between and within the three groups. They also reveal individual preferences of what subjects were photographed and the perspectives (e.g., close-ups) that were preferred.

However, before interpreting the resulting images, the first indicator of the level of engagement with the environment (and the activity in general) is the quantity of images uploaded per group. The most distinctive result is the low number of images contributed by Group 2, combined with their relatively limited exploration of the environment (though they added proportionally more commentary). The USGS map is the least detailed of the three, and it is possible that this influenced the participants' behaviour. Indeed, this would seem to corroborate Meng's (2005) suggested link between detail, cognitive load, and emotional responses. In their feedback, this group mentioned that the map did not include many labels and, when taken with its age (over 50 years old), this made navigation particularly difficult. Hence, it is possible that this group found the activity less stimulating and sought to record buildings in a more "emotionally detached" manner; most of its photographs were of the Buildings and Landmarks category, and it contributed more images to this category than any other group. These images, and their comments (whether added via Padlet or during the group follow-up discussion) tended to record whether or not certain buildings were present on the map. The paucity of images would suggest a low level on the arousal dimension of the circumplex model described by Russell (1980), emphasized by the fact that the group took no close-ups of the environment, only of the map itself.

By contrast, Groups 1 and 3 were more engaged with the activity, contributing 46 images each. Group 1 (OSM),

for example, mentioned that they investigated features out of curiosity. Having seen the symbols on the map, they then wanted to find them in reality. Through the lens of OSM, with its rich symbology for showing various amenities found in a city environment, the participants perhaps saw the urban landscape as a commodity to explore and enjoy, with many of their images focusing on shops and signs. The detailed symbology of the map invited exploration, which is reiterated by their comment regarding the map-inspired discovery of a nice courtyard. Several close-ups were contributed by one member of the group, who clearly took advantage of the activity's creative freedom by capturing the various textures encountered in the urban environment. The group's members did not venture far from the workshop venue, but some of their images of the group itself convey the fun of sharing the novel experience of exploring an unfamiliar city together. This would correspond to a higher level of arousal and pleasure on Russell's (1980) circumplex model.

Those using the Soviet map (Group 3) ventured furthest from the workshop venue, explored more of the neighbourhood, and appear to have headed for the government buildings that are prominent on their map. They took photographs along the route and their images reflect a similar balance of subjects as per Group 1 (OSM). In the follow-up discussion, however, they implied that the map had directly influenced how they saw with the environment "from the viewpoint of possible targets." The map certainly appears to have stimulated the imagination of participants, with some of the images being taken covertly, as if the participants were Soviet spies gathering intelligence in the US capital. The opportunity to revel in this role play is also reflected in the creativity that the images demonstrate as they focus on recording the functions of buildings and on architectural detail. Perhaps of all three maps, this provided the most immersive and stimulating experience for the participants, and their images appear to reflect their lively approach to the activity. Hence, this group would represent the strongest levels of arousal and pleasure on the circumplex model.

The different sets of images and feedback from the three groups therefore suggest that the maps (and especially how each group interpreted their map's purpose) influenced how participants interacted with and responded to the environment. The detailed urban symbology provided on OSM inspired Group 1 to act as consumers, investigating amenities in the vicinity; the USGS map appears to have been more difficult to follow *in situ* but inspired Group 2 to identify particular buildings (perhaps acting as state officials); while the Soviet map encouraged Group 3 to pretend that they were spies gathering intelligence. Within these contexts, it is possible to observe a relationship between the maps and the behaviour of the participants, since the assumed purpose of the maps directed the groups in their general attitudes towards the environment. More specifically, it is the groups' perceptions of the interests of the map as well as its content that appear to have set the overall context. For example, if Group 3 had not known that their map was a Soviet military plan produced in secrecy during the Cold War, would they have experienced the excitement of pretending to be spies?

Identifying the specific responses aroused by each of the maps in the activity is more difficult, since the subject matter of the images was often the same (particularly between Groups 1 and 3). Although the proportion of close-up photography could be interpreted as a deeper engagement with the environment, the fact that these images were taken by very few individuals suggests this may have been driven by artistic sensitivity to particular aspects of the environment (possibly resulting from their experience as photographers) rather than a link with the map in use. Photography handbooks routinely encourage fostering a sensitivity to detail in order to capture the essence of a place. For example, Luck and Freeman state that "wherever you are, you should be alert to the chance of getting these small but vital shots that will record how it feels to be somewhere; the textures, colours and shapes" (2011, 268). More specifically, the genre of urban photography is characterized by capturing the extremes of visual unity and disunity: the street view and the close-up, the general and the detail (Clarke 1997, 76). The simpler/outdated portrayal of the environment in the USGS map does appear to be responsible for a lower level of engagement in the activity by Group 2 and possibly also reflects a sense of frustration at the lack of ease in using it for navigation. That participants chose to take images of the buildings shown on this map and annotate them (e.g., "black building in the map") suggests that at least some participants were immersed in comparing it with their experience of the environment and perhaps indicates more contentment than excitement according to the circumplex model.

The associations between participants' images and their emotions, and therefore between their images and the topographic maps they used in this activity, is difficult to

establish. Nevertheless, it is possible to attempt some interpretation based on the work of Hallman and Bendow (2007), who analysed the content of 140 family zoo photographs to better understand the everyday and emotional geographies of family life. Their approach examined the purpose and connotation of images (e.g., recording family ties; unity) in order to identify common themes. Regarding the present activity, Table 2 therefore presents an interpretation of the purpose/motivation and the possible meaning/connotation of images by category. Where image tags were added in Padlet, as mentioned above, these were consulted in order to interpret images more accurately.

While it is possible to attempt to plot these images onto Russell's (1980) circumplex model by group, it is difficult to provide any authoritative interpretations of the specific emotions captured by the photographs. Moreover, although it is plausible to suggest that the taking of any of the photographs implies a raised level of arousal, it is difficult to interpret the exact dimension of the emotion felt behind the lens of the camera and therefore to establish a firm link with the map in use. Close-up photography, for example, may be regarded as reflecting a higher state of arousal from the observation required (and possibly surprise), but where this should be placed on the valency dimension is open to question. Images of textures of the pavements with sprayed marks indicating where roadworks will take place could be interpreted either positively or negatively. Indeed, the close-up photographs involved in Garrod's (2007) study of Aberystwyth included images of dog mess and litter. Of course, a major limitation is the interpretation of images of the environment according to how stimulating the image itself is rather than how aroused or positive the emotion was in taking the picture, since there is an assumed link between the subject of the image and the emotion of the photographer. Hallman and Bendow's (2007) images, by contrast, involved family subjects whose facial expressions gave more reliable indicators

Category	Purpose or Motivation	Meaning or Connotation
Buildings as Landmarks	Recording whether buildings are present on the map	Accuracy, completeness
Plaques and Signs	Recording the urban environment/functions	Sense of place/city life
Street Furniture	Recording the urban environment/curiosity	The exotic city
Pavements	Recording textures/obstacles	Art/city life
Building Sites	Recording life in the city	Change in the city
Plants and Trees	Fascination/capturing detail	Naturalizing the city
Sky/Weather	Recording the weather	Heavy rain/novel experience
Architectural Details	Fascination/capturing detail	The intriguing city
Views of Street	Recording the urban environment/perspectives	City life
Building Interiors	Recording the urban environment/shelter	Life in a big city
Monuments	Fascination/recording unique landmarks	The historic city
Group Members	Recording the activity itself/others in group	Novel experience/fun
Group Map	Recording the map used/navigation	Completing the task

Table 2. *Interpretation of images by category.*

of the implied emotions involved. In the results of the present study, there is very little to distinguish between the images of the three groups and therefore differences in the emotions evoked by the maps.

CONCLUSION

The activity described in this study suggests that topographic maps can affect our experience of place. This was demonstrated in the quantity and subjects of images that participants took while exploring an urban environment—a neighbourhood in Washington, DC—and in their own reflections on the activity. All three maps include street-level detail, but the participants' perception of the function of each map appears to have directed how they engaged with their environment and therefore influenced the emotions that they experienced. More specifically, their perception of the function or interest served by the map appears to have had the most influence on how the participants saw and behaved in the environment, either as consumers (OSM), as state officials (USGS map), or as spies (Soviet map). Differences in terms of the level of detail suggest that simplified maps may have inspired less exploration and engagement with the environment, reflecting a low level of arousal and therefore supporting the view that this simplification limits the emotional dimensions we associate with places (Meng 2005).

An association between the use of the topographic maps and particular emotional responses has been more difficult to establish. The number of photographs and the geographical spread of their capture can suggest that different levels of arousal and characterized behaviour may be associated with the use of different topographic maps, but the interpretation of specific emotions (e.g., classified according to the circumplex model of affect) from images is much less precise. By its nature, photography is about capturing the moment, but the intention of the photographer at that moment is not always clear. It is also very easy to interpret an image based on what is meant to be felt by someone viewing the image, rather than what the photographer was feeling at the time of capture.

Inevitably, there are some limitations to this study, and several ways in which its methodology could be developed. Gathering more information about the participants would allow a deeper analysis of potentially different approaches taken according to, for example, gender, age, nationality, and familiarity with the environment and the maps used. As participants were invited to use their own smartphones for capturing images, this led to variation in the photographs taken and the devices used (e.g., through camera quality, ease of use, GPS data and so on) and in users' familiarity with their own smartphones. It is notable that fewer than a quarter of the participants in the activity contributed images, and so it would be worth investigating the role of the group dynamic in this process. Results, for example, might have been different if participants had conducted the activity individually. If all devices were GPS-enabled, it would be possible to analyse the routes chosen and to understand how these routes influenced which subjects were photographed. The dramatic change in the weather also influenced the choice of images taken (e.g., of group members sheltering in the rain) and the activity could be repeated under different—and drier—conditions for comparison. Since the images uploaded are likely to be only a selection of the total number captured, it is likely that there is an aesthetic bias towards those included, which could be removed by requiring participants to upload all photographs taken. In addition, an automated method could be used for analysing the images, perhaps focusing on aspects of colour, that may yield similar findings to that of Geslin, Jégou, and Beaudoin (2016). More generally, it would be interesting to repeat the activity using maps with much less street-level detail to further explore Meng's (2005) hypothesis.

The study raises important questions for undertaking future research into how topographic maps play an active role in generating and re-generating emotions that are associated with place. As the agency of topographic maps, and maps in general, lies beyond their socio-political value and encompasses an ability to affect our emotional experience and therefore our understanding of place, the design of topographic maps could be improved by further research in this area. If emotion is transferred through art (Tolstoy 1995), this research should explore how the artistic elements of topographic mapping can enhance its cartographic language and draw on our emotions more effectively. This will contribute to a deeper understanding of how all maps can play a role in the formation of more authentic attitudes towards environments, before, during, and after they are experienced.

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