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The Emergence of Home Advantage from Differential Perceptual Activity

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Benjamin Ryan Meagher, Ph.D.

University of Connecticut, 2014

The creation and maintenance of physical territories are behaviors common to many species, including humans. One of the most well-documented outcomes associated with territories is the phenomenon of *home advantage*, the tendency for residents to prevail disproportionately over intruders during competition. Previous attempts to explain this effect have focused largely on a defense framework: residents, in response to an intruder, experience dominance motivation, which leads to more aggressive behavior. In the current work, I draw on ecological theorizing to develop an alternative account, arguing that differences in perceptual activity necessary for adaptive functioning produces distinct performance outcomes for hosts, relative to visitors. Across four experiments, this proposal is contrasted with the defense account using multiple types of territories (e.g., lab settings, computerized scenes, dormitories) and multiple types of outcomes (e.g., visuospatial ability, visual search, persistence). In Experiment 1, I evaluate a procedure for inducing territoriality after a brief period of time in the laboratory. In Experiment 2, I employ this procedure to evaluate performance on a block design task, measuring visuospatial ability and perspective taking. In Experiment 3, I assess visual search ability across a range of interior scenes designed to simulate resident and visitor status. Finally, in Experiment 4, I employ an ego-depletion paradigm in participants' dorm rooms and find that residents exhibit greater self-regulatory strength following a depleting task.

Taken together, these studies represent initial steps towards moving the study of territorial behavior away from a preoccupation with competitive defense to a broader understanding of the resident-territory relationship.

The Emergence of Home Advantage from Differential Perceptual Activity

Benjamin Ryan Meagher

B.A., Gordon College, 2007

M.A., University of Connecticut, 2011

A Dissertation

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Doctor of Philosophy

at the

University of Connecticut

2014

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2014

APPROVAL PAGE

Doctor of Philosophy Dissertation

The Emergence of Home Advantage from Differential Perceptual Activity

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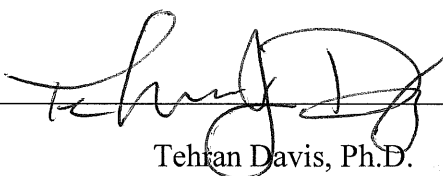
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Chapter 1

The Formation of Territories

No organism exists in empty space. Rather, animals are embedded within physical environments that constitute their ecological niche. Any activity engaged in by an organism within their niche depends on both the physical capabilities of the organism as well as the supporting structure of the environment in which it seeks to act. For example, visual perception requires not only an organism with light receptors, but also a medium through which perception is possible (e.g., air, water), a source of illumination, and surrounding surfaces capable of reflecting light (J. J. Gibson, 1979). It is because of this fact that animal behaviors cannot be understood independent of the characteristics of the niche affording these activities.

The development of particular phenotypic expressions and patterns of behavior within species is the product of *co-adaptation*, a bidirectional influence within this animal-environment relationship (Lewontin, 1978). The environment contains the various resources – food, shelter, refuge – needed for the animal to survive and procreate. Thus, particular animals and species persist to the extent that they successfully gain access to these resources. However, organisms also alter their niches over time, either incidentally as a result of their movement or through overt physical manipulation of environmental features. Organisms are not passive: “Trees remake the soil in which they grow by dropping leaves and putting down roots. Grazing animals change the species composition of herbs on which they feed by cropping, by dropping manure and by physically disturbing the ground” (Lewontin, 1978, p. 215). Animals act on, utilize, and alter their environments in the process of adapting to it.

Part of this co-adaptation involves solving the question of how to use physical space in relation to other animals. Notably, species differ widely in terms of the social systems employed to organize members across different areas and locations. For example, many species have *home ranges*, demonstrating a stable physical area that the animal inhabits and restricts its movement to during food gathering, mating, and caring for young (Börger, Dalziel, & Fryxell, 2008; Burt, 1943). Individual animals frequently share sections of these home ranges with conspecifics and do not restrict others access to it. The creation of *territories*, a related concept and the topic of the present document, is an alternative social strategy evidenced in a wide variety of animal species, among them various types of fish, birds, and mammals (Grant, 1993; Howard, 1920; Maher & Lott, 2000; Noble, 1939). The formal definition of what constitutes a territory has varied among ethologists (Maher & Lott, 1995), but three basic criteria are most common: (1) the animal defends the area from other animals, either through fighting or threat displays, (2) the area is an exclusively occupied space, based on some defined threshold of occupancy by others, or (3) the animal exhibits site-specific dominance, showing high levels of aggression towards intruders and having priority in access to its resources.

As one of many potential ways in which animals can spatially organize, the emergence of territorial behavior requires that it be adaptive in terms of the specific ecological constraints the organism is embedded in, viz. its costs are outweighed by its benefits (Hinsch & Komdeur, 2010). For certain animals, possessing and defending a territory offers several advantages. First, residents will exhibit greater efficiency in their foraging of resources, both in terms of enhanced predictability of food location provided by familiarity with the region, as well as with reduced competition from others (Houston

& Davies, 1981; Possingham, 1989). Beyond food, in many species possessing a territory also ensures access to mates and allows for greater security when rearing young (Corlatti, Caroli, Pietrocini, & Lovari, 2013; Haley, 1994). Moreover, despite the costs associated with fighting off intruders, territorial behavior across a species can actually decrease the frequency of violent confrontations. Markings and threatening displays by residents communicate to potential intruders their boundaries of safety, thus providing individuals with information regarding where it is or is not safe to enter.

The continued existence of territorial activity within a species implies certain benefits for those capable of maintaining these physical locations. In this document, I will be focusing specifically on the territories of humans, which is of particular note within the animal kingdom. As Burt (1943) commented, territorial behavior “reaches its highest development in the human species” (p. 346). As a result, further discussion is warranted regarding how territorial functioning is uniquely expressed among humans.

Territoriality in Humans

As in many other species, territories are a ubiquitous part of human life (Edney, 1976). Humans create homes for themselves, marking and personalizing these places to express ownership and occasionally defending these spaces from encroachment by others. These territories serve many of the same functions for humans that they do for other animals (Ardrey, 1966). Establishing a home provides a person with a reliable place to engage in everyday functions, thereby facilitating the development of habitual activity. This predictability in securing access to resources, such as storing food and having a place to sleep, dramatically reduces the stress of regular life. Moreover, many of the activities done exclusively or mainly within home territories are similar to the practices

done in animal territories: for example, sleeping, copulating, and raising children. Also like other species, humans show territoriality both as individuals and as groups, having places of their own and places they share as members of a group (e.g., families, clubs).

Despite these similarities, there are several key distinctions between how human and animal territoriality is expressed. First, animal territories generally serve several very basic functions, such as food gathering, maternal care, and reproduction. Human territories appear to serve a more complex array of needs, such as emotion regulation (Rafaeli & Vilnai-Yavetz, 2004b; Scheiberg, 1990) and identity expression (Gosling, Ko, Mannarelli, & Morris, 2002; Lohmann, Arriaga, & Goodfriend, 2003). Moreover, rather than exclusively defending one's space from others, humans regularly host and encourage others to visit their homes (Sebba & Churchman, 1983). Notably, rather than expressing dominance in such situations, hosts instead show normative tendencies to cater and attend to the needs of visitors, thereby serving a temporarily subservient role. In light of this point, it is apparent that the types of behaviors engaged in by humans in their territories are much more varied and socially complex than the activities engaged in by nonhumans.

Secondly, animal territories are typically restricted to a single location, which varies in geographic area according to the size of the animal, its food supply, and other population characteristics. In contrast, human territories are much more variable in terms of size, location, and number. For example, a person can have both a home and an office, each of which functions as a distinct, nonadjacent territory. Having multiple territories, separated in space, is unusual in other species. More than just number, human territories also show much greater complexity and variability. Altman (1975) suggested that, uniquely, human territories can be defined along a gradient, rather than by a single

territory-nonterritory binary distinction. That is, humans form different types of territories, based on a pair of orthogonal factors: (1) how central the setting is to a person, how close it is to their everyday lives, and (2) the duration of time spent in the setting, the perceived permanence of the territory.

From these variables, Altman proposed three basic types of territories that emerge among humans. *Primary territories*, such as one's home, are both central to everyday life and controlled on a relatively permanent basis. Intrusion into the space by an outsider is considered a serious affront, as the resident expects to have control over others' access to it. Thus, primary territories are most similar to those observed in other animals. In contrast, *secondary territories* are somewhat less central and less exclusive. A neighborhood bar, for example, may be viewed as a territory by a regular customer, who has a certain seating location, engages in a variety of social functions within the setting, and may even view outsiders entering the bar with suspicion (Cavan, 1963). However, the person has less control over such spaces than their primary territories. Finally, *public territories* represent temporary control over a space that others will eventually have free access to. For example, possession of a particular table at a restaurant or library may be defended for a limited period of time (Sommer, 1970; Sommer & Becker, 1969), but will eventually be abandoned once its use is over. Temporary control of these spaces is heavily determined by cultural norms, rather than by rules set down by a particular occupant. This typology developed by Altman has received empirical support in several field sites, such as hospitals and libraries, in terms of how people think about, report on,

and act in the spaces they inhabit (Kinney, Stephens, & Brockmann, 1987; Taylor & Brooks, 1980; Taylor & Stough, 1978).¹

Finally, in humans territoriality is expressed not only by behaviors, but also with accompanying attitudes and cognitions tied to the setting (Sebba & Churchman, 1983). The concept of *ownership* has been used to articulate the feelings humans have toward possessions, such as their territory (G. Brown, Lawrence, & Robinson, 2005; J. L. Pierce, Kostova, & Dirks, 2003). Specifically, ownership reflects a “relationship between a person and an object...in which the object is experienced as having a close connection to the self,...becoming part of the extended self” (J. L. Pierce et al., 2003, p. 86). This relationship can be strong enough that parts of the external environment can be viewed as a component of one’s identity and self-concept (Belk, 1992; Proshansky, Fabian, & Kaminoff, 1983). These environments therefore may reflect characteristics of its owner. Empirical work has shown that territories are capable of providing reliable and usable information regarding the identity of the resident, serving as indicators of personal values, interests, and past behaviors (Gosling, Gaddis, & Vazire, 2008; Gosling et al., 2002). A similar concept within environmental psychology is *place attachment*, a positive affective bond between a person and a setting (Altman & Low, 1992; Lewicka, 2010). As a physical location closely tied to one’s identity, a resident is likely to show a similar positive disposition towards his or her territory. For example, objects arbitrarily

¹ It has also been suggested by some that an additional complexity associated with human territoriality is its application to domains beyond a geographic location, such as to objects, other people, and even ideas (Bakker & Bakker-Rabda, 1973). However, by broadening the concept in this way, the spatial behaviors unique to the concept to be described in Chapter 2 (e.g., marking displays, performance outcomes) cease to be relevant. The value of expanding the concept in this way is therefore questionable, as it may potentially make territoriality, as a theoretical concept, too large to be empirically useful. Therefore, consistent with Taylor (1988), in this document territoriality will be discussed specifically in terms of one’s relationship with actual physical space, whereas ownership can be understood as a cognitive construct relevant to both concrete and abstract possessions.

assigned to an individual are evaluated more positively (the mere ownership effect; Beggan, 1992; Gelman, Manczak, & Noles, 2012), assessed as more valuable (the endowment effect; Morewedge, Shu, Gilbert, & Wilson, 2009; Reb & Connolly, 2007), and remembered better in memory (Cunningham, Turk, Macdonald, & Macrae, 2008). Nevertheless, attachment to place is not exclusive to territories. One can feel attachment to a location without any claims of ownership, or the capacity or motivation to exclude outsiders from accessing it. Territoriality and place attachment are therefore related, but distinct constructs.

The extent to which non-human animals can experience the complementary cognitive and affective components of territoriality found in humans is unclear (J. H. Kaufman, 1972). Because of this, a more explicit definition of specifically human territorial functioning is warranted, beyond what is currently found within ethological work. For the purpose of this document, the definition provided by Taylor (1988) will be employed, with territorial functioning defined as:

An interlocked system of attitudes, sentiments, and behaviors that are specific to a particular, usually delimited, site or location, which, in the context of individuals in a group, or a small group as a whole, reflect and reinforce, for those individuals or groups, some degree of excludability of use, responsibility for, and control over activities in these specific sites. (p. 81)

As a working framework, this conceptualization allows for a much broader understanding of human territories than what is offered in ethological descriptions of other animal species. Unlike definitions used in ethology, it acknowledges the cognitive and affective components of the human experience, in addition to expected behaviors. Moreover, these cognitions and behaviors reflect more than just a defense motivation against intruders,

instead also including a sense of responsibility for and control over maintaining the setting. As will be discussed in the next chapter, the majority of empirical work has focused exclusively on defensive behaviors at the expense of better understanding these other motivations. Sensitivity to these other components of territorial functioning allows for a greater understanding of the activities engaged in by a resident when alone in the setting, as well as when actively hosting visitors.

The Origins and Functions of Human Territoriality

A key historical debate regarding the nature of territoriality is the means by which it emerged in humans. Intertwined with this debate is the question of what function territoriality serves, both for individuals and for larger groups. Within the scientific literature, three main perspectives are generally expressed: (1) human territoriality is an evolutionary instinct related to aggression and the product of a species-wide adaptation, (2) human territoriality is a social construction, which is used to exert influence over others along power hierarchies, and (3) human territoriality is a means of regulating successful social interaction, both for an individual and within larger communities. As will be seen, these approaches are not necessarily mutually exclusive. Nevertheless, they do reflect very different frameworks for explaining and evaluating the phenomenon. I will next briefly describe each of these perspectives in turn.

Territoriality as an Evolutionarily Derived Behavioral Instinct

For a number of researchers, the presence of territorial behaviors in a diverse range of animal species offers a potential means of understanding the expression of similar territorial behavior in humans. That is, whatever ecological determinants and motivations guide the defense of a physical location for one organism should also show

parallel expression in human's relationship to particular settings. In his culturally influential book, *The Territorial Imperative*, Ardrey (1966) presented a strong form of this argument, suggesting that, for humans: "If we defend our title to our land or the sovereignty of our country, we do it for reasons no different, no less innate, no less ineradicable, than do lower animals" (p. 5). According to the view proposed by Ardrey, territoriality is an unavoidable, hard-wired instinct to defend one's property, one that drives human behavior in the same way it does other species. Just like the will for self-preservation and the desire to procreate, the territorial instinct is a fundamental drive shared across certain animals because of its capacity to enhance survival. From Ardrey's perspective, human nature is inherently aggressive, and territorial functioning is the basic means by which it manifests. In fact, Ardrey suggests that the defense of physical space is a more basic drive than sex: "How many men have you known of, in your lifetime, who died for their country? And how many for a woman?" (pp. 6-7).

Ardrey's (1966) argument for the primary role of territorial defense is developed from selected accounts of the activity of other species. For example, wolves mark their territories not to attract mates (they are monogamous), but to communicate boundaries. Male Ugandan kobs engage in fights exclusively over specific patches of land, but do not fight outside this stamping ground, even if females are actually present elsewhere. Moreover, territorial behavior is not exclusive to males, as certain females, such as robins, will also defend their space from intruders. From these examples, Ardrey argues that territorial functioning is not reducible to other, more basic instincts, but is itself a fundamental drive serving basic psychological and survival needs.

The account outlined by Ardrey has been widely criticized as reductionistic and logically flawed by both animal and social scientists (Alland, 1972; Elms, 1972; Taylor, 1988). The main critique of his argument is its reliance on incidental parallels between animal and human behavior and the assumption that these reflect comparable processes. Moreover, it fails to propose testable theories and ignores studies showing that cultural and environmental factors influence the expression of both territoriality and aggression. Additionally, there are many primate species more genetically similar to humans than the examples employed by Ardrey that are not territorial. Presumably, if the territorial drive was as basic as the sex drive, it would be expressed across a wider range of species.

Without discarding the evolutionary basis of territorial functioning, the criticisms directed at Ardrey highlight the need to consider the unique circumstances from which territoriality could emerge specifically in humans. Taylor (1988) outlines a sociobiological account of early human development, derived from the work of the evolutionary anthropologist C. Owen Lovejoy (1981, 2009), as an explanation for the emergence of territories among early hominids. The general account is as follows: Because of the extended period of helplessness experienced by human infants, population adaptations that increased parental monitoring and decreased parental travel would have increased infant survival. The best means of protecting infants is to raise offspring in settings of maximum safety. The division of labor along sex lines originally served to provide a means of fulfilling this need. A *male provisioning, home-based* model hypothesizes that mother-infant pairs occupied a restricted base area, while males foraged for food in locations farther away. Females, having to engage in less travel but still receiving provisions from returning males, are able to maintain high levels of protein

intake while substantially reducing the energetic costs of their own foraging behavior. At the same time, monogamous pair bonding allows the male to remain confident of his own lineage, despite leaving mates unattended.

Gradually, these familial home bases became group territories, shared by multiple monogamous pairs, because of the need to defend members from predators and to allow for the hunting of animals substantially larger than any individual human. Importantly, such territorial arrangements would be most likely to occur in times and places where ecological conditions made it adaptive, i.e., when resources were moderately plentiful and geographically predictable (Dyson-Hudson & Smith, 1978). If food were too scarce, the group would need to maintain greater mobility in search of new resources. On the other hand, if food were overly abundant, there would be much less need to defend sites from other groups. However, the emergence of agriculture and animal domestication made these ecological constraints much less critical in determining territorial expression. Rather, as the home base sites of small groups gradually evolved into villages and the importance of the hunter-gatherer groups declined, greater emphasis came to be placed on family-specific home-sites and smaller interpersonal interactions within groups. It is in this way that cultural developments served to guide and constrain the expression of particular biological predispositions to defend space.

In sum, Taylor's view (1988) conceptualizes territorial functioning as the product of its small group based origins. This socio-evolutionary perspective attempts to explain the expression of territoriality in humans just as it is in other species: in terms of its survival value for human ancestors and as dependent upon certain ecological conditions. Moreover, this perspective emphasizes the social nature of the phenomena, arguing that

a territory serves relatively little purpose for a single individual, but it is important in terms of regulating how humans engage in specific types of social interaction with other members of its species. According to this framework, the concept of territoriality as applied to modern day humans is thought to be applicable only to the types of interactions that would have been relevant to our early ancestors. Specifically, it is proposed by Taylor that territorial functioning is relevant only to the limited contexts of small, face-to-face group interactions, which is the social context within which this behavioral tendency first emerged.

Territoriality as a Strategy for Exerting Social Influence

In contrast to viewing territoriality in humans as comparable to what is observed in animal behavior, an alternative perspective is to understand it as a uniquely human, non-instinctual social *strategy*. To possess a territory is to have unique access to a resource. Thus, territorial behaviors may ultimately serve the function of accruing power for a particular individual or group at the expense of some other individual or group. Geographers have frequently relied on this perspective of territoriality to describe the actions of various nation-states. Sack's (1986) influential account of territoriality in humans, for example, frames the construct as any "attempt by an individual or group to affect, influence, or control people, phenomena, and relationships, by delimiting and asserting control over a geographic area" (p. 19). Far from being an innate need, possessing a physical region is viewed as one of many possible means of exerting influence and maintaining power. For example, if a parent wants to stop her child from banging pans in the kitchen, she could move the pans to a shelf that is too high for the child to reach. Alternatively, a territorial strategy would involve the mother telling her

child that he cannot go into the kitchen without permission. This latter method is viewed as territorial, in that she is restricting the “child’s access to things by asserting control over an area” (p. 16). With this basic framework, governmental policies can also be viewed as territorial, to the extent that their enforcement influences people’s access to certain geographical locations. This perspective therefore differs dramatically from Taylor’s socio-evolutionary framework (1988), which reserves the term territorial functioning only for processes occurring at the level of small groups, so as to be comparable to the concerns and experiences of human ancestors. Territoriality as a strategy for dominance, however, can be understood at much larger scales.

When viewed in this way, territoriality is a particularly human attribute, in that its expression often requires abstract and complex conceptions of rights and property (Noles & Keil, 2011). Importantly, this perspective substantially downplays the intrapersonal emotional and cognitive components of the territorial construct, such as place attachment or identity expression. Rather, the function of establishing a territory is tied wholly to its social implications and one’s ability to control others’ access to the space. Thus, possessing space is a secondary motivation and merely one of many possible means for influencing others and exerting power.

Consistent with this perspective, several empirical investigations at the individual level have tested the ways in which physical space is used as a means of maintaining and expressing dominance over others. As would be expected, such studies tend to observe greater defense motivation for locations that are more valuable. For example, several early studies by DeLong (1970, 1971, 1973) explored how habitual seating patterns around a rectangular table reflect the social hierarchies of its members. Maintaining a

position near or at the head a table has been shown to be related to leadership status, at least in certain cultures (Sommer, 1961; Ward, 1968). Dispositionally dominant people are therefore more likely to claim prominent, central locations (Hare & Bales, 1963). Likewise, in classroom auditoriums, students located in central seats (i.e., presumably better locations) are more likely to defend the space from an intruder than are those seated elsewhere (Haber, 1980). The ways in which owners decorate their territories can also serve to communicate high social status. Sandilands and McMullin (1980) measured the decorations placed on faculty members' office doors and found that department rank and number of publications correlated positively with the total area marked on the door. The physical setting therefore expresses the perceived importance of the occupant, specifically to visitors waiting to enter.

However, highly dominant individuals do not always express more territorial behavior than do submissive ones. Rather, the relationship between dominance and territoriality appears to be more complex, and it is likely dependent in part on particular social conditions (Edney, 1974). Work by Esser and his colleagues (Esser, 1968, 1973; Esser, Chamberlain, Chapple, & Kline, 1964) in clinical populations is one such demonstration of these variations. In certain circumstances, highly dominant individuals act less territorial because they have free access to any area (Esser et al., 1964). That is, they have the ability to be more mobile and untied to particular physical locations, thereby having no need to defend specific areas. However, when there are particularly desirable areas in a shared setting (e.g., recreation room, television access), highly dominant individuals will then become more motivated and likely to stake claim to these specific locations (Esser, 1973). Another potential factor predicting the relationship

between dominance and territoriality is consensus regarding the social hierarchies present within the group. Supporting this claim, Sundstrom and Altman (1974), in a study of spatial behavior among boys in camp cottages, found that dominant boys were most territorial towards valuable locations during socially stable periods, when individuals had well-established interpersonal relationships. With social status well known, dominant boys were able to maintain exclusive access to desirable locations without conflict. However, when group composition changed and hierarchical relationships became less clear, territorial defense declined and all boys moved throughout the cottage. This unstable period was also characterized by more interpersonal conflict, as the boys sought to reestablish status. This suggests that territorial behavior is most common during socially stable periods as a means of exerting power without having to engage in overtly aggressive acts, such as interpersonal violence. However, when territorial claims become ambiguous, violent behavior may be needed to reassert control.

This perspective views territorial functioning purely in terms of social influence. Because of this focus, its conceptualization of people's relationship to territories is fairly limited in scope. Being in one's territory is likely related to many intrapersonal processes, particularly in light of the fact that humans spend most of the time in their territory either alone or with others whom one shares the space with. Noting the variability of the dominance-territoriality relationship described above, Edney (1975) sought to broaden this perspective by suggesting that *control*, rather than dominance, is the critical component of territorial functioning: "Control is a concept related to dominance, but broader; instead of referring only to an active social behavior it accommodates the influence a person has over other people, inanimate spaces, and even ideas, and in both

active (initiating or offensive) and passive (resistive or defending) ways” (p. 1109).

While still closely tying territoriality to power, Edney argues that this power may be expressed inwardly, in terms of one’s personal capacity to alter a setting however he or she wishes.

Finally, in addition to downplaying the importance of certain intrapersonal processes related to territoriality, the exclusive focus on the relationship between dominance and territoriality is only able to address the dynamics of vertical interactions (i.e., containing individuals of differing social status and goals). Other types of social interaction, particularly those involving horizontal, peer relationships, also take place within territories (Edney, 1976; Taylor, 1988). Although addressing how parents can discipline children by restricting access to space, the dominance-motivated social influence perspective may not be best suited for addressing what it means for two parents to gradually learn how to share a joint territory, or for parsimoniously explaining their motivations and behaviors when hosting guests in this home.

Territoriality as a Means of Regulating Social Interaction

Both of the previous views conceptualized territoriality largely in socially negative terms, either as an innate, aggressive predisposition to defend space or as a social strategy for dominating and controlling others. An alternative approach views territorial functioning in much more positive terms, instead focusing on how territories help to regulate positive social interactions. This view points out that human societies depend critically on territorial claims to successfully function. At the group or national level, having a means by which individuals can hold exclusive rights to particular locations and possessions provides the stability necessary for successful functioning

within a society of several thousands or millions of people. Imagining what life would be like without territories, as Edney (1976) suggests, reveals a hypothetical world that is disorganized, stressful, and oriented only towards moment-by-moment survival. Without places to settle in, future access to resources would be much less predictable. The ability to make plans would be greatly hindered if one was unable to be sure that he or she could be in a particular place at a particular time. Moreover, without consistent environmental scaffolding, many habitual patterns of behavior would be essentially impossible to maintain. Routines related to preparing and consuming food, maintaining personal hygiene, and conducting work would be extremely challenging without ensured, predictable access to the tools and settings relied on for these activities. Territories also make social interactions much more organized. By knowing what people are associated with what places, individuals are able to predict where others will be and thus be capable of finding (or avoiding) them. Without this knowledge, interpersonal contact would be essentially random. Territoriality therefore acts as a critical stabilizing force in group functioning (Taylor, Gottfredson, & Brower, 1981).

In a similar way, at the individual level, possessing a territory serves an important role in reducing the stress of everyday social interactions (Costa, 2012). For example, within a home environment, having established seats at the dining room table, personalized rooms, and clear sides of the bed to sleep on vastly reduces the stress and conflict arising from sharing a single location with several other people by providing clear expectations for communal conduct. Married couples, in fact, have been found to be more territorial in this way than cohabiting couples, potentially reflecting greater commitment to prolonging cohabitation (Rosenblatt & Budd, 1975). Consistent with this

claim, Altman, Taylor, and Wheeler (1971), in a study of Naval recruits living in pairs in prolonged isolation, observed that greater territoriality early in the study predicted smoother social functioning between the pair and a reduced likelihood of aborting the experiment. Results such as these have even encouraged theorizing in clinical work, using territorial functioning as a way to frame marital therapy (Orathinkal & Vansteenwegen, 2006).

A consonant theoretical framework for this work at the individual level, and the most prominent view of territoriality within environmental psychology, is Altman's (1975, 1976b) theory of privacy regulation. According to Altman, individuals seek to achieve an optimum level of social interaction, which varies both across and between individuals. This is framed as a motivation to achieve and maintain privacy, a lack of which leads to a loss of behavioral freedom and stress associated with crowding (Proshansky, Ittelson, & Rivlin, 1972). A number of behavioral mechanisms are proposed to function as a means of minimizing the difference between desired level of privacy and actual level of privacy. For example, maintaining personal space is one such mechanism that helps to regulate the amount of interpersonal contact one is engaged in (Evans & Howard, 1973). Territoriality is suggested to function in much the same way as personal space. Whereas the latter is a portable, invisible boundary, territories are visible and stationary. Nevertheless, in both cases, unwanted encroachment leads to heightened arousal, negative affect, and a behavioral defense response. People therefore create and maintain territories as a way to avoid the stress associated with unwanted social interaction.

Altman's view therefore subsumes territoriality within the concept of privacy, and frames its motivation in terms of a social stress reduction model. Territorial behavior is chiefly motivated by a desire to reduce anxiety associated with social interaction. However, some empirical work has pointed towards a distinction between territoriality and privacy. For example, Edney and Buda (1976) found in a laboratory experiment that behavior in a private setting (i.e., when alone) and behavior in a territory condition (i.e., designed by the student) were given different attributions by participants. Moreover, Taylor (1988; Taylor & Ferguson, 1980) has pointed out that different types of privacy (e.g., solitude, intimacy, anonymity) may be achieved in different types of territories. For example, when seeking intimacy with another person, individuals prefer to do so in a primary territory. However, when they want to be alone and away from others to be introspective, they are actually more likely to prefer temporary public territories, such as a secluded public park (Taylor & Ferguson, 1980). This highlights the point that a territory offers a resident more than just privacy; otherwise, the type of territory one seeks in search of privacy would be of little importance. This framework, treating territoriality exclusively as a means of social stress reduction, therefore does not appear to offer a comprehensive account of the construct. Rather, as discussed earlier, territories appear to serve additional functions, such as identity expression (Belk, 1992; Gosling et al., 2008; Gosling et al., 2002), restorative emotional experience (Gulwadi, 2006; Korpela, Hartig, Kaiser, & Fuhrer, 2001), and, as will be discussed at length in the next chapter, performance enhancement on certain tasks (Allen & Jones, 2014; G. Brown & Baer, 2011; Taylor & Lanni, 1981).

Chapter Summary

Territoriality is one way in which an animal or species uses physical space relative to other animals. Specifically, ethological work has defined territories as locations that an animal defends from others, has exclusive access to, and exhibits site-specific dominance. Research and theorizing on the topic in humans developed out of this ethologic framework, and so subsequent psychological work has generally framed territorial functioning in a comparable way. Three dominant frameworks for understanding human territoriality exist in the scientific literature: as deriving from an instinctual aggressive need to protect space, as a strategy to exert dominance over others, or as a means of reducing the stress of having to interact with other people. Although the psychological motives of these approaches differ, in all cases territorial functioning has been understood chiefly in terms of defending space from intruders. This fact will be particularly evident in the next chapter, which focuses on the behaviors historically associated with possessing a territory, as well as the performance outcomes believed to result from these types of behavior.

Chapter 2

Territorial Behavior: Defense of Space from Intruders

In the previous chapter, I described several of the proposed origins and functions of human territoriality. What, though, does possessing a territory entail? Because the study of this topic in humans emerged largely out of earlier work on animals, the conceptualization of territorial behavior by psychologists has followed closely the definition first offered by ethologists: how one defends a particular area from others (Maher & Lott, 1995). This focus on defense from intruders follows naturally from early definitions of territories. By defining territoriality as the mutually exclusive use of physical locations (Altman & Haythorn, 1967; Altman et al., 1971; Sundstrom & Altman, 1974), it follows that territorial behavior should therefore be understood as how one keeps this area exclusive. As a result, behavior within one's territory has been framed largely in terms of a defense motivation, rooted in aggression and dominance towards outsiders. In this chapter, I will focus on the empirical work to date exploring the behaviors and outcomes associated with how territories are defended.

The motive to defend one's territory from unwanted intruders is well demonstrated. Early work by Sommer (Felipe & Sommer, 1966; Sommer & Becker, 1969) in college settings demonstrated the very negative reactions experienced by the occupants of temporary, public territories in response to intruders' violation of the boundaries. More recently, survey data from Brown and Robinson (2011) found that territorial infringement in the workplace produces substantial levels of anger, which mediates subsequent behavioral responses to it. Moreover, strong attachment to a particular location may lead to greater defensive vigilance for potential intrusions. A field

study by Edney (1972b), for example, found that the number of territorial displays on a home was positively related to the resident's length of occupancy and the speed with which he or she responded to a visitor entering their property (i.e., time until answering a knock on the door). These findings suggest that as the importance of a space increases, so too does one's need to monitor and limit the use of it by outsiders. Additionally, several studies have conceptualized people's relationship with their cars in territorial terms (Fraine, Smith, Zinkiewicz, Chapman, & Sheehan, 2007; Szlemko, Benfield, Bell, Deffenbacher, & Troup, 2008). Interestingly, aggressive driving appears to be positively related to the extent to which an occupant views the vehicle as a primary territory. Szlemko et al. (2008) argue that this is the result of a driver's motivation to defend a primary territory while in a field of potentially dangerous intruders, which results in more frequent expressions of anger. Clearly, then, unwanted intrusion by others into one's territory is capable of producing a negative emotional response.

Lyman and Scott (1967) noted that there are three types of territorial encroachments that residents must defend their space from. An *invasion* occurs when an outsider crosses the boundary and enters a territory. Alternatively, the *violation* of a territory occurs when one uses the space in an unwarranted way. The invasion of a territory by an unwanted guest can itself be a violation. However, in other circumstances, a guest given access to a space may subsequently act inappropriately within it (e.g., by ignoring certain norms, acting rudely), thereby violating the behavioral expectations of the host. Finally, the *contamination* of a territory may occur if the space is rendered symbolically impure. For example, in a study during the Hindu festival Magh Mela, the intrusion into a campsite by a female interviewer produced swifter territorial responses by

occupants than the intrusion of a male (Ruback & Kohli, 2005). This response difference was based not on a difference in terms of physical threat, but instead on the symbolic implications of a prohibited person entering the space of a holy ritual.

With this framework, the study of territorial behavior has traditionally explored how residents seek to defend their space from these various potential forms of encroachment. One point of note, however, is that actual interpersonal conflict between residents and intruders is relatively rare among humans, at least compared to certain animal species. Instead, most defensive territorial behavior is essentially preventative (G. Brown, 2009; G. Brown et al., 2005). It is only when these initial safeguards are ignored or fail that a resident must then engage in active defense. In this chapter, I will discuss the various types of behaviors associated with territorial defense. First, I will describe three types of preventative behaviors: (1) anticipatory defense, (2) direct verbal and nonverbal communication with potential intruders, and (3) indirect communication provided by marking. Secondly, I will describe the outcomes associated with actual competitive conflict between residents and intruders when preventative behaviors fail. Specifically, evidence for the *prior-residence effect* (Braddock, 1949), the tendency for residents to disproportionately prevail over intruders in these conflicts, will be described across several very different domains. I will also discuss how the territorial defense account traditionally explains these discrepant outcomes in terms of residents' greater aggression and dominance motivation.

Anticipatory Defense

When in possession of a territory, a resident may expect that intruders will attempt to encroach upon it in the future. To prevent these potential encroachments, the

occupant can engage in anticipatory defenses, actions “that are noncommunicative in nature, taken prior to an infringement with the purpose of thwarting infringement actions taken by others” (G. Brown et al., 2005, p. 583). These actions secure a territory independent of the current presence of either visitors or invaders. For example, installing a lock on the door to one’s house or building a large fence around the yard will directly inhibit others’ capacity to invade the space. The frequency of these types of behaviors will depend on the beliefs of the resident regarding their need for preventative defense, absent an immediate threat. As a result, anticipatory defenses will likely occur more frequently when the resident believes intruders will either not be aware of the territory’s boundaries, or when they are likely to consciously ignore its boundaries. This type of behavior is therefore most common when the location is valuable, or when the residents believe others do not share their beliefs regarding the space.

Verbal and Non-Verbal Communication

Once in the presence of a potential intruder, a resident is likely to seek to explicitly communicate to this outsider, informing this person of his or her ownership over the space. Such communication is designed to convince the outsider not to encroach into the territory. Territorial songbirds are a prime user of this strategy. In addition to attracting mates, songs are also used as an intrasexual threat signal to broadcast the range of a bird’s territory (Brumm & Ritschard, 2011; de Kort, Eldermire, Cramer, & Vehrencamp, 2009; Morton & Stutchbury, 2012). Humans, likewise, will also engage in threatening speech when their space is in danger of being invaded. Brown (2009), developing a self-report measure of territorial behavior in the workplace, classified this type of communication as a *reactionary* defense. In his sample of office workers,

reactionary defense was quite common: Over the past year, more than half of his respondents reported having to explain to an infringer that their workspace was claimed, and 43% admitted having to display hostility towards such spatial intruders.

In addition to explicitly speaking to an outsider, residents may also engage in a variety of nonverbal, communicative gestures to ward off intruders. Among primates, dominance is regularly communicated by what is called *formal dominance*, nonverbal rituals between dominant and submissive animals, which are distinct from direct, physical domination through fighting (de Waal, 1982). For example, to communicate dominance a higher-status ape will make itself appear larger by stretching, standing its hair up, and walking in exaggerated ways (Tomasello & Call, 1997). Among pigeons, territorial disputes are overwhelmingly won by the resident prior to any actual fighting. Rather, behavioral displays, such as stretching out the neck, are highly effective in causing the intruder to immediately flee (Nelson, 1984). Humans, likewise, can communicate dominance to each other through particular behavioral displays. For example, one meta-analysis of 74 studies showed a significant relationship between vertical social standing (e.g. power, dominance, status) and increased facial expressiveness, postural expansion, and increased interpersonal distances (Hall, Coats, & LeBeau, 2005). Eye gaze also appears to be closely tied to vertical social status in humans. The visual dominance ratio, the percentage of gaze maintained while speaking divided by the percentage of gaze maintained while listening, reveals a positive linkage between power and maintaining gaze (Dovidio & Ellyson, 1982). Either avoiding or increasing one's eye contact with an outsider is one way in which a resident can either

encourage or discourage others from entering his or her space (Edney & Jordan-Edney, 1974).

Rather than displaying dominance towards the potential intruder, one's nonverbal activity towards the setting may also indirectly communicate and reinforce one's claim to ownership over the space. Thus, rather than being threatening, a resident can instead merely seek to avoid conflict by making the boundaries that define the territory more explicit. For example, Werner, Brown, and Damron (1981) observed behavior in an arcade to see how non-utilitarian touching is used to maintain temporary public territories in high-demand locations (i.e., in front of a particular videogame machine). They found that players more frequently touched the machine when they first began to play the game and more when they were approached by a stranger, relative to when they were approached by a friend. Increasing physical contact in this way helps the resident to lay claim to the space, making potential competitors aware of one's relationship with the setting.

Marking Behavior

In addition to communicating directly with intruders, a resident may also physically alter a setting in some way to indirectly communicate their ownership over the space. Behavior of this sort is known as *marking*. Territorial species differ in terms of the means by which they mark their territory, but in all cases it is done in ways that express socially meaningful information to its conspecifics. For example, numerous animal species deposit their scent, either via their urine or specialized scent glands, to mark off particular areas. Complementing these olfactory markers, certain species may also leave visual information to others. Leopards have been found to mark off their territories by

clawing trees (Bothma & Coertze, 2004), and male white-tailed deer will use their antlers to strip the bark off of trees (Marchinton & Kile, 1977).

In a similar way, marking behavior in humans also involves altering the setting in ways that communicate socially meaningful information to others. Of course, for humans, such marking behavior generally involves the use of symbols and artifacts, rather than direct body-related byproducts (although, behavioral residue is not irrelevant for humans either; Gosling et al., 2008). Humans may leave long term markers in primary territories (e.g., putting family photos up in one's home), as well as placing markers to maintain temporary, public territories (e.g., leaving a coat jacket on a movie theater seat). Nevertheless, in both cases the action reinforces and reflects the resident's connection to the physical location. Two basic forms of marking behavior are evident in humans: those that communicate the resident's control over the space, and those that communicate the resident's identity (Altman, 1975; G. Brown, 2009; G. Brown et al., 2005).

Control-Oriented Marking

The purpose of control-oriented marking is to communicate the boundary of a territory to others, so as to control access to the space. Unlike anticipatory defenses, control-oriented markings have power only in terms of their ability to communicate socially normative information. For example, a tall wall covered in barbed wire is able to physically prevent an intruder access to a restricted area. In contrast, a small picket fence surrounding a suburban home, though physically unable to prevent a motivated person from scaling and entering the yard, nevertheless clearly defines the boundaries of the territory. Control-oriented markings are therefore efficacious only if violating the

marker's message has social consequences (e.g., a confrontation with the resident, trespassing police charges).

In public territories, objects are often placed in the space to communicate possession and the boundary of one's area of occupancy. Sommer and Becker (Becker, 1973; Sommer & Becker, 1969), for example, conducted a series of experiments to observe how seating at a college study hall could be reserved by an occupant. Interestingly, even a small object, such as a wrapped sandwich or book, could successfully reserve an entire table for a substantial period of time. However, different markers had different success rates: objects that represented the owner more clearly (e.g., a jacket, a notebook) reserved the space for a greater length of time than did less identified objects (e.g., an academic journal). Masculine objects have also been found to be more effective in protecting a territory in certain cases (Shaffer & Sadowski, 1975), potentially reflecting differences in the physical risks incurred by invading. Control-oriented markers can also be employed in public settings to expand the boundaries of one's territory over time (Edney & Jordan-Edney, 1974). In fact, in a library setting not unlike those studied by Sommer and Becker, markers have been shown to be capable of successfully displacing occupants who briefly leave the space and return (McAndrew, Ryckman, Horr, & Solomon, 1978). Staking claim to a space through physical objects therefore appears to be a surprisingly robust way to exclude others' access, even in the face of lengthier occupancy by another.

Despite evidence for the efficacy of control-oriented marking in temporary locations, infringement in these settings is likely to produce conflicting motives in occupants: boundary invasion elicits a flight response if construed as a personal space

violation, but it will produce a defensive fight motivation if viewed as a territorial infringement (Becker, 1973; Becker & Mayo, 1971). In primary territories, however, the role of control-oriented markers is less ambiguous. For example, certain types of territorial markings have been shown to be successful in reducing the incidence of burglary. Notably, burglarized houses tend to have more public qualities, whereas nonburglarized houses tend to have markers that communicate privacy, such as enclosed back yards and evidence of maintenance, such as sprinklers (B. B. Brown & Altman, 1983; B. B. Brown & Bentley, 1993). Importantly, the presence of control-oriented markers does more than just inhibit a potential intruder's capacity to invade. Rather, these markers also communicate something about the resident. People are able to infer the strength of a resident's territorial attitudes and commitment to the space from the number of markers present in the setting (Brower, Dockett, & Taylor, 1983; Harris & Brown, 1996). Thus, how one chooses to communicate the boundaries of a territory appears to indicate to intruders the potential risks involved in violating them.

Identity-Oriented Marking

The second type of territorial marking involves altering the space to reflect the residents' own identity. Rather than simply communicating possession or control over the space, an identity-oriented marker expresses information about who that occupant is. For example, residents may display particularly meaningful objects within the setting, such as photographs of family and friends, artwork and decorations, or objects representing a favorite hobby. Moreover, the setting can itself be arranged in such a way as to communicate aspects of the resident's taste, style, and preferences.

According to Gosling and his colleagues (Gosling et al., 2008; Gosling et al., 2002), identity-oriented markings are the product of multiple, though non-mutually exclusive, motivational mechanisms. Most consistent with the traditional territorial construct, *other-directed identity claims* are those display symbols that seek to make statements to others about how the resident would like to be regarded. Bumper-stickers (Szlemko et al., 2008) and office door decorations (Sandilands & McMullin, 1980) are particularly likely to be other-directed, in light of the fact that the objects are rarely within the perceptual field of the resident. Because these are intentionally communicative, it is possible for a resident to use such markers to purposely deceive a visitor. *Self-directed identity claims*, in contrast, are environmental adornments that are symbolic statements made for the individual's own benefit, in order to reinforce one's self-concept. For example, prominently displaying an object with sentimental meaning (e.g., a rock from one's childhood yard) will communicate little to outsiders, but would strongly reinforce to the owner his or her personal narrative. Finally, Gosling et al. (2008) also note the existence of what they call *behavioral residue*, physical traces left in the environment following the resident's previous activity. An artist will likely have sketches or paint lying about, a musician may have instruments readily accessible, and an athlete will probably have running shoes near the door. Though less direct, this residue generally reflects repeated behaviors and therefore also provides information about residents' personalities.

Although conceptually distinct, these various forms of environmental markings are not mutually exclusive. For example, what was originally simply behavioral residue may become a more overt and conscious identity display over time. For example, skis

near the door may originally be simply the physical traces of a recent mountain vacation, but by leaving these skis out the resident may be choosing to communicate a particular, athletic persona to those that enter. Moreover, most displays are likely to communicate both self-reinforcing information to the resident as well as new information to a visitor. In fact, a substantial body of supporting evidence now exists to suggest that homes and offices communicate surprisingly veridical information to outsiders about the personalities and characteristics of inhabitants (Gosling et al., 2002; McElroy, Morrow, & Ackerman, 1983; Sadalla, Vershure, & Burroughs, 1987; Wells & Thelen, 2002).

Unlike control-oriented marking, identity-oriented markers do not clearly communicate the boundaries or scope of a territory. Nevertheless, they too may aid in the preventative defense of a space by clearly communicating the fact that the space is, in fact, possessed by a particular individual. Supporting this, objects in temporary territories that are personally identifying (e.g., a notebook or diary) are more successful at reserving space than are generic objects without obvious owners (Sommer & Becker, 1969). It therefore seems that invading a space is less likely if the identity of the occupant is unambiguous. Moreover, if active defense is necessary, the presence of self-directed identity claims may motivate a resident to better defend the space, as it becomes more personally meaningful and costly to lose. Thus, identity displays increase individual attachment to the setting. Consistent with this, a pair of studies found that the way in which students decorated their dorm room positively predicted whether the student would remain at the university the rest of the year (Hansen & Altman, 1976; Vinsel, Brown, Altman, & Foss, 1980). Personalizing a setting leads to greater investment and longer anticipated occupancy. Notably, it is because of this that the relationship between the

resident and the territory is bi-directional. Even as the setting reflects the inhabitant's identity as a result of personalizing activity, it also helps to shape and redefine the resident's identity over time (Belk, 1992).

Active Defense

Despite the measures taken to prevent invasions into one's space, intruders may nevertheless enter. When this occurs, the resident will have to engage in some form of direct, competitive conflict with the outsider. In the case of territorial animals, an attacking intruder typically seeks to displace the resident and claim the setting as its own. In modern human society, however, this type of violent territorial conflict that poses the risk of displacing the resident is comparatively rare.² What is more common in human territories is antagonistic or competitive interactions between a resident and a visitor, which have a more symbolic association with territorial disputes. That is, although humans are rarely forced out of their territories by an intruder, they may nevertheless be challenged in various ways while in their home turf, which may be thought of as *violations* (Lyman & Scott, 1967).

What is notable is not just a resident's motivation to fight off encroachers, but the discrepant outcomes associated with these competitive contests. Specifically, the possession of a territory appears to grant residents "some mysterious advantage" (Ardrey, 1966, p. 52) that allows them to prevail over visitors a disproportionate percentage of the time, a phenomenon referred to as the *prior-residence effect* (Braddock, 1949) or the *home-field advantage* (Allen & Jones, 2014; Schwartz & Barsky, 1977). This effect has

² Military invasions are a notable exception to this, which have been viewed by some as largely equivalent to the violent raids observed in certain primates (e.g., Ardrey, 1966). However, Taylor's (1988) socio-evolutionary view limits territorial functioning to small group interactions, differentiating territorial defense in the classic sense from attitudes and behaviors taken to defend a country.

been demonstrated across three broad domains of research: (1) territorial disputes between animals, (2) sports competitions, and (3) decision-making and zero-sum negotiations. After describing of the empirical work in each area, I will discuss how the territorial defense account explains these findings by attributing outcome discrepancies to residents' aggression and dominance motivation.

Conflict between Animals

The prior-residence effect is an old and well-established concept within the field of ethology (Braddock, 1949). Many animal species, when inhabiting a shared geographic region, regularly engage in combat to determine dominance. Using both naturally occurring field observations (i.e., the researcher monitors conflict within a particular region over time) and experimental procedures (i.e., the researcher artificially places two animals in the same region under controlled conditions), ethologists have tested whether previous occupancy of the space predicts a greater likelihood of overcoming one's opponent. Consistently, and across a wide variety of species, outcomes tend to favor the earlier resident. Notably, this effect is not simply dependent on the resident's pre-existing strength, which may be confounded if it has greater access to resources prior to combat. Instead, experimental tests of this effect indicate that owners win confrontations more often even when there is no apparent difference in fighting ability between the contestants (Fayed, Jennions, & Backwell, 2008; Leimar & Enquist, 1984) and in some circumstances even when the intruder has a size advantage (Figler, Wazlavek, & Chaves, 1988).

A particularly large body of work exists for this effect among fighting fish species, which are easily observable and lend themselves to experimental tests in highly

controlled tank ecosystems. Those species showing a prior-residence advantage in aggressive conflict include betta fish, Atlantic salmon, and cichlids (Braddock, 1949; Bronstein, 1985; Figler, Canoune, & Kitner-Triolo, 1986; Figler & Einhorn, 1983; Figler & Evensen, 1979; Figler & Peeke, 1978; Figler, Wazlavek, Spencer, & Gussio, 1985; Gómez-Laplaza & Morgan, 2000; Johnsson & Forser, 2002; Kvingedal & Einum, 2011). Certain bird species are also known to be amongst the most territorial of animals and, when in flocks or during paired interactions, form observable status hierarchies. Here too, prior residence predicts greater interactional dominance across a number of species, such as sparrows (Snell-Rood & Cristol, 2005), juncos (Nolan Jr & Ketterson, 1990), blackbirds (Beletsky & Orians, 1989), robins (Tobias, 1997), and woodhoopoes (Radford & Du Plessis, 2004). The prior-residence effect has also been observed in simple insects and arachnids, such as fruit flies (Papaj & Messing, 1998), butterflies (Takeuchi & Honda, 2009), and spiders (Riechert, 1979), as well as in more complex organisms, like frogs (Baugh & Forester, 1994), elephant seals (Haley, 1994), and rutting species, such as kobs and chamois (Ardrey, 1966; Corlatti et al., 2013). A review of this work by Kokko, López-Sepulcre, & Morrell (2006) offers a list of over 100 species for whom the prior-residence effect has been evaluated.

Explaining why this phenomenon occurs was one of the first applications of game theory by ethologists (Maynard Smith, 1982; Maynard Smith & Price, 1973). This approach has sought to explore the apparent adaptive benefits of what has been called a *bourgeois strategy* (Maynard Smith & Parker, 1976), in which one acts aggressively only when in the role of defender of a territory. Because defending a territory entails energetic costs associated with fighting off intruders, the emergence of the prior-residence effect

appears necessary to sustain territoriality as a population-wide behavior, for without a greater likelihood of winning such contests this spatial behavior would not have been selected (Hinsch & Komdeur, 2010). This work tends to view the prior residence advantage as the product of enhanced aggressiveness on the part of a resident, specifically because there are greater costs associated with losing a fight (Jansen et al., 2011; Nijman & Heuts, 2000; Riechert, 1979). This value-asymmetry promotes greater investment in winning the fight among residents, and therefore the need to dominate. Consistent with this, some evidence suggests that the prior-residence effect is strongest when the habitat is worth more in terms of available resources (Kvingedal & Einum, 2011). This greater need to possess the setting makes residents more willing to attack first (Bronstein, 1985; Figler et al., 1986; Figler & Peeke, 1978; Rosell, Gundersen, & Le Galliard, 2008), which will also communicate to intruders the risk of continued attacks if their stay is prolonged. This, in turn, will make the value of the space much weaker for intruders, encouraging an earlier retreat. Thus, possessing a territory will only be adaptive if the resident remains vigilant about intruders and acts aggressively in response to them. By immediately attacking and displacing the invader at the first sign of an encroachment, the resident will be able to limit the costs associated with prolonged, hostile interactions and continual monitoring of environmental resources.

Sports Competition

Among humans, sports scientists have produced the largest body of empirical work assessing performance in terms of one's relationship to the physical environment. Here, researchers have investigated how performance outcomes are related to playing in one's own field, stadium, or arena, relative to playing in the opponent's turf. This work

has revealed an effect known as the *home-field advantage*, “a consistent finding that home teams in sport competitions win over 50% of games played under a balanced home and away schedule” (Courneya & Carron, 1992, p. 13). Here too, the effect appears to be quite robust, as it has been evaluated across a diverse range of athletic competitions. Home advantage has been found in many team sports, including baseball (Courneya & Carron, 1991; Romanowich, 2012), basketball (García, Sáez, Ibáñez, Parejo, & Cañadas, 2009), hockey (Bray, 1999; McGuire, Courneya, Widmeyer, & Carron, 1992), soccer (Pollard, 1986, 2006a; Seçkin & Pollard, 2008), handball (Oliveira, Gómez, & Sampaio, 2012), and rugby (Gómez, Pollard, & Luis-Pascual, 2011). An advantage for home players has also been shown in individual sports, such as tennis (Koning, 2011), speed skating (Koning, 2005), and wrestling (Gayton & Langevin, 1992; McAndrew, 1993). Moreover, the effect does not appear to be limited to professionals: Amateur and student athletes are also more likely to win games in their own venue (Gayton & Coombs, 1995; Madrigal & James, 1999).

A recent meta-analysis of 87 studies covering ten different sports found that home teams win approximately 60% of all matches (Jamieson, 2010). Nevertheless, the size of this advantage does vary substantially by sport. The effect appears to be largest for soccer (67%) and rugby (64%), and lowest for baseball (56%). What explains this variability? Contrary to claims that home players may “choke” and perform worse in high-pressure situations (Baumeister & Steinhilber, 1984), Jamieson (2010) found that the advantage was larger the more important the game (e.g., during playoff games). Thus, players appear to benefit more from being at their home field in sports with shorter seasons, where winning each match is critical. Others have noted that the advantage appears to be

strongest for sports that are more continuous, viz. those having fewer breaks and timeouts (Gómez et al., 2011; Stefani, 2008; Tsonis & Tsonis, 2001). Such breaks allow coaches to intervene, slow the momentum of opposition, and reorganize players, which are opportunities that may attenuate the benefits for the home team.

For sports scientists, the primary explanation for these superior outcomes was first suggested to be the social support offered by spectators (Schwartz & Barsky, 1977). For home players, a successful play results in an overwhelmingly positive response from the supportive audience. Superior performance by the visitor, on the other hand, fails to produce such positive feedback, or even draws a hostile response from the crowd. As a result of this dramatic difference in reinforcement processes, home players should be more motivated to perform than visitors. Additionally, besides impacting the play of the actual participants, partisan crowds have also been thought to alter outcomes by influencing the judgment of the referee. Noise from the crowd provides the officiating crew with a heuristic for interpreting otherwise ambiguous events, such as whether or not to call a foul (Boyko, Boyko, & Boyko, 2007; Downward & Jones, 2007; Greer, 1983; Nevill, Balmer, & Williams, 2002; Unkelbach & Memmert, 2010).

However, more recent research on this topic now suggests that crowd support is unlikely to provide a comprehensive account of the advantage. For example, if benefits are garnered from large and passionate crowd support, one would expect that the home advantage should be larger when there are bigger crowds. However, the number of spectators does not appear to be positively related to the size of the effect (Clarke & Norman, 1995; Gómez et al., 2011; Pollard, 1986). Moreover, Pollard (1986) found that crowd density also did not appear to be related to the magnitude of the home advantage.

In fact, there is some evidence that home teams tend to win more often even when games are played without an audience (van de ven, 2011), and even in the unusual circumstance where the majority of the crowd supports the visitors (Salminen, 1993).

An alternative perspective has developed out of the aforementioned literature on animal conflict, which seeks to explain the home advantage in terms of a similar territorial defense motivation (Morris, 1981). According to this perspective, a visiting player or team represents a symbolic invasion or violation of one's territory, be it a particular field or stadium. This elicits a protective response to defend the territory, which produces an increase in competitiveness and motivation to dominate on the part of the home team. Pollard and colleagues (Pollard, 2006b; Pollard & Gómez, 2009) have attributed regional differences in the magnitude of the home advantage in soccer games to stronger cultural attitudes regarding territorial defense. For example, the advantage appears to be larger in countries with a history of occupation, greater regional autonomy, and distinct cultural identities, such as the Balkans in Europe and Ecuador, Peru, and Bolivia in South America. Territorial aggression has also been employed to explain differences in the effect between sports. Gómez et al. (2011), comparing nine different sports in Spain over the same time period, found rugby to have the largest home advantage. They suggest that the large home advantage found in rugby is attributable to the particularly violent nature of the sport, which requires bodily contact and continually seeking to gain ground over opponents. The sport with the lowest home advantage in their analysis, volleyball, is by comparison far less directly physical.

Testing this idea at the individual level, studies have also sought to assess how hormonal levels indicative of territorial aggression may differ prior to either home or

away games. Measures of the steroid hormone testosterone in particular have been thought to provide information regarding aggression and dominance motivation. Among animals, raising testosterone experimentally leads to increased aggression (Monaghan & Glickman, 1992), and territorial conflicts have been shown to raise levels of the hormone in both birds (Wingfield & Wada, 1989) and mice (Fuxjager, Mast, Becker, & Marler, 2009). Although this relationship has been more equivocal in human studies (Archer, 1991), testosterone is still generally judged to be positively related to aggression and dominance (Eisenegger, Haushofer, & Fehr, 2011; Mazur & Booth, 1998; Montoya, Terburg, Bos, & van Honk, 2012). Testosterone is believed to serve a role in striving for and maintaining social status, conferring high motivational drive and reduced inhibition (Eisenegger et al., 2011).

Testing this perspective in the context of athletic competitions, Neave and Wilson (2003) found that the salivary testosterone levels of soccer players were significantly higher before a home game. Moreover, these levels were particularly high when playing an extreme rival team. Higher levels of testosterone were also found for hockey players playing at home compared to playing away (Carré, Muir, Belanger, & Putnam, 2006), although this result indicated that testosterone levels actually dropped for visitors, rather than increasing in residents. In light of this work, there is now a growing belief that a territorial defense motivation may elicit enhanced performance by home players. In fact, Panyaarvudh (2012), a reporter at *The Nation*, describes how Chelsea F.C., a London soccer team, have installed lockers in the away changing room to be low to the ground, forcing the visiting players to bend down and adopt submissive postures prior to the start of the game. Lockers in the home team's dressing room are, in contrast, larger and

higher, thereby making home players take expansive posture. This bit of gamesmanship represents an attempt to enhance the relative dominance of their own team and reduce the testosterone levels of their opponents. Nevertheless, the specific behavioral means by which dominance and testosterone could improve performance in these sporting contexts remains largely unevaluated.

Decision-Making and Negotiation

Because sports involve physical competition between adversaries, drawing parallels between athletics and animal fights can seem like an intuitively satisfying analogy. However, humans can engage in many other forms of competition that are non-physical but may still demonstrate outcomes consistent with an advantage for residents elicited by a territorial defense motivation. One such domain that has garnered some empirical attention is verbal competition, such as zero-sum negotiations or debates. Here too, evidence exists for a home advantage for residents.

The earliest study in this vein was conducted by Martindale (1971), who had students debate a fictional criminal case in a college dormitory, with one student acting as the prosecutor and the other as a defense attorney. The goal of the dyad was to decide upon an appropriate prison term. He found that the agreed upon prison sentence was substantially shorter when the defense attorney was at home, compared to when the prosecuting attorney was home. In fact, the territory of the attorneys accounted for 30% of the variance in the outcome. By comparison, the dispositional dominance of the participants accounted for just 1%. Notably, residents were also found to spend a significantly greater amount of time speaking during the conversation than visitors, essentially dominating the discussion. Similar results were found by Taylor and Lanni

(1981) for triadic discussions: Group decisions reached on a contentious issue were most closely related to the original position of the resident, relative to the other two participants. Again, this held true regardless of the participants' dispositional levels of dominance. Conroy and Sundstrom (1977) also observed similar speech behaviors in resident-visitor conversations. They found that when the pair disagreed with one another, residents spoke significantly more than visitors, and were more likely to be deferred to when participants began to speak simultaneously. However, this was true only when the pair disagreed. When their opinions were similar, visitors actually spent more time speaking than residents, suggesting what the authors called a *hospitality effect*. Thus, dominant behaviors only emerged during negative interpersonal interactions.

Additionally, people in their primary territories appear to be more resistant to persuasion generally. For example, Harris and McAndrew (1986) had researchers approach college students to sign a counter-attitudinal petition, either in their primary territory (dorm room), a public territory (library table), or a nonterritory (walking around on campus). They found significantly less compliance among those approached in their territories. Interestingly, the home advantage in decision-making tasks appears to develop quite early in life. In a study of Chinese kindergartners, Han, Li, and Shi (2009) paired children, so that one was in his or her own classroom and the other a visitor, and observed outcomes on: (1) a dictator game, where one participant allocates to the other person a portion of an initial fund (i.e., a certain number of cookies), and (2) an ultimatum game, in which two players agree on how to split the pot, with one player making an offer and the other given the choice to either accept or refuse. On both tasks, children in their own classrooms achieved a net gain compared with the visiting children.

Brown and Baer (2011) recently sought to test whether monetary negotiations over the price of products would similarly be influenced by location. Notably, they manipulated resident status experimentally, comparing resident-visitor, resident-neutral, and neutral-visitor combinations. Here, visitors were led to believe that they were entering the other person's office, whereas those in the neutral condition believed the setting belonged to a third party (see Chapter 4 for a lengthier discussion of this procedure). This experimental design allowed for an analysis of whether outcome differences would be due to a home advantage or a visitor disadvantage. As expected, residents outperformed both visitors and neutrals, indicating a clear home advantage. However, neutrals also outperformed visitors, suggesting a simultaneous visitor disadvantage.

What causes an advantage in decision-making and negotiation tasks like these? The studies that focused on language use (Conroy & Sundstrom, 1977; Martindale, 1971) adopted an explanatory paradigm largely consistent with the territorial defense account, focusing on speaking frequency as a reflection of social dominance. That is, resident status was related to overtly seeking to control the conversation. Higher levels of power are associated with initiating competitive actions, such as making the first offer in a negotiation (Magee, Galinsky, & Gruenfeld, 2007). This greater assertiveness may allow residents to gain the initial upper hand. Moreover, aggressive tactics, such as expressing anger and using threats, have been shown to be capable of producing concessions from negotiators (Sinaceur & Tiedens, 2006; Sinaceur, Van Kleef, Neale, Adam, & Haag, 2011; van Kleef, De Dreu, & Manstead, 2004; van Kleef, De Dreu, Pietroni, & Manstead, 2006). However, anger appears to be effective only when it is genuine. Simply faking

anger, in contrast, actually produces more intransigence in recipients, leading to worse outcomes for the negotiator (Côté, Hideg, & van Kleef, 2013). Increased arousal has also been shown to improve negotiation outcomes, but only when the speaker has positive attitudes about negotiation generally (A. D. Brown & Curhan, 2013). It is therefore possible that a defense motivation among residents leads to increased arousal and more aggressive tactics, which in turn provides an advantage. This pathway has not been empirically tested, however.

Alternatively, Brown and Baer (2011) found that confidence partially mediated the observed outcome discrepancy, and that an intervention aimed at increasing visitor confidence could negate the effect. They suggest that confidence leads to setting higher performance goals (Kray, Thompson, & Galinsky, 2001), which allows the resident to better sustain a certain strategy or course of action. However, it is unclear how confidence is manifested behaviorally so as to actually improve negotiation performance among residents. It is also notable that confidence is itself likely related to interpersonal dominance, as a person in a perceived position of power will feel more secure in their ability to achieve desired outcomes.

Chapter Summary

The bulk of work studying territorial behavior has sought to evaluate the ways in which individuals defend space from others. This motivation to defend is manifested in anticipatory actions, such as marking, as well as reactionary behaviors, such as actively confronting invaders. A critical and robust finding in regards to the latter is that, when engaging with an intruder, residents tend to prevail a disproportionate amount of the time. This prior-residence effect has been observed across a wide range of species during

physical conflicts, but it has also been found in humans during more symbolic invasions of space, as in sporting contexts. Territorial explanations for this phenomenon have focused on the dominance motivation presumed to be driving resident behavior following a visiting opponent's encroachment into or violation of one's territory. Thus, the presence of an intruder is believed to trigger a defense response, resulting in a spike in testosterone and an increase in aggression on the part of the resident. Although this explanation is appealing because it can be applied to both animal and human interaction, in the next chapter I will describe some of its apparent limitations.

Chapter 3

An Alternative Account of Home Advantage

In the previous chapter, I provided a review of the literature on territorial behavior, which has been framed around the defense of space by residents. However, it is worth considering again the definition of territorial functioning offered by Taylor (1988):

[Territoriality is] an interlocked system of attitudes, sentiments, and behaviors that are specific to a particular, usually delimited, site or location, which, in the context of individuals in a group, or a small group as a whole, reflect and reinforce, for those individuals or groups, some degree of excludability of use, responsibility for, and control over activities in these specific sites. (p. 81)

Although the previous work described in Chapter 2 has explained behaviors relevant to how one can exclude others use of a space, and sought to account for behavioral outcomes during competition in these terms, this work has much less to say about the behavioral implications of having responsibility for and control over a setting. This aspect of being embedded in a territory should be particularly important in humans, whose normative activities within their homes, offices, and other primary territories are unlikely to be predominantly combative or competitive. Rather, much of what they do in these settings is done either alone or in the company of other people that one chooses to have there.

In the current chapter, I will first describe several potential limitations that the territorial defense account may have in explaining home advantage. As an alternative, I will provide an outline of the theory of the organism-environment system (Järvillehto, 1998a, 2009), an approach that draws on ecological theorizing (J. J. Gibson, 1979) to explain human activity as an emergent property of the interrelationship between a person

and the environment. I will then discuss the implications of this theoretical framework for understanding the behavioral outcomes that occur within a territory. Specifically, I will propose that the enhanced performance of residents relative to visitors is the product of the relationally defined information and reciprocal dynamics that exist between a resident and a territory as elements of a single system. This will inform the rationale for the empirical work to be explored in the remainder of this document.

Problems with the Defense Account

The territorial defense account of home advantage argues that residents tend to prevail because of their “protective response to an invasion” (Neave & Wolfson, 2003, p. 270). This response involves an increase in aggression and one’s motivation to dominate others, reflected in spikes in testosterone production. However, there are several potential limitations to the explanatory power of this proposal for the domains described in Chapter 2.

First, in sporting contexts, there is little evidence that home teams actually act more aggressively than visitors (Jones, Bray, & Olivier, 2005). In fact, some studies have actually found the visiting team to engage in more aggressive play (Lefebvre & Passer, 1974; Thomas, Reeves, & Smith, 2006). It is notable that explanations for increases in visitor aggression typically attribute this response to the times when players are losing and frustrated. Additionally, self-report measures of affective state also fail to show evidence of the negative arousal assumed to be produced by territorial encroachment, which should be a catalyst for dominance motivation. Several studies have found little difference in terms of mood or anxiety between residents and visitors (Bray & Martin, 2003; Polman, Nicholls, Cohen, & Borkoles, 2007). On the contrary, athletes playing at

home are instead more likely to engage in psychological performance strategies prior to matches that reflect reductions in negative affect, such as relaxation, self-talk, and mental imagery (Thelwell, Greenlees, & Weston, 2009). Home players therefore seem to be more likely to actively seek to inhibit excess arousal, suggesting that, if anything, the advantage would derive from enhanced emotional stability and control.

Secondly, even if residents did exhibit greater aggression and dominance motivation, it is not at all self-evident that this would be universally beneficial in terms of performance outcomes. In a sporting context, excess aggression can easily lead to committing more fouls, a decidedly negative outcome (Thomas et al., 2006). Moreover, when considering specifically the potential role of testosterone spikes, it is important to note that this hormone appears to be related only to very specific types of human aggression. For example, there exists reactive aggression, which is typically a physical response to provocation, as well as offensive aggression, which is a more instrumentally goal-driven form of aggression (Eisenegger et al., 2011). The additional complexity of the latter, which may involve purely psychological and subtle forms of aggression, complicates the territorial defense story, as it does not appear to be tied to testosterone levels (Josephs, Mehta, & Carré, 2011). Intuitively, one would expect that higher-order, goal-driven forms of aggression would be more predictive of successful outcomes in humans, rather than purely reactionary responses. Additionally, in certain circumstances high levels of testosterone are actually associated with worse behavioral functioning in athletic contests. For example, Mehta, Wuehrmann, and Josephs (2009) found that high testosterone was related to worse performance during intergroup competition (i.e., when in teams), presumably because it inhibited effective, cooperative coordination within

groups. Such a finding is challenging for a testosterone-related explanation of home advantage, in light of the consistent evidence of the effect found in team sports (Jamieson, 2010).

The relationship between testosterone levels and cognitive performance has also been rather equivocal. Traditionally, testosterone has been thought of in the medical community as very important: Clinical studies of elderly men have generally concluded that low levels of testosterone lead to a much greater risk of various cognitive impairments (Holland, Bandelow, & Hogervorst, 2011; M. F. Warren, Serby, & Roane, 2008). In this population, positive associations are generally shown for testosterone levels and global cognition. However, other work has found negative relationships between testosterone levels and performance for certain types of cognitive tasks, such as those measuring working memory and spatial ability (Lacreuse, Chiavetta, Shirai, Meyer, & Grow, 2009; Matousek & Sherwin, 2010; O'Connor, Archer, Hair, & Wu, 2001; van Anders & Watson, 2007). It now seems more likely that there is a curvilinear association, with some optimal level of testosterone needed for best cognitive functioning (Holland et al., 2011). Again though, it remains unclear whether cognitive performance benefits can be expected from more temporary increases in the level of the hormone in the general population, particularly if excess amounts ultimately reduce effective functioning.

One cognitive outcome that has been experimentally shown to be linked with levels of testosterone is risky decision making (Peper, Koolschijn, & Crone, 2013; Stenstrom & Saad, 2011; van Honk et al., 2004). That is, the hormone appears to reduce sensitivity to punishment, but increase reward sensitivity and reward dependency. As a result, although testosterone may encourage positive goal striving, this has been shown to

result in certain disadvantageous patterns of decision-making that ignore the potentially negative consequences of certain actions (van Honk et al., 2004). When considering resident behavior during negotiation tasks, for example, the benefits thought to exist for aggressive strategies may therefore be far from unequivocal. Mutual trust is a critical component of effective negotiations (Thompson, Wang, & Gunia, 2013). Mistrust, in contrast, will lead to reluctance to share information or refusal to believe the promises of the other party. Risky and aggressive decision-making strategies may ultimately sever these interpersonal bonds, thereby harming chances of a beneficial outcome. For example, anger at the other party reduces motivation to work with the other person in the future, hindering one's ability to realize successful resolutions in certain contexts (Allred, Mallozzi, Matsui, & Raia, 1997). Similarly, in ultimatum-type games, negotiators expressing negative affect are least likely to have their offers accepted, relative to those displaying positive or neutral dispositions (Kopelman, Rosette, & Thompson, 2006). This collection of empirical work raises, at the very least, a number of issues and potential caveats regarding the claims made by the territorial defense account of home advantage. Although a spike in testosterone may boost dominance and status-seeking motivation, the degree to which this by itself can act as a catalyst for seemingly universally enhanced performance is questionable, considering the costs to cooperation and effective decision-making it may also bring.

In addition to these issues regarding its ability to adequately address predictions regarding competitive contests, three additional concerns about the comprehensiveness of this approach are also worth briefly noting. First, the territorial defense explanation assumes that the effect is driven wholly by the behavior of the host: a visitor enters the

resident's territory, which produces a physiological and psychological effect on the host. However, in most studies, the assumed home advantage is confounded with the possible alternative explanation of a visitor disadvantage. In actuality, some ethological work suggests that a lack of familiarity with one's surroundings may be a far more powerful factor in determining subsequent behavior than prior experience is (Beauchamp, 2000; Nikaido & Nakashima, 2009). Thus, it may be that visitor performance is dramatically inhibited by their entering someone else's territory, whereas host performance remains relatively stable. Brown and Baer's (2011) study of negotiation found some initial support for a visitor disadvantage.

Second, the territorial defense account predicts that a home advantage emerges only in a competitive social context. However, people regularly perform a variety of challenging tasks at home that may be done alone or cooperatively with other people (e.g., doing homework, solving crosswords, playing board games, exercising). It is quite possible that being in one's home territory provides a more general benefit to its residents, regardless of whether they have an actual opponent in the setting. As will be discussed below, there is at least some tentative, empirically supported reasons for believing that they do (e.g., Provencher, Demers, Gagnon, & G  linas, 2012). An account focusing exclusively on defense motivation will have very little to say about these types of tasks.

Third, despite being a theoretical perspective that emerged out of the field of environmental psychology, the environment actually plays very little role in this explanation of the positive outcomes of residents. That is, the causal mechanisms for performance differences are purely internal, affective and hormonal processes. As a

result, what goes unaddressed here are the behavioral consequences of actually being embedded within a particular physical setting that has functional and social meaning for its occupants. One would think that the territory itself should be critically important, as the relationship between an occupant and the behavioral opportunities offered by the environment is ultimately what allows for the realization of particular behaviors and outcomes. This latter concern will provide the critical framework informing the ecological approach to be described.

Developing an Alternative Framework

With these existing limitations in mind, I will next begin to outline an alternative perspective. I will first describe the limitations of the traditional mechanistic, stimulus-response framework that has dominated how psychologists tend to discuss the way animals relate to the physical environment generally. The territorial defense account of home advantage is an example of this approach. I will then draw on ecological theory (J. J. Gibson, 1979; Reed, 1996a) to describe a different perspective, which seeks to conceptualize behavior as an emergent property of a unitary animal-environment system (Järvilehto, 1998a). This broader, meta-theoretical perspective will provide a relational way of understanding resident behavior – one that depends critically on both the actor and the physical setting itself. This perspective will stand in clear contrast to the internally-driven territorial defense account.

Mechanistic, Two-System Theories of Psychological Activity

A territory, as a concept, reflects a particular type of relationship between a person and a physical setting. However, even in general terms, the nature of how humans and environments relate to one another is a controversial and challenging issue that has

hung over psychology and its scientific study for many centuries. Descartes is famously credited with establishing the now prevalent mind-body dualism that exists in much of modern thought, which contrasts the physical world with the mental world (Reed, 1996a). The distinction between the hard and soft sciences, or the physical and social sciences, reflects the clear dichotomy created within academia between the natural world and the world of people. Humans are treated as distinct from animals, interpreting and projecting meaning onto the world, with their physical environments serving largely as the backdrop for this activity. As a result, the mental processes of humans have been held up as the true realm of interest, with the environment serving a largely perfunctory role. As Järvillehto (1998a) notes, “The basic characteristic of human beings has usually been considered to be their inner life, their mental activity and consciousness. This is connected with the idea that man and nature stand against each other: man as a thinking subject, inhabitant of culture and user of knowledge, and nature as something rudimentary and vulgar” (p. 321). The mental and the physical then are viewed as two separable, but interacting systems (Järvillehto, 1998a, 2009).

This distinction between the external world of nature and the internal world of the mind has framed the way in which psychological processes are traditionally explained and understood. To explain how these separable systems interact, psychological theories have generally relied on mechanistic accounts consisting of the linear processing of environmental stimulation. For example, the earliest behaviorists characterized this process in terms of stimulus-response reflexes: an external factor is sensed by an organism, which then triggers a sequence of events leading to behavior. Although more modern cognitivist theories contrast themselves with the simplicity of the behaviorist

worldview, in reality even here there remains a strong commitment to the stimulus-response framework (Costall, 2001). Cognitive psychologists, though focusing on the mediating steps between the stimulus and response, do not dramatically change this basic account: Some independent feature of the external world is sensed, then analyzed, and then responded to. In fact, cognitivism essentially exacerbates the distinction between these two systems. In order for mental processes to respond to the external world, sensations must be translated, or constructed, into representations stored somewhere within the mental realm. Reed (1996a) characterizes cognitive science as wholly derived from this assumed process:

Many psychologists have argued that the task of the brain or mind is to construct a “model of the world” (Craik, 1943). The idea is that the animal must collect, collate, and interpret stimuli until it has a model of the world that is adequate to let it issue commands that will cause its body to move in appropriate ways. With the increasing technological fetishism of modern science, this idea has become so popular that an entire discipline – cognitive science – has been built up around it.... The one thing that seems to have united psychologists, neuroscientists, and cognitive scientists is the assumption that the brain functions to construct and utilize representations of the world around us. (p. 10)

The territorial defense account, like most theories in psychology, is framed in this type of linear, mechanistic language. An external stimulus (the intruder) triggers an associated response in the resident’s behavior (aggressiveness), which is presumably mediated by the resident’s stored attitudinal representations toward the setting.

Numerous critiques exist for this two system, animal-environment dichotomy and the resulting stimulus-response framework for explaining psychological activity (Bang, 2007; Järvillehto, 1998a, 2009; Marsh, Johnston, Richardson, & Schmidt, 2009; Reed,

1996a, 1996b; Turvey, 2009; van Dijk, Kerkhofs, van Rooij, & Haselager, 2008).

Although the philosophical underpinnings of these criticisms cannot be wholly described here, two main issues are worth noting for the purposes of this document. First, although it may seem intuitive, if not self-evident, that organisms and environments are separable, identifying a clear boundary point between what constitutes an animal and what constitutes the physical environment is highly elusive. For example, Järvillehto (1998a) describes the behavior of drinking a cup of coffee, raising the basic question: Where does the person end and the environment begin?

The coffee in the cup is clearly part of the environment, and when the subject is drinking it becomes a part of the organism system – or does it? Is it possible to say when the coffee is in the organism? When it is in the mouth? Or in the intestines? Or when the chemical parts of the coffee are in the blood? In fact, it is impossible to define any exact border which should be exceeded so that we could on this basis unequivocally determine whether the coffee has moved from the environment into the organism. (p. 328).

Similar questions can be raised regarding one's respiratory system: When is the air part of the organism, and when is it part of the environment? Likewise, for a perceptual system: Does placing a pair of glasses on one's nose, which contains lenses serving the same function as the biological lenses of the eyes, somehow make the spectacles cease to be a part of the external environment and become a part of the organism? This inability to differentiate between what is internal and what is external is important, in light of the prevailing scientific assumption that psychological activity is a characteristic of organisms. The continued goal to localize the neurological structures associated with certain cognitive processes in neuropsychological work reflects the clear belief that

psychological activity takes place somewhere in the brain of the organism (Järvilehto, 1998b). However, in light of these examples, it does not appear that organisms can be defined independently of their surrounding environment. How can a process or activity be localized to the organism, if the limits of what constitutes the organism cannot themselves be defined?

Secondly, the stimulus-response framework is based wholly on a mechanistic type of physics. Mechanical systems, by their nature, do not act unless they are put into motion by an external force. For example, a computer will not turn on, write a document, or connect to a network unless these processes are put into motion by the key presses of a user or programmer. Most psychological theories, adopting this mechanistic, computer metaphor for the study of thought and behavior, have assumed that any form of human action must likewise require a stimulus to set the behavior in motion. Behavior is therefore a response believed to derive from either an external reactive mechanism, which would respond to environmental stimuli, or from an internal, instructive mechanism, such as a personal goal or motive. However, although it is true that machines do not act without a catalyst, animals are *always* active; that is, living creatures have agency, in that they put themselves into motion and engage in unceasing activity (Reed, 1996a).

This fact is true even for the simplest of organisms, including those without nervous systems. For example, van Dijk et al. (2008) describe how *E. coli*, a single-cell organism without a nucleus, alters its flagella movement relative to the chemical gradient of the environment. Thus, it proves capable of detecting and distinguishing properties of the world, such as food versus non-food, relative to its internal equilibrium. Importantly,

this type of behavior in single cell organisms cannot be described simply in terms of reactions to external stimuli. After all, it has no nervous system with which it could process sensations. Rather, it reflects modifications in the relationship between the organism and its surroundings. Herbert Jennings, in his classic 1906 studies on paramecia, characterized the activity of microorganisms in this same way: “The nature of the behavior under given conditions depends as much (or more) on the action system of the animal as on the nature of the conditions” (as cited in Reed, 1996a, p. 16). In other words, the organism is not being caused to act in a certain way by a hardwired instinct or some environmental stimulation. Rather, behavior emerges from a dynamic, ongoing interchange, which depends critically on how the ongoing activity and physical characteristics of the organism relate to critical components of the surrounding environment.

These issues challenge the common assumption that the brain and nervous system are primarily a receiver of stimuli and an emitter of responses. Instead, it is clear that the nervous system itself evolved in creatures that were already active in their environments. Thus, in terms of evolutionary history, behavior came well before the brain (van Dijk et al., 2008). The question to be understood is therefore not how organisms sense and then react to stimulation, but instead how organisms, already engaging in action, adapt to and alter their activity in relation to changing conditions in the environment. Behavior consists of and requires processes both inside and outside of the body, and as a result must be considered in terms of a single system: “An organism exists as an organism only together with its environment, and both are bound together in behavior” (Järvilehto, 1998a, p. 330). This mutualistic perspective, which defines both the animal and the

environment in terms of their relational, functional properties, forms the framework for the ecological approach.

Ecological Psychology and Regulation

The starting point for an ecological approach to psychology is its focus on the necessary mutuality between the environment and the animal. Gibson's (1979) theory of perception emphasized this point, arguing that animals and environments form an inseparable pair. Just as an animal needs an environment to exist, environments are defined in terms of the organisms acting within them. Together, they are the product of a co-evolutionary process (Lewontin, 1978). As Costall (2001) describes it: "They are aspects of a unitary, continual historical process. Animals inherit environments just as much as they do their genes, and their environment already acknowledges their existence – from vegetable mould surrounding the earthworm to Skinner boxes and their intended subjects" (p. 191). To speak of the activity of an animal is to imply and necessitate an ecological niche capable of supporting that activity.

A key implication of this mutuality is the fact that psychological activity is not something that takes place within an organism, and meaning does not reside exclusively in the so-called mental realm. Rather, meaning exists in the world as a product of the relationship between the animal and the environment. This framework requires a drastic shift from the two-system approach described earlier. In a traditional cognitivist account, meaning is something added or projected onto the physical world by an individual. For example, a cognitivist account of visual perception will generally argue that individuals receive limited, value-neutral sense experience, and then from it construct a personalized and likely biased representation of the world. Gibson (1979) rejected this framework,

arguing that visual perception does not involve receiving sensations from stimuli, but is instead characterized as the awareness of an environment that results from being immersed within an ambient optic array. The light in this array is structured in such a way as to specify the nature of the physical world, providing the perceiver with functional meaning that can be detected.

Importantly, the meaning in the world to be discovered is itself a relational property of the animal-environment system. The world is made up of multiple, nested scales of time and space, and so the level at which it is experienced is only within the constraints of the given niche to which the organism is attuned. Thus, perception involves picking up information in one's environment in relation to the self, for awareness of this environment is necessarily dependent on an active perceiver moving within the ambient array. For example, moving one's eyes, head, or feet alters the structure of the optic array, all while the person's body acts as an invariant across these changes. Just as with Jennings's paramecia, the action system of the perceiver is irrevocably intertwined with its awareness of the environment. The concept of *affordances*, a term coined by Gibson, emphasizes the mutualism of this approach to meaning. Affordances are defined as: "what [the environment] offers the animal, what it provides or furnishes, either for good or ill" (p. 127). These functional properties are not subjective projections from the perceiver onto the world, nor are they inherent, objective properties of the environment. Rather, they exist as a result of how the perceiver and environment relate to one another. Environments offer possibilities for action in relation to the behavioral potentials of the organism, known as the organism's *effectivities* (Shaw, Turvey, & Mace, 1982). Berries, nuts, and grass afford eating, but only in relation to certain types of animals. In the same

way, steps are climbable (W. H. Warren, 1984), seats usable (Mark, 1987), and doorways passable (W. H. Warren & Whang, 1987) only when both the properties of the perceiver and the physical characteristics of the object or setting allow for such an action.

The relationship between humans and their environments is therefore characterized not by constructing mental representations and responding to stimulation, but instead in terms of continuous, ongoing regulation. As Reed (1996a) argues, “For ecological psychology, the study of psychological processes is a study of functional adjustment to the environment, in which input and output are not meaningfully separable” (p. 65). Behavior emerges from the internal dynamics of a single animal-environment system, whose elements adapt in relation to one another. An organism achieves its desired outcomes by becoming aware of and realizing the affordances of the setting, which are relational properties revealed over time during the organism’s ongoing exploratory activity.

The organism’s ability to regulate activity relative to an environment is possible because there is ecological information specifying affordances to which it can be attuned. For example, the optic array of terrestrial animals has an invariant bipartite pattern: the lower hemisphere (the ground) is dense with varying structures, whereas the upper hemisphere (the sky) is relatively unstructured and varies cyclically in luminosity over the course of a day. This information does not change as a result of anything the animal does, and therefore specifies a fact of the environment. Alternatively, some information may vary as a function of what the animal does. For example, Gibson (1979) described how animal movement creates optic flow: the point at which one moves appears motionless in the optic array while the rest of the visual environment moves away from

that point. The nature of this dynamic information specifies to the animal how it is moving in the world (e.g., in terms of velocity and acceleration). The ability to detect and utilize this type of ecological information provides substantial survival and performatory advantages to animals, thereby making species-level attunement to this information evolutionarily adaptive (Reed, 1996a).

Animals are able to regulate themselves relative to an environment precisely because, unlike mechanical systems, they exhibit agency, and are therefore not dependent upon reflexive responses to external stimulation. According to Eleanor Gibson (1994), agency occurs when an organism exhibits control over its actions, relative to its environment. Agency is manifested in psychological organisms through three basic capacities: *prospectivity*, *retrospectivity*, and *flexibility*. Prospectivity entails the “forward-looking” character of behavior, directed towards producing a novel state. Detecting an affordance, for example, requires prospectivity, as it involves recognizing the prospects available in the world. A predator pouncing to where the prey will be, or an infant demonstrating anticipatory eye movements (Haith, 1993), reflects this sensitivity to the emerging features of unfolding situations. Retrospectivity, the “backward-looking” character of behavior, reflects knowledge of previous event information (R. C. Schmidt, 2007; Turvey & Shaw, 1979). Often, an animal’s ability to recognize unfolding events is dependent upon having meaningful past experiences. A predator may lie in wait outside the entrance to a burrow if it had previously witnessed its prey enter. Finally, flexibility entails the “interchangeability of means to achieve the ends of actions” (Reed, 1996a, p. 12). There are often many ways to realize a given affordance, and an animal may select from among them. Although cognitive scripts provide generalized information about

certain situations (Schank & Abelson, 1977), behavior in real settings and situations vary in many different ways and therefore require an enormous amount of adaptability.

Moreover, animals are able to adjust their behavior dynamically to realize a goal in the face of changing conditions. For example, catching a ball falling from high in the air does not require an a priori calculation of trajectory and landing location. Rather, it depends on sensitivity to ongoing optical information that guides physical movement, thereby allowing a person to adapt to perturbations caused by wind and other factors (Michaels & Oudejans, 1992; Oudejans, Michaels, Bakker, & Dolné, 1996).

By framing the relationship between humans and environments in this way, we can next begin to consider what relational factors will lead to more optimal regulation. Specifically, I will now propose how a territory, being a particular type of animal-environment relationship, can allow for more successful regulatory behavior on the part of residents.

Home Advantage in Terms of Regulatory Ability

The concept of a territory fits neatly within this ecological, mutualistic view of psychological processes. It is itself a relational property of an animal-environment system. Being a territory is not an objective part of any physical environment, as it can only be defined relative to an actual resident. It is also not a subjective projection of a perceiver, as one cannot wish or imagine a territory into existence. Rather, a territory is a specific type of animal-environment relationship that emerges from a particular history and pattern of behavioral activity.

In the preceding section, I described how the ecological approach to psychology conceptualizes behavior as an ongoing process of regulation. However, individuals may

differ in terms of how well their behavior is adapted to a specific environment. In this section, I will describe how being within one's territory facilitates the three capacities – prospectivity, retrospectivity, and flexibility – that allow for effective regulation. Specifically, I will argue that a key difference between a resident and a visitor is their respective capacities to pick up the information specifying affordances in the environment. Differences in the perceptual activity necessary for adaptive functioning are proposed to produce distinct performance outcomes. Two features of the resident-territory system are expected to further more effective behavioral performance: familiarity and ambient self-associative information. Each of these factors will be described in turn.

Familiarity. According to Altman (1975), one of the main factors predicting whether a particular setting will become a territory is the amount of time spent occupying the space. Residents have a history of perceptual exploration and behavioral activity within the territories they inhabit. Retrospectivity is therefore a critical component of how one interacts with a territory. Importantly, remembering, like perception, is an activity engaged in by the entire animal-environment system, and it is therefore not exclusive to the inner workings of the mental realm (R. C. Schmidt, 2007; Turvey & Shaw, 1979). Instead, retrospectivity reflects attunement to higher-order invariants that persist over the course of ongoing events, thereby allowing the past to be perceivable in the present. For example, Gibson's (1979) description of the phenomenological experience of perceiving occluded objects, such as when a chair temporarily disappears as another person walks past it, shows how the past is involved in unfolding events.

The surface that was being covered was seen to persist after being concealed, and the surface that was being uncovered was seen to pre-exist before it was revealed. The hidden surface could not be described as remembered in one case or expected in the other. A better description would be that it was perceived retrospectively or prospectively. It is certainly reasonable to describe perception as extending into the past and the future. (p. 190)

In a similar way, the current activity of a resident in his or her territory is not an isolated, independent event. Rather, it is behavior nested within a history of temporally extending, continuing events, which includes prior activity exploring, designing, and inhabiting the setting. This past activity will provide a resident with greater sensitivity to the ecological information specifying the structure and features of the environment (Reed, 1996a).

Ethologists have long acknowledged the benefits of site familiarity among a wide variety of species (Piper, 2011). Previous occupancy provides residents with opportunities to learn various forms of functional information that will facilitate more successful activity. For example, familiarity provides enhanced knowledge of food locations (Bradshaw, Hindell, Sumner, & Michael, 2004; González-Gómez & Vásquez, 2006), more efficient movement and navigation (Cain, Gerin, & Moller, 1994; López et al., 2001), and more effective escape strategies when fleeing from predators (C. Brown, 2001). Human residents are also able to more efficiently engage in a variety of behaviors because of their greater awareness of the environmental invariants specific to the setting. For example, assessments of elderly and disabled adults' motor skills (i.e., ability to interact with and move around the environment) and process skills (i.e., ability to carry out actions/steps and modify performance) have been found to be greater when measured in their home, relative to clinical settings (Hoppes, Davis, & Thompson, 2003;

Provencher et al., 2012; Provencher, Demers, & G  linas, 2009; Raina, Rogers, & Holm, 2007). Tellingly, these benefits appear to be particularly substantial for those with impaired executive functioning ability (Provencher et al., 2012). The familiar setting allows behavioral control to be distributed across the entire environment (A. Clark & Chalmers, 2010), thereby requiring fewer cognitive resources on the part of the resident to perceptually discover how to effectively navigate and interact with the setting.

Additionally, a resident not only has a long history of previous activity in his or her home territory, but this history of behavior is itself highly varied. Individuals perform a wide variety of activities in their homes, including working, relaxing, preparing food, entertaining guests, watching children, and many more. Critically, it is this variability of behavior that helps one come to better and more deeply understand how to function within the environment. Differential learning theory (Frank, 2008; Sch  llhorn, Hegen, & Davids, 2012) has highlighted the fact that behavioral performance is most enhanced when skills are learned in highly diverse, complex, and non-repetitious ways. In this way, “noisy” training allows individuals to discover optimal performance patterns in a self-organized way. Applying this principle to territorial functioning, the range of behaviors performed in a home environment will differ dramatically between residents and visitors. An athlete in his own turf is embedded in the location that he not only plays in, but also where he trains, relaxes, jokes with teammates, and walks about in. A visitor, in contrast, has a much more limited repertoire of prior behavioral activity within the setting, and will therefore have much more constrained range of behavioral flexibility.

Correlational evidence supports the behavioral value of a residents’ history with the setting in a number of sporting contexts. For example, relocated teams show a

temporarily reduced advantage after moving to a new stadium (Pollard, 2002; Wilkinson & Pollard, 2006). Moreover, the longer the resident team's home stand (i.e., the number of consecutive games played at home), the stronger the home advantage (Courneya & Carron, 1991). Atypical environmental features also seem to enhance the effect. For example, when artificial turf is unusual in a league, the few teams that do play on it exhibit an increased advantage (Barnett & Hilditch, 1993; Clarke & Norman, 1995). Similarly, home advantage for professional baseball games was found to be significantly greater for games played in domed stadia, compared to those in more common open-air or retractable-roof venues (Romanowich, 2012). This body of work provides some initial evidence that long term familiarity with the local playing conditions is capable of aiding behavioral performance within it.

Additionally, a wealth of empirical work in cognitive science has also provided evidence to support the importance of familiarity in guiding how humans relate to physical locations generally. Several regions of the brain necessary for spatial orientation – the parahippocampal place area (PPA), transverse occipital sulcus (TOS), and the retrosplenial cortex (RSC) – have been demonstrated to respond to familiar and non-familiar visual scenes differently. Specifically, greater activation in these neural regions has been shown for familiar locations, relative to unknown settings, using fMRI procedures (Epstein, Higgins, Jablonski, & Feiler, 2007; Müller, Strumpf, Scholz, Baier, & Melloni, 2013; Sugiura, Shah, Zilles, & Fink, 2005). This effect has been explained in terms of having increasingly more enriched representations for familiar locations, although an equivalent explanation could attribute these differences to increased attunement and sensitivity to the features of the familiar setting. Moreover, tentative

evidence exists to suggest that experimentally manipulated familiarity can lead to increased viewpoint invariance for perceiving these scenes (i.e., equivalent activation after repeated presentation of a single scene, even when one's location or perspective is altered). This consistency potentially reflects greater understanding of how different perspectives relate to the layout a single environmental (Epstein, Higgins, & Thompson-Schill, 2005). Notably, navigational ability was found in this study to be positively correlated with differential neural activity for novel versus familiar spaces, suggesting clear behavioral and performance implications for these differences.

At the same time, decades of empirical work have shown that previous exposure to objects and scenes leads to less effortful and more efficient perceptual sensitivity, an effect known as repetition priming (Forbach, Stanners, & Hochhaus, 1974; Scarborough, Cortese, & Scarborough, 1977; Wiggs & Martin, 1998). This effect has been demonstrated most frequently with faster reaction times for previously presented objects, reflecting greater ease detecting and differentiating presented perceptual information. Notably, the effects of repetition priming appear to occur even when the individual is under high levels of attentional demand, which indicates that familiarity is able to attenuate the negative consequences typically associated with cognitive load (Baqués, Sáiz, & Bowers, 2004; Jenkins, Burton, & Ellis, 2002; Lavie, Lin, Zokaei, & Thoma, 2009). Repeated exposure therefore appears to enhance *perceptual fluency*, the ease with which information can be detected from an object or ambient array (Alter & Oppenheimer, 2009).

This empirical work shows that familiarity provides both greater understanding of a space, as well as greater ease detecting and responding to it (Müller et al., 2013).

Residents are therefore embedded within an entire environment that is perceptually facilitated. Visitors, in contrast, must devote greater levels of attention and more cognitive resources towards detecting and understanding the novel ambient structure of the setting, which is required for effective regulation. Critically, the benefits of high perceptual fluency associated with previous exposure occur even when one is engaged in complex, cognitively demanding tasks (Baqués et al., 2004; Jenkins et al., 2002; Lavie et al., 2009), which should be particularly relevant for the competitive tasks that have historically demonstrated a home advantage.

Self-associative information. The amount of time one spends in a setting increases the likelihood of viewing the space as a territory, but familiarity alone does not wholly explain this relationship. After all, a delinquent child may be quite familiar with the principal's office, but it is certainly not his territory. Altman (1975) therefore argued that a setting must also be central to one's sense of self for the space to become a primary territory. That is, it will reflect high levels of personal involvement and be a pervasive part of the life of the occupant.

Behaviorally, this additional dimension is typically characterized by the marking described in Chapter 2. Settings that are central to the person's everyday life will, over time, come to reflect the resident who inhabits the space. As a result, more than just having a generalized history of behavioral interaction with the setting, the environment will specifically communicate information about that previous activity, which reinforces the identity of the resident and his or her unique claims to the setting. This information will be directly perceivable to occupants of the space. Gibson (1979) himself, in a discussion of art and pictures, noted that humans create displays such as these with the

explicit purpose of communicating social information to others: “[Pictures] allow the original observer to communicate in a fashion with unborn generations of other observers.... Pictures convey knowledge second hand and thus are efficient methods of teaching” (p. 274). In the same way, the control-oriented and identity-oriented markings in a resident’s territory provide additional, social information that is relevant to the specification of opportunities for action available in an environment.

Although the social meaning of objects and settings is typically attributed to subjective representations, here too an ecological approach can conceptualize social affordances as real, relational properties between humans and their environments. Behavioral opportunities for humans with respect to an environment are dependent on more than just physical body scaling. Instead, the cultural systems that humans as a species have developed create new opportunities for action, above and beyond directly observable physical properties in the immediate present. Social affordances in this sense represent opportunities for action that are dependent on not only the relationship between the actor and the physical environment, but also on a particular social system in which both are embedded. One’s current activity is nested within a larger history of continuously unfolding events, and so the sociocultural meaning in the world is detectable to a perceiver in light of one’s previous activity being embedded in socially-maintained, societal structures (R. C. Schmidt, 2007). For example, Gibson (1979) stated that a “postbox affords letter-mailing to a letter-writing human in a community with a postal system. This fact is perceived when the postbox is identified as such” (p. 139). The postbox is perceived in terms of what Heft (1989) calls the “intentional repertoire” of the perceiver, reflecting the goal-directed possibilities for action sustained by cultural

institutions and practices. For humans, behavioral opportunities are constrained not only by physical relations, but also by the relevant sociocultural system in which the perceiver is embedded. A mailbox therefore affords mailing a letter only for those situated within a cultural context that would facilitate the emergence of this human-environment relationship. For humans, physical and sociocultural factors are inseparably intertwined (Heft, 2007).

Because physical objects are nested within interpersonal, social relationships, information that communicates ownership will inform perceivers about what behaviors are possible, above and beyond basic and immediate physiological factors such as body-scaling (R. C. Schmidt, 2007). For a visitor in someone else's territory, one's behavioral opportunities and repertoire will be limited by various types of social constraints.

Although one may be physically capable of lifting and drinking from a mug, knowing that it is someone else's property will reduce one's likelihood of actually realizing this behavior. Here, the social information in the world communicates one's relationship to the other person, as well as the cultural patterns of how to interact with physical objects associated with other people. This added dimension informs the perceiver of whether the mug does in fact afford drinking from, in light of the values that constrain action (Hodges & Baron, 1992). In this way, social and functional information are closely connected. For example, knowing that an object belongs to someone else can inhibit one's ability to detect the affordances of that object. Constable, Kritikos, and Bayliss (2011) found that reaction time for mug recognition was faster when the direction of the handle was congruent with the button participants had to push (i.e., left or right key). However, this effect was abolished when participants were told that the mug belonged to the

experimenter, thereby altering the social affordances associated with the object (i.e., their right to grasp another person's possession). Meagher (2014; Meagher & Kang, 2013) found similar results at the intergroup level, with affordance detection attenuated by the target object's association with an out-group (i.e., highly feminine or masculine). Thus, the social information of physical objects appears capable of altering how well functional information can be detected and utilized. The fact that an object is socially "off-limits" is reflected in how one attends to that object.

In light of this work, there is good reason to believe that the flexibility with which a visitor can act – one of the key components of agentic action – will be relatively limited when in someone else's turf. That is, a visitor's behavior is far more likely to be, at least in part, dependent on the actions of the host, as well as the pervasive cultural expectations that provide a historical framework for what a visitor can and should do in someone else's territory. The ambient environment contains social information that communicates limits on what the visitor may do, whereas the resident is engulfed in ambient social information that reinforces his or her control over the space. As discussed earlier, Eleanor Gibson (1994) conceptualized agency specifically as an organism's capacity to maintain control over its own actions. The capacity to engage in agentic behavior should therefore be facilitated in one's own territory, precisely because it will contain minimal social constraints inhibiting the resident's own self-directed activity. Consistent with this, having control over one's environment has been shown to be related to many positive outcomes, particularly in organizational contexts (Avey, Avolio, Crossley, & Luthans, 2009). For example, prior research has found that employees' ability to both control and personalize their desks and offices is predictive of better job satisfaction (Lee & Brand,

2005; McLaney & Hurrell, 1988), well-being (Wells, 2000), and performance (O'Neill, 1994; Robertson & Huang, 2006). One can expect that the behavioral freedom offered by a personalized environment one controls will provide greater flexibility and more varied forms of behavior.

In addition to the increased behavioral opportunities offered by owned objects, identity-oriented markers also provide a highly self-referential ambient environment. The self-relevance of information has been shown to be an important factor in a number of cognitive processes. For example, the *self-reference effect* (SRE; Rogers, Kuiper, & Kirker, 1977; Symons & Johnson, 1997) is the well-documented finding that information perceived or considered in regards to oneself (e.g., being asked “how intelligent are you?”) is better remembered than content considered in relation to someone else (e.g., being asked “how funny is David Letterman?”). The SRE has been attributed to the greater resonance and elaboration associated with information related to one’s self-construct, relative to other types of information (Symons & Johnson, 1997). Importantly, the prioritization of self-relevant information in memory appears to be tied to the large amount of attentional resources devoted to it when it is encountered (Turk et al., 2013). Information about the self is more salient to perceivers than neutral information, with greater attention given to depictions of, for example, one’s own face and name (Devue & Brédart, 2008; Gray, Ambady, Lowenthal, & Deldin, 2004; Sui, Liu, Wang, & Han, 2009). The well-known “cocktail party effect” (Moray, 1959) – being able to hear one’s name in a crowded room – reflects this sensitivity to self-associative information within even very complex ambient perceptual arrays.

Although the vast majority of work on the SRE has focused on differential responses to traits, empirical work has demonstrated that this effect also extends to how people relate to their physical possessions, which can also be incorporated into one's sense of self (Belk, 1992). Because of this, people respond to presentations of their own objects quite differently than they do to neutral objects. For example, objects arbitrarily assigned to an individual are evaluated more positively (the mere ownership effect; Beggan, 1992; Gelman et al., 2012) and assessed as more valuable (the endowment effect; Morewedge et al., 2009; Reb & Connolly, 2007). These effects are consistent with other demonstrations of cognitive fluency, with fluent information generally judged more positively (Alter & Oppenheimer, 2009). Additionally, like self-referencing trait information, cognitive processes appear to be more elaborate and focused when the target is one's own possessions. For example, just as they do with trait concepts, people show enhanced memory for objects arbitrarily assigned to be theirs (Cunningham et al., 2008). People also appear to attend more to objects assigned to them. Turk, van Bussel, Brebner, et al. (2011), measuring ERP signals, found that presentation of owned objects generated a P300 component, which reflects a rapid increase in visuospatial and executive attention, whereas the presentation of neutral objects did not. Thus, like familiarity, self-association appears to predict more efficient perceptual activity.

Sensitivity to personally relevant information in the environment is clearly advantageous, as it is likely to be of much greater importance to the perceiver than is information about others. Importantly, this increased attention is likely to facilitate improved performance for tasks that depend on effective perceptual activity. For example, Bovasso and Rettig (1997) tested participants' susceptibility to the Müller-Lyer

illusion, a phenomenon in which individuals tend to perceive a line with “fins” (>-----<) as greater in length than an equivalently long line with “arrows” (<----->). Critically, they found that this effect was mitigated when the line was made personally meaningful to the participants, relative to when it was relevant only to the experimenter. In other words, participants made more accurate perceptual judgments when the target was self-relevant.

This body of work provides support for the expectation that perceptual activity will be facilitated in a highly self-associative ambient environment, which will allow for enhanced behavioral performance. For residents, behavioral opportunities in their territory should be efficiently detected, being coupled to self-relevant information that attracts attention and is highly fluent. Visitors, in contrast, will need to act in an environment filled with various forms of inhibiting social information, which should attenuate their ability to engage in effective perception and action.

Outline of the Current Studies

The ecological view just described proposes that the home advantage observed in one's own territory is the product of superior regulatory behavior, achieved by more efficient perceptual activity. Being embedded in a highly familiar and highly self-associative environment allows for greater sensitivity to the ecological information specifying behavioral opportunities. Moreover, this environment also contains a wealth of social information that is self-affirmative, thereby imposing little constraint on a host's ability to realize these affordances, relative to a visitor. Thus, performance enhancement is proposed to be the product of the animal-environment system, reflecting differences in the pick-up of relationally defined information.

The chief goal of the research to be described in the following sections was to evaluate this ecologically-derived account of home advantage, relative to the predominant territorial defense explanation described in Chapter 2. According to the latter, a home advantage should be linked to greater aggression and dominance on the part of the resident, emerging specifically during competitive social contexts. In contrast, the proposed ecological account predicts enhanced performance in a much broader range of behavioral domains associated with regulatory ability. Because of this critical difference, in the studies to be described behavior was evaluated on tasks specifically developed to be independent of, or even inhibited by, aggression: visuospatial ability, perspective taking, visual search behavior, and self-control. Moreover, performance was tested both in competitive and cooperative social contexts, so as to test for the necessity of symbolic, territorial conflict for producing improved performance. These experiments therefore allow for clear contrasts to be made between the respective theoretical approaches.

In Experiment 1, I first evaluate the degree to which territorial attitudes and behaviors can emerge within a lab context after only a brief period of time. In it, I assess the validity of an experimental procedure designed to enhance the two critical dimensions proposed by Altman (1975) – permanence and centrality – in inducing differences between residents and visitors. Importantly, despite the focus placed on defensive activity in the empirical literature, possessing a territory involves more than just excluding others' access. As Taylor (1988) notes, it should also involve a strong sense of responsibility for and control over activities in these specific sites. Therefore, this initial study sought to assess whether attention to behavioral opportunities reflecting responsibility for

maintaining the setting would be observed after inducing Altman's (1975) critical factors. Demonstrating the effectiveness of this method, and showing how outcomes other than defense motivation are affected by possessing a physical location, provides an established paradigm for future work seeking to test predictions about territorial activity in highly controlled laboratory environments.

In Experiment 2, I use this lab methodology to evaluate a pair of perceptual skills: visuospatial ability and perspective taking. Of particular note is the latter, which in a cooperative context can help to reveal whether a home advantage can emerge in a non-competitive, hosting situation. As argued above, if being in one's home territory provides a more general benefit derived from perception-action facilitation, a resident's performance on a social, affiliative task should also be enhanced when hosting a visitor in a cooperative context. Such an effect would be quite contrary to a territorial defense explanation of resident advantage, which assumes any advantage would only emerge when one is threatened by an unwanted intruder. Specifically, this experiment evaluates the extent to which participants spontaneously take the perspective of another person in the setting, which is a behavior that requires additional attentional effort (Tversky & Hard, 2009), and the group and individual-level performance outcomes that occur as a result of this social behavior. If residents exhibit responsibility for maintaining the activity that takes place in their territory, they should be more adept at attending to the actions of their partner than are visitors. A resident's ability to recognize the perspective of the visitor is hypothesized to be a critical factor that ultimately enhances the performance of the cooperative dyad.

In Experiment 3, a computerized task is employed to simulate a virtual territory on a task specifically designed to assess attention. Based on previous work demonstrating the self-reference effect on memory and attention, I hypothesize that performance on a difficult visual search task will be facilitated when it is done in a self-associative territorial display. This study assesses differential perceptual activity in either a socially competitive context or a non-competitive solo context, as well as when participants are in the role of a resident, a visitor, or in a neutral setting. This allows for an assessment of two critical questions. First, it addresses whether observed performance enhancement is dependent upon a perceived social threat, or whether it is derived from a more general cognitive process. Secondly, it addresses whether any observed advantage is based on resident performance, visitor underperformance, or both.

In Experiment 4, participants took part in an experiment while in their actual territories, i.e., their dorm room. Using an ego-depletion paradigm (Baumeister, Muraven, & Tice, 2000), I test whether being present in one's territory enhances self-regulatory strength, operationalized as persistence on an extremely difficult task. If being in one's home territory provides residents with greater regulatory resources, the home environment can be understood as highly restorative and capable of attenuating the detrimental effects associated with exerting self-control (Kaplan & Berman, 2010). Importantly, this will help to evaluate the proposed hypothesis relative to the alternative perspective, wherein home advantage is attributed to increased levels of aggression and testosterone (e.g., Neave & Wolfson, 2003), a factor shown to be related to declines in self-regulatory strength.

Chapter 4

Experiment 1: Inducing Territoriality in a Lab Setting

The creation and maintenance of territories are ubiquitous social phenomena in humans (Edney, 1976). However, it is a topic that has received relatively little empirical investigation among social psychologists. As described in Chapter 2, the work that does exist has been framed almost entirely around antagonistic social interaction, with territoriality conceptualized as defensive behavior against intruders, involving increased negative arousal, hormonal change (Neave & Wolfson, 2003), and displays of dominance (Edney, 1974; Lyman & Scott, 1967; Sommer & Becker, 1969). Taylor (1988), in contrast, provided a much broader definition that included residents' sense of responsibility for and control over activities in these specific sites. This conceptualization comes much closer towards capturing the human-environment relationship inherent in the concept. That is, regardless of the presence of social threat, a resident is afforded unique behavioral opportunities within his or her own territory (J. J. Gibson, 1979), to which he or she will be particularly attuned to and responsible for maintaining.

Unfortunately, social psychologists failed to evaluate many of the theoretical claims made regarding territorial activity during the era when environmental psychology was still a significant focus of social psychology (Altman, 1976a). This omission is likely due in part to social psychologists' waning interest in the physical environment, along with the difficulty of developing rigorous experimental designs to test hypotheses about territoriality. In light of recent calls for a more embedded and embodied social psychology (Marsh, Johnston, et al., 2009; Reis, 2008; E. R. Smith & Semin, 2004), it is appropriate to give renewed attention to novel ways of testing fundamental issues

regarding person-environment relations within a laboratory context. A small handful of attempts to create territories in the lab have been made previously (G. Brown & Baer, 2011; Edney & Buda, 1976; Edney & Uhlig, 1977); however, the efficacy of these approaches has not been closely evaluated. For example, early work (e.g., Edney & Buda, 1976; Edney & Uhlig, 1977) found only equivocal support for attitudinal differences between residents and visitors, and no behavioral differences were tested.

More recently, Brown and Baer (2011) used a personalizing task to create a territory for experimental condition participants as a means of testing hypotheses about home advantage. In their procedure, residents were given 20 minutes alone to personalize a small office room prior to a negotiation task. Visitors, in contrast, arrived to the study, completed a questionnaire, and then entered the resident's room. Although participants in the resident condition did ultimately have more preferential outcomes relative to visitors, the design of the study did not rule out recent self-affirmation or creative activity as rival hypotheses for their findings. That is, the act of creating a space reflecting one's identity, rather than the fact of being currently embedded within it, may have contributed to the observed difference in performance outcomes. It is therefore important to control for recent self-affirmation when assessing the efficacy of an induced territorial procedure.

What factors are likely to produce territorial feelings, even within an experimental laboratory? As discussed in Chapter 1, Altman's (1975) foundational theorizing proposed that a primary territory is most critically determined by two orthogonal dimensions: permanence and centrality. First, territorial feelings should be strongest for places that one has a history of inhabiting. Although extensive past experience in a laboratory room cannot be readily induced, participants can be led to believe that they will return to the

setting in the future. Thus, anticipated duration may function in a way similar to previous duration (Edney, 1972a). Second, the centrality of the setting is also presumed to be a necessary condition for experiencing territoriality. Centrality is reflected by two types of resident marking behaviors (G. Brown, 2009): those that specify ownership and control, and those that communicate the resident's values and identity (Gosling et al., 2002). In a lab context, providing participants with opportunities to perform marking behaviors is hypothesized to help induce feelings of territoriality.

In the current study, I test hypotheses regarding the adequacy of these factors in inducing territoriality, positing that territorial behavior and attitudes can emerge even after only a brief time within a lab context. Specifically, this experiment tests a procedure designed to increase an occupant's identification with a space, as well as his or her sense of responsibility for it. In particular, it was hypothesized that individuals in their territory would demonstrate greater behavioral freedom and an increased sensitivity for certain affordances related to the maintenance of the setting, relative to control participants. This hypothesis was tested in two ways. First, participants' spontaneous behavior in response to opportunities to maintain the integrity of the setting was assessed, which included cleaning up litter and fixing a broken clock. Differences in how residents and visitors respond to this environmental information would reflect differential attunement to particular behavioral opportunities related to maintenance on the part of residents, independent of and irrelevant to any motivation to defend the space from others.

Secondly, self-report measures were also collected to compare differences between residents and visitors in terms of individual-level factors as well as critical, action-relevant items related to the person-environment relationship. I hypothesized that

differences would be observed chiefly for the latter constructs, rather than for individual-level variables. That is, territory-related effects were expected to be largely independent of self-representations or cognitive style, which, in this study, included participants' self-reported Big Five personality factors (i.e., extraversion, agreeableness, conscientiousness, neuroticism, and openness; McCrae & Costa, 2008), feelings of self-determination, which reflects an individuals' sense of being intrinsically motivated (Deci & Ryan, 2000), and construal level, which reflects a person's current tendency to think in abstract or concrete terms (Trope & Liberman, 2010). Moreover, territorial functioning should also be independent of changes in participants' mood or anxiety levels (Korpela, 2003; Rafaeli & Vilnai-Yavetz, 2004a), which has been the focus of studies exploring reactions to invasions. In the same way, concern over restricting the number of people that could enter the space should not be the primary focus of residents, despite its emphasis in previous work (Edney, 1975). Finally, viewing a setting as one's own territory should also involve more than just evaluating it more positively than a control setting, as would be expected with just an endowment effect (Kahneman, Knetsch, & Thaler, 1991; Knetsch & Sinden, 1984). Instead, the goal of the present study was to test how differences are the result of a territory affording distinct, relationally defined behavioral opportunities to which a resident is attuned. Thus, I hypothesized that groups would differ chiefly in regards to relational measures assessing one's sense of fit with the environment, operationalized in terms of differences in participants' identification with the space, as well as their ratings of the room in terms of comfort and spaciousness (Meagher & Marsh, in press).

Method

Participants

Forty-two undergraduate students (27 women) participated in this experiment.

Procedure

Participants volunteered to take part in a study called “creating and working in different settings.” They arrived individually to the lab and were told that they would be given a room in which to complete a number of tasks. The experimenter asked participants if they would be willing to return for several sessions before the semester ended. If they agreed, participants were then brought to a small office, informed that this would be their room, and provided with a key. They were told that their first task would be to design the room itself. They were given a packet of images and instructed to circle the objects that they would like to have in their office (see Materials and Measures). After they had made their selections, the experimenter left to retrieve their items from a supply room. Participants, meanwhile, were given a piece of paper to write their name on with colored markers, which they could hang on the door. The experimenter then returned with the participant’s items and provided a dry-erase calendar so that participants could write their upcoming schedule, ostensibly as a way to determine when they would like to return. The experimenter then left and began recording the amount of time participants spent decorating. Taken together, this procedure sought to produce control-oriented markings (name on door, possession of key), identity-oriented markings (personalization), and enhanced occupancy duration (anticipated return).

Once participants finished decorating, they were told that there was a preliminary questionnaire to complete. In the resident condition, they returned to the participant’s

room. In the visitor condition, the experimenter indicated that the questionnaire had been left in another participants' room – someone who had completed the entire study earlier that day. This room had been decorated by an earlier participant; however, any overlapping objects selected by the current participant were replaced by the experimenter while the participant was decorating. Visitors were told that they would complete the questionnaire here. However, before giving it, the experimenter said: “Oops, actually this is the wrong form. I need to go downstairs and print out the right version. Do you mind waiting here while I do that?” The experimenter then looked at the clock on the desk, which had purposefully been set to be ten minutes slow prior to the start of the experiment, and said, “Oh, it looks like the clock is about ten minutes slow, but it will take maybe five minutes for me to get the right form.” Then, when leaving, the experimenter crumpled the “wrong” questionnaire into a ball and tossed it towards the trashcan, placed one foot from the corner of the room. The experimenter was trained so that the paper would miss the garbage but consistently fall between the trashcan and the wall. The experimenter waited three minutes until returning to the room with the correct form, which the participants then completed.

Materials and Measures

Two identical 2.01 m by 2.29 m rooms located in the same hallway were used as settings. Each room contained a desk, a chair, a computer, a trashcan, a dry-erase calendar, and a clock. Participants could select the following from a packet of possible decorations: (a) 2 posters out of a selection of 20, (b) 6 postcards out of a selection of 52, (c) 2 writing instruments out of a selection of 15, (d) 1 colored notepad out of a selection

of 5, (e) 1 colored folder out of a selection of 5, (f) 1 pencil cup out of a selection of 9, and (g) 1 paper tray out of a selection of 6.

Three types of dependent measures were collected: behaviors, room-ratings, and self-ratings. Two binary behaviors were coded by the experimenter: (1) whether the crumpled paper was picked up off the floor and put in the garbage, and (2) whether the clock's time was corrected. These behaviors reflect participants' sense of responsibility for the setting. The other primary measures assessed person-environment relational factors. Impressions of the room were collected on 18 items using 7-point Likert-type scales, ranging from "disagree strongly" to "agree strongly." Consistent with previous work (Meagher & Marsh, in press), composite measures were created for a spatial index (Cramped, Crowded, Restricting, Roomy, Spacious; $\alpha = .77$) and a comfort index (Comfortable, Cozy; $\alpha = .68$). To test for the possibility an endowment effect, an index was also created for general positive valence towards the room (Adequate, Good, Insufficient, Pleasant, Substandard, Unsuitable; $\alpha = .81$). Several filler items were also included in the questionnaire (e.g., well-lighted). Additionally, five items were adapted from Droseltis and Vignoles (2010) to measure identification with the room: "I feel like I fit well in this setting," "I feel a sense of emotional attachment to this place," "My values are represented in this setting," "I feel like myself in this setting," and "This place reflects the type of person I am" ($\alpha = .85$). Finally, participants estimated "How many people do you think could fit comfortably in this room?"

To rule out the possibility that differences in territorial behavior and attitudes would be attributable to participants' affective state, mood was assessed using the PANAS (Watson, Clark, & Tellegen, 1988). This 20-item scale includes both positive

(e.g., excited, proud, determined) and negative (e.g., nervous, irritable, upset) items ($\alpha = .83$).

Self-ratings, though largely exploratory, were collected to assess whether being in a territory had a direct effect on any individual-level psychological states. Dispositional measures included a 10-item scale of Big 5 personality factors (Gosling, Rentfrow, & Swann, 2003): extraversion ($\alpha = .80$), agreeableness ($\alpha = .62$), conscientiousness ($\alpha = .64$), neuroticism ($\alpha = .67$), and openness ($\alpha = .57$). Also included were scales derived from Self-Determination Theory (Deci & Ryan, 2000): the Self-Determination Scale, measuring self-awareness ($\alpha = .72$) and sense of choice ($\alpha = .75$), and satisfaction with one's basic needs, measuring autonomy ($\alpha = .59$), competence ($\alpha = .76$), and relatedness ($\alpha = .74$). Finally, a measure derived from Action Identification Theory (Vallacher & Wegner, 1989) assessed the abstractness or concreteness of participants' general construal level (Behavior Identification Form; $\alpha = .85$).

Results

Participants spent 10.45 minutes on average decorating their assigned room, with women generally devoting more time than men, $t(40) = 2.03$, $p = .049$, $M_{\text{women}} = 11.54$, $M_{\text{men}} = 8.50$. The primary question of interest was whether participants in their own lab room would demonstrate a sense of responsibility for the setting; that is, whether they would be more likely than visitors to clean up the paper on the floor and fix the clock. Because visitors entered a room previously decorated by a resident, participants were linked dyadically. However, a mixed-effects model including this random effect produced no change in the log-likelihood relative to the null model for any dependent variable. Therefore, only chi-square tests are reported here. As hypothesized, participants

in their own room were more likely to clean up the crumpled paper, $\chi^2(1) = 7.67, p = .006, OR = 6.22$, 73% of residents, 30% of visitors. Although the frequency of participants correcting the clock was fairly low, residents were also far more likely to do so than visitors, $\chi^2(1) = 4.89, p = .029, OR = 8.87$, 32% of residents, 5% of visitors. No gender differences were found for either behavior. Participants also completed self-report measures while in the experimental room, which were then regressed on the critical behaviors using logistic regression. Notably, no main effects for individual differences were found for picking up the paper. For fixing the clock, only conscientiousness was a significant predictor, $b = 1.89, Wald = 5.35, p = .021$.

Consistent with the hypothesis, residents and visitors did not significantly differ in terms of their mood, $t(40) = 0.86, p = .395, M_{\text{residents}} = 4.87, M_{\text{visitors}} = 4.74$. The groups also did not differ on any of the self-ratings, $|t|s \leq 1.42$. However, measures that assessed person-environment relations did reveal differences, as Figure 1 shows. As hypothesized, residents reported greater levels of identification with the room than did visitors, $t(40) = 4.99, p < .001, d = 1.55$. Notably, residents also found the room to be more comfortable, $t(40) = 2.48, p = .018, d = 0.77$, and rated it as more spacious, $t(40) = 2.17, p = .036, d = 0.68$. In contrast, groups did not significantly differ in their ratings of general positive valence for the room, $t(40) = 1.52, p = .14, d = 0.48$. Employing ANOVAs to test for the possible additional effect of participant gender on room ratings revealed no statistically significant main effect or interaction with residency status, $ps \geq .216$. A poisson regression did not reveal a statistically significant difference between the two groups in terms of the number of people they believed could fit in the room, $b = 0.212, Wald = 2.02, p = .155$. It is notable, however, that the means for this question trended in the

opposite direction of the other room ratings, with residents tending to report that fewer people could fit in the room, $M_{\text{residents}} = 2.30$ people, $M_{\text{visitors}} = 2.83$ people. In fact, estimates for the number of people the room could hold was negatively correlated with ratings of spaciousness, $r = -.392$, $p = .012$.

Discussion

This study tested whether territorial attitudes and behavior, defined as responsibility for and control over the activities within a setting (Taylor, 1988), could emerge during brief experimental sessions. Consistent with the hypothesis, participant behavior in the resident condition reflected greater responsibility for the setting, despite the fact that this was merely a lab space they had occupied for less than 15 minutes on average. Participants in their own environment were more likely to notice and respond to both litter and an incorrect clock. This difference reflects greater attunement to behavioral opportunities to maintain the integrity of the space, as well as the motivation to engage in responsible action. By demonstrating these clear differences between residents and visitors, this study provides clear empirical validation of the key variables proposed by Altman (1975) to produce territorial behavior. Importantly, participant behavior was tied specifically to the person-environment relationship inherent in the territory construct. No random effect was found for the actual combination of items in the room, and the individual difference variables measured had minimal predictive value in determining their actions. Thus, rather than being the product of either environment-driven or person-driven effects, participants' actions were best explained by their relationship with the environment as a resident or a visitor.

Similarly, responses on self-report items significantly differed between groups only for items that reflected the participant's relationship with the physical setting. Residents and visitors showed no differences in terms of any measured individual-level construct, including negative and positive affect, self-perceptions, or construal level. Thus, the observed differences in behavior are not attributable to a change in either mood or cognitive orientation. Moreover, ratings of the room in terms of general positivity did not significantly differ between groups, so differences in their actions and impressions of the space cannot be parsimoniously explained merely by aesthetic preferences, generalized self-enhancement, or the endowment effect (Kahneman et al., 1991; Knetsch & Sinden, 1984).

Instead, groups differed in regard to their fit with the environment: residents showed greater identification with the setting and also viewed it as more comfortable. A particularly novel finding of this study is that residents also rated the room as more spacious than did visitors, despite the fact that they contained the same exact number of objects. Consistent with this, Meagher and Marsh (in press) recently proposed that feelings of spaciousness are based not on abstract computation of area, but are instead dependent on the opportunities for action afforded by the setting. According to this ecological account, space is perceived in terms of action potential (J. J. Gibson, 1979), and so feelings of spaciousness within an enclosure are tied in part to the wealth of behavioral opportunities available. Supporting this, they found that judgments of a room's spaciousness were significantly higher when furniture was arranged to facilitate a range of actions, relative to arrangements that limited functionality, even when the furniture itself was identical. The current study extends this basic finding to a context

where behavior is not physically constrained, but is socially constrained. There is evidence that individuals perceive interpersonal constraints, such as ownership, in much the same way that intrapersonal affordances are detected (Constable et al., 2011). Residents, having greater control over the activity within the setting, are comparatively uninhibited in regards to their behavioral opportunities. The present results suggest that this leads the resident to actually judge the space itself as larger.

Despite being viewed as more spacious, residents did not believe that a greater number of people could comfortably fit in the space. In fact, estimates trended in the opposite direction, with visitors reporting a slightly higher number of possible people. This is consistent with a field study conducted by Edney (1975), who found that visitors to a dorm room indicated that more people could fit in the space without it becoming overcrowded, relative to the actual inhabitant of the room. This discrepancy between impression of spaciousness and estimated maximum occupancy may be the product of the additional social element present in the latter construct. That is, an excess number of people in one's own territory may be construed as an encroachment warranting defense and an increased need for greater spatial claims (Lyman & Scott, 1967; Sommer & Becker, 1969). Thus, even if one's own territory may feel like a larger space, a resident may nevertheless have a smaller tolerance for each additional person present within it. Demonstrating the difference between these two variables highlights a potentially important distinction between one's experience of a territory as a lone actor (i.e., when working or relaxing alone at home) and one's experience of a territory when having to engage socially with intruders (i.e., defending one's desk space from an encroaching neighbor). Whereas the latter has received the majority of empirical focus (e.g., G. Brown

& Robinson, 2011; Haber, 1980; Martindale, 1971), the former likely represents the more common psychological experience warranting greater study.

Chapter Summary

In addition to testing fundamental hypotheses about the nature of territoriality, this study introduces a validated experimental procedure for inducing territoriality within a controlled setting for future work. Importantly, it demonstrates how a resident's relationship to his or her territory reflects more than just a need to defend. Instead, clear differences were observed regarding variables specifically measuring feelings of fit, identification, and responsibility. For a resident, behavioral regulation within his or her territory entails the capacity and freedom to alter, arrange, and maintain its structure so as to best facilitate current and future activity. Visitors, in contrast, are comparably inhibited in this regard, and must adjust their activity in accord with the wishes or presumed wishes of the resident. The current study demonstrated clearly this behavioral difference. In the proceeding chapters, I will begin to test how this distinction may lead to actual performance differences between residents and visitors.

Chapter 5

Experiment 2: Visuospatial Task Performance and Perspective Taking

In the previous chapter, it was found that clear behavioral and attitudinal differences could emerge in a laboratory setting when participants were given the opportunity to engage in marking activity and anticipated a future return. Importantly, the behavioral discrepancies observed differed from the traditional emphasis placed on behaviors associated with territorial defense and a motivation to exclude others. Instead, residents demonstrated greater attention to and responsibility for maintaining the integrity of the setting. That is, residents were attuned to the behavioral opportunities available to improve their territory (i.e., realize the values or goods of the space; Hodges & Baron, 1992), and their unique relationship with it allowed for high levels of behavioral freedom, with the space feeling more comfortable and less physically restricting.

Nevertheless, the question remains as to whether this procedure may also lead to differences in performance outcomes in a temporary lab context for residents relative to visitors. Of particular interest is whether a home advantage can be found here on tasks where interpersonal dominance motivation and aggression would be unlikely to be beneficial. Instead, enhanced performance should be observable for tasks that require greater perceptual attunement to the specific functional features of the environment that allow for behavioral success. Evidencing this resident enhancement would lend support to the ecological perceptual perspective while challenging the comprehensiveness of the territorial defense account. In this second study, I evaluate two behavioral capacities within a laboratory-created territory that fit this criterion: visuospatial ability and perspective taking.

Visuospatial Ability

Visuospatial ability is a collection of several capacities related to how well one can visualize, understand, and act on spatial relationships between physical objects, oneself, and the environment (Hegarty & Waller, 2005). Most activities that humans engage in require this capacity, although it is perhaps most clearly reflected in behaviors such as packing a suitcase, learning to navigate through a new city, or recognizing how open a teammate is before passing a ball. The assessment of this skill has proved capable of predicting differences in personal outcomes across clinical, educational, and organizational contexts.

One common way of measuring individual differences in visuospatial ability is through the use of a block design task (Kohs, 1920). In a block design task, participants must organize a set of colored blocks to match a presented matrix pattern. A number of clinical tests have used variations of this task, most prominently as a component of the Wechsler Intelligence Scale (A. S. Kaufman, 1990; Shear & Jak, 2006). Solving the puzzle requires cognitive and perceptual skills such as: “pattern analysis into component parts, visuospatial organization, formulation and application of a coherent problem-solving strategy, as well as self-monitoring and self-correction of any transient error” (Groth-Marnat, Gallagher, Hale, & Kaplan, 2000, p. 171). Moreover, the test has been shown to be strongly related to general measures of everyday visuospatial ability (Farley, Higginson, Sherman, & MacDougall, 2011; Groth-Marnat & Teal, 2000). Performance also correlates highly with general intelligence, but it is only weakly related to education level (Groth-Marnat et al., 2000), supporting its value in assessing a non-semantic skill and form of intellect.

Although the block design task is used chiefly as a tool to measure visuospatial ability as a dispositional capacity, there is reason to hypothesize that performance should be facilitated when in one's own territory. As described earlier, Bovasso and Rettig (1997) found that susceptibility to a visuospatial illusion was attenuated when the stimuli was itself self-referential. Thus, there is initial evidence that one's understanding of spatial relationships may be improved by the personally meaningful nature of the context. In that study, results were explained by the presumed differences between the groups in terms of their respective levels of epistemic curiosity for and perceptual attention on the stimuli object. In a territory, the nature of the ambient environment should likewise be capable of facilitating perceptual focus on the spatial task. In general, familiarity and preexisting sensitivity for the invariant information in the setting should allow the resident to engage in less peripheral, exploratory perceptual activity, thereby allowing them to better attend exclusively to the critical task at hand. Importantly, moving the puzzle blocks to match a displayed design involves physically rotating the pieces relative to one's own body within an actual physical setting. Thus, awareness of and sensitivity to one's own position in the space, relative to the example design on display to be matched, is a crucial requirement for success. A history of varied action within the space should provide residents with a far richer and more intuitive understanding of these spatial relationships.

The block design task employed in the current study provides a stringent test of this hypothesis for a pair of reasons. First, visuospatial ability is traditionally studied in terms of a particular individual-level skill or dispositional ability (Hegarty & Waller, 2005). As a clinical assessment tool, the block design task diagnoses what are

presumably chronic mental and developmental disabilities. Thus, the extent to which performance on this task is malleable as a result of environmental factors has not yet been thoroughly investigated. Nevertheless, as referenced in Chapter 3, other measures of disabled adults' motor and process skills have been found to be greater when measured in their home, relative to clinical settings (Hoppes et al., 2003; Provencher et al., 2012; Provencher et al., 2009; Raina et al., 2007). However, these assessments generally require participants to engage in a familiar task (e.g., make a meal in a kitchen), whereas the block design puzzle is typically a new activity for all participants. The second reason this task provides a particularly conservative test of the hypothesis is because the procedure developed in Experiment 1 to create a new territory and employed here is so brief. Thus, any benefits that would occur as a result of familiarity with the setting are limited to only an initial 10-15 minutes of activity. Nevertheless, in addition to providing self-referential information, the activity of arranging decorations and personalizing the space was expected to be particularly helpful in developing an intuitive understanding of the spatial relationships of objects in the environment. By hanging decorations up and arranging the objects relative to one another, this activity is itself likely to provide uniquely comprehensive and relevant knowledge about the environment that would be less likely gained while engaging in less interactive behavior with the space.

Critically, it is unlikely that dominance motivation would adequately explain a potential difference between residents and visitors on a visuospatial task such as this. In fact, increased aggression may be expected to inhibit performance. For example, anthropological work has found that long-term cultural differences in terms of aggression may predict differences in visuospatial abilities. In a comparison between 3 peaceful

groups and 3 groups of warring hunter-gatherers, Pontius (2002) found that the hunter-gatherer groups performed much worse on a visuospatial task that required maintaining the spatial relations of shapes within a pattern. Pontius attributes these performance deficits to group differences in neurological activity: Living in the presence of fear-inducing threats leads to the prioritized utilization of subcortical brain regions, which facilitate rapid but relatively crude processing at the expense of other regions, such as prefrontal and parieto-occipital areas, that are necessary for more deliberative action. It is possible that a state change towards a more aggressive disposition may also produce similar, detrimental short term effects, with the threat of an intruder leading to the prioritization of more primitive, risky, and less thoughtful behavioral tendencies. Moreover, there is correlational evidence showing that, for children, it is positive mood that is predictive of superior performance on visuospatial tasks, not negative emotional arousal (Rader & Hughes, 2005).

Additionally, unlike negotiation tasks or physical confrontations in athletic contests, measures of visuospatial ability do not involve direct interaction with a competitor. Rather, the task may be done merely in parallel with the other person. This fact limits the extent to which aggressive actions can be beneficial, as there is little the aggressor can do to directly inhibit the performance of one's competitor. That is, there is not a behavior equivalent to striking first or speaking over the other person, which are suggested as possible means by which dominance can aid performance in other competitive tasks. It therefore seems unlikely that a perceived invasion by an intruder would benefit the resident, and so it is unlikely that the aggression based account could parsimoniously explain improved visuospatial abilities among residents. In contrast, the

proposed perceptual attunement account would make such a prediction, arguing that residents should outperform visitors at rates comparable to those observed in other competitive interpersonal contests (Jamieson, 2010).

Perspective Taking

In addition to general visuospatial performance, the second behavior evaluated in this study is a specifically pro-social behavior: perspective taking. One unique quality of human territories that has been largely overlooked in the empirical literature is the frequency with which residents choose to host guests. That is, despite the emphasis placed on competitive contexts, such negative interactions are unlikely to be the normative social encounters people engage in with visitors while in their homes and offices. Importantly, hosting very often involves the responsibility of attending to the needs of one's guests, and therefore directly implies a pro-social motivation.

Being able to recognize how another person views the world, and how that may differ from one's own perspective, is a critical skill necessary for successful interpersonal interaction, cooperation, and coordination (Elfers, Martin, & Sokol, 2008). In order to engage socially with another person, one must understand what information is known and shared with that individual (H. H. Clark, 1996). For example, ecological researchers have tested the extent to which perceivers are able to recognize the affordances that exist for other people. Doing so requires attending to information in the environment that specifies behavioral opportunities for the other person. In fact, individuals do seem capable of detecting the critical boundaries of particular actions for others, such as the maximum height one can sit on a surface (Stoffregen, Gorday, Sheng, & Flynn, 1999), whether an object is reachable (Ramenzoni, Riley, Davis, & Snyder, 2005), and whether a gap can be

crossed (Mark, 2007). Thus, perceivers prove to be capable of alternating from an egocentric perspective to an allocentric perspective when forming impressions about the environment. Recognizing someone else's affordances entails perceiving the world relative to them and therefore relates closely to understanding how the other person perceives the world. Actually recognizing what another person sees and how she sees it allows an individual to predict and adequately respond to the other person's behavior (Creem-Regehr, Gagnon, Geuss, & Stefanucci, 2013).

Indirect behavioral measures, such as response times and eye-tracking, have provided evidence that sensitivity to what is seen in the environment by another person is often done quite quickly and automatically (Samson, Apperly, Braithwaite, Andrews, & Bodley Scott, 2010; Surtees & Apperly, 2012). This appears to be true specifically of so-called Level-1 perspective taking, which involves being able to recognize whether or not objects are visible to another person (Flavell, Everett, Croft, & Flavell, 1981; Surtees, Butterfill, & Apperly, 2012). In fact, another person's perspective may be difficult to ignore even if one wishes to (Böckler, Knoblich, & Sebanz, 2012; Samson et al., 2010; Surtees & Apperly, 2012). For example, exposure to a coactor who has a different perspective is able to slow responses dependent exclusively on one's own perspective (Samson et al., 2010). Moreover, recent developmental work has found that infants as young as 12 months are capable of Level-1 perspective taking (Creem-Regehr et al., 2013; Hegarty & Waller, 2005), clearly demonstrating the basic and potentially innate nature of this human tendency for social understanding. Level-2 perspective taking, in contrast, requires the ability to understand *how* another person sees an object or environment

(Flavell et al., 1981), which is a more complex skill requiring greater effort that does not appear to be done automatically (Surtees et al., 2012).

Nevertheless, for both Level-1 and Level-2 forms of perspective taking, egocentrism – interference from one’s own perspective – is capable of limiting the capacity and efficiency with which individuals adopt the perspective of someone else. Children’s errors on perspective-taking tasks, for example, are most typically associated with their own perspective, rather than being purely random (Flavell et al., 1981). Adults also appear to generally employ an egocentric heuristic, which they must seek to overcome when it is necessary for resolving interpersonal ambiguity (Keysar, Barr, Balin, & Brauner, 2000). Epley and colleagues (Epley, Keysar, Van Boven, & Gilovich, 2004; Epley, Morewedge, & Keysar, 2004) have found that one’s own perspective acts as an “egocentric anchor,” in that people adopt the perspective of others only after adjusting from their own. Because of this, adults in suboptimal conditions, such as when they are under time constraints, will tend to produce more egocentric errors, relying on their own view and failing to notice their partner’s discrepancy (Samson et al., 2010). Consistent with this argument for perspective taking’s dependency on cognitive resources, individual differences in executive functioning predict perspective taking ability in both children (Carlson & Moses, 2001) and adults (Wardlow, 2013).

What then are the conditions under which individuals will be more likely to spontaneously take the perspective of someone else? Wu and Keysar (2007) pitted a representational hypothesis against an attentional hypothesis in a cross-cultural study of American and Chinese participants. According to a representational hypothesis, people incorporate close others into their representation of the self, and so egocentric biases in

perspective taking should be most likely among people who are oriented towards interdependence and confound their own perspective with others. In contrast, an attentional hypothesis predicts that an interdependent orientation results in greater focus on the actions of others, which will produce less egocentric bias. Results of indirect measures of eye-gaze found support for the attentional hypothesis, with Chinese participants showing greater sensitivity to a partner's perspective than Americans. Other work has also found that spontaneous perspective taking is most common when perceivers attend to and seek to understand the *actions* of others. For example, several studies have found that perspective taking rates increase when the coactor is demonstrating an action, relative to when they are standing still or merely looking (Furlanetto, Cavallo, Manera, Tversky, & Becchio, 2013; Mazarella, Hamilton, Trojano, Mastromauro, & Conson, 2012; Tversky & Hard, 2009). This appears true even for anthropomorphized objects: Zwickel (2009) found evidence of more spontaneous perspective taking after exposure to a cartoon triangle when it moved in ways requiring attributions of agency.

Additionally, willingness to adopt the other person's perspective will be particularly likely if that perspective is believed to be important for establishing mutual understanding. Duran, Dale, and Kreuz (2011) found that a majority of listeners in their task, hearing ambiguous spatial instructions from a partner, adopted the perspective of the other person in their response. Importantly, the likelihood of taking the instruction-giver's perspective increased when success on the task depended on greater collaboration. Thus, the nature of the task itself and one's relationship to the other person appears capable of driving rates of perspective taking.

In light of this prior work, there is reason to hypothesize that residents will more frequently take the perspective of a visitor, relative to the visitor's adoption of the resident's perspective. As shown in Experiment 1, residents have an increased sense of responsibility for controlling and maintaining the activities taking place in the setting. If that activity involves collaborative joint action with a visitor, the resident – as a host – can therefore be expected to be particularly likely to attend to the actions and behavioral opportunities of the other person. Just as they were more likely to notice the garbage dropped on the floor, they should also be more attuned to the perspective of their visitor, who is central to the activity taking place in the territory. That is, if success on the task depends on effective social coordination, residents are hypothesized to be more likely to attend to functional information about their partner, thereby making them more effective social actors.

Visuospatial Ability and Perspective Taking

In the present study, both visuospatial ability and perspective taking was tested using a block design task. The former was measured by the time taken to complete the puzzle. Because the block design paradigm involves having a number of small puzzle pieces laid out in front of participants, perspective taking could also be measured by observing the extent to which participants acknowledge the other person's view of these puzzle pieces prior to beginning the task itself. Thus, participants were asked to describe the location of the pieces while sitting on opposite ends of a shared table. Whether or not the other person was considered when viewing the layout of the puzzle was assessed by coding these descriptions for terms acknowledging the other person.

In addition to having both a resident and visitor, the nature of the social context was manipulated for each dyad, such that the puzzle was framed as either a competitive task or a cooperative task. In the former, participants completed an individual puzzle simultaneously, whereas in the latter participants worked jointly to solve a single puzzle together. It was expected that perspective taking should be more common in a cooperative condition, as participants will be more likely to attend to the other person when it is relevant for their own performance.

It was also hypothesized that engaging in perspective taking would in fact improve performance on the cooperative puzzle task. When trying to solve the puzzle jointly, being aware of how the other person views the pieces and their spatial relationships should facilitate interpersonal coordination and problem solving. This is likely particularly critical for residents, who may be expected to act as *de facto* leaders within their own environment. Their ability to attend to their partner will help to determine how well the pair functions together. In contrast, when one is in a competitive version of this task, attending to the other person may in fact be detrimental to performance. The actions of the other person will largely be an unnecessary distraction when trying to solve the puzzle in parallel. Because of this, attending to the perspective of the other person is expected to have very different effects on performance, depending on the nature of the social task.

Finally, the self-report measures used previously were again collected to provide a replication of the results observed in Experiment 1. As before, it was hypothesized that residents would report greater identification with the setting and rate it as more comfortable and more spacious, even when participants are in a competitive contest with

an outsider while in the space. Moreover, individual-level factors were also measured following the puzzle task. These again included participants' mood (Watson et al., 1988), self-reported Big Five personality factors (McCrae & Costa, 2008), self-determination (Deci & Ryan, 2000), and construal level (Trope & Liberman, 2010). By measuring these scales following participants' competitive performance, it is possible to assess whether residents and visitors are differentially affected by how well they did on the task. According to the territorial defense account, performing poorly during competition while in one's own territory should represent a particularly powerful symbolic defeat. Thus, poor performance times among residents would be expected to produce more severe declines in mood and self-concept evaluations. In contrast, the perceptual account proposed here emphasizes the self-associative nature of the ambient environment, which contains information affirming the identity of the resident. Rather than being particularly devastated by home defeat, the environment can instead buffer residents from the negative experience of poor task performance. Observing how participants in a competitive context respond to defeat provides another useful comparison between these respective perspectives.

Method

Participants

One hundred twenty-six undergraduate students (70 women) participated in this experiment.

Procedure

Participants volunteered to take part in a study called “task performance in specific settings.” Sessions were created so that an initial seat was posted for participants

in the resident condition, with a second seat scheduled to start 20 minutes later for participants in the visitor condition. The initial procedure for residents followed that of Experiment 1, with participants first asked if they would be willing to return to the setting for later sessions, followed by being given a key, a nametag for the door, a dry-erase calendar to fill out, and a packet of decorations used to personalize the room. As before, this procedure sought to produce control-oriented markings (name on door, possession of key), identity-oriented markings (personalization), and enhanced territory permanence (anticipated return). While the resident was in the room, the experimenter recorded the amount of time spent decorating and waited in a secondary location for the participant in the visitor condition to arrive. The resident and visitor were always members of the same sex.

Once the visitor was present and the resident had completed decorating the experimental room, the two were told that they would both be working on a puzzle task. They were brought back into the resident's room and seated across from one another at a small table. Ten colored, wooden blocks were then arranged on the table by the experimenter (see Figure 2). Each block had a small number sticker placed on either side, so that this number would be visible to both participants. The experimenter said that an image would be hung on the wall, and the goal of the task would be to try to recreate that image using the puzzle pieces in front of them. Participants were first shown an example of the type of design they would create (see Figure 3). Dyads were randomly assigned to be in either a competitive or cooperative condition. In the cooperative condition, participants were told that they would be working together as partners to try to solve the puzzle as quickly as possible. In the competitive condition, participants were told that

there would be enough pieces on the table for them each to solve the puzzle individually, and that they would be competing with one another to solve the puzzle as quickly as possible. In the competitive condition, two designs would be put up simultaneously, and participants were instructed to complete the image on the left first before moving on to the image on the right. In both conditions, the resident was told that he/she could only touch pieces that have even numbers, and the visitor was told that he/she could only touch pieces that have odd numbers. This was done to emphasize the need to work together in the cooperative condition, and as a means to encourage participants to recognize the action capabilities of their partner. They were instructed that when they believe that they completed the puzzle, they must say the word “done.”

Once both participants indicated that they understood the task, the experimenter said that there was one initial task for them each to do before they started. A one-page questionnaire was given to each participant. Although both papers were identical, the experimenter looked closely at each before dispersing them, saying “I’ll have you do this one” while handing it to each participant. This script was used so as to imply that each participant had a different task. The form itself asked participants to describe the current location of each block on the table as best they could. Giving participants the impression that they were the only ones doing this particular task was done as an additional attempt to encourage participants to incorporate the view of the other person in their descriptions.

When participants completed their descriptions, the experimenter then repeated the instructions for the puzzle task and placed the target design on the wall. The experimenter recorded the time taken to complete the puzzle, stopping the stop-watch

once each participant said the word “done.” After the puzzle task was completed, participants were then given a final questionnaire to complete.

Measures and Materials

The room and packet of decorations used by the resident were identical to those in Experiment 1. The puzzle task was adapted from the Block Design Task component of the Wechsler Adult Intelligence Scale (WAIS), which is a clinical tool designed to measure visuospatial ability. Although the original WAIS task consists of several identical red and white blocks, the current task was altered so that three color combinations were present. Additionally, the blocks were numbered so that for both odd and even numbers, each participant could touch two green and white blocks, two red and white blocks, and one green and red block. The target designs to be recreated are shown in Figure 3.

The block location form was used to assess whether participants would include the perspective of the other person in their descriptions. Responses for each block were coded for number of words used, whether a self-referencing term was used (e.g., “my,” “to me”), and whether an other-referencing term was used (e.g., “his,” “to my partner”). Both self- and other-references represent an acknowledgement of the social component of the task, as opposed to those who use only directional terms without a perspective qualifier (e.g., “on the left”). Clarifying one’s own perspective (e.g., indicating that the block is to my left) is itself an acknowledgment that there is another way to view the table, although doing so is clearly a less explicit incorporation of the other person’s view in the description.

The questionnaire was essentially unchanged from Experiment 1. Ratings of the room were again assessed with composite measures created for a spatial index (Cramped, Crowded, Restricting, Roomy, Spacious; $\alpha = .79$), a comfort index (Comfortable, Cozy; $\alpha = .72$), and a positive valence index (Adequate, Good, Insufficient, Pleasant, Substandard, Unsuitable; $\alpha = .76$). Identification with the room was assessed with an adaptation of Droseltis and Vignoles' (2010) scale, including: "I feel like I fit well in this setting," "I feel a sense of emotional attachment to this place," "My values are represented in this setting," "I feel like myself in this setting," and "This place reflects the type of person I am" ($\alpha = .86$). Finally, participants estimated "How many people do you think could fit comfortably in this room?"

Participants' affective state was assessed using the PANAS (Watson et al., 1988), including both positive and negative affect items ($\alpha = .79$). Self-ratings again included the Self-Determination Scale, measuring self-awareness ($\alpha = .67$) and sense of choice ($\alpha = .75$), satisfaction with one's basic needs, measuring autonomy ($\alpha = .66$), competence ($\alpha = .72$), and relatedness ($\alpha = .81$), and the Behavior Identification Form, measuring construal level ($\alpha = .84$). Measures of personality factors were also collected both for the participant's self-rating and their rating of the other participant. However, despite being validated in earlier work (Gosling et al., 2003), very low reliability was observed for nearly all of these 2-item scales: extraversion ($\alpha_{\text{self}} = .64$; $\alpha_{\text{other}} = .66$), agreeableness ($\alpha_{\text{self}} = .41$; $\alpha_{\text{other}} = .25$), conscientiousness ($\alpha_{\text{self}} = .58$; $\alpha_{\text{other}} = .63$), neuroticism ($\alpha_{\text{self}} = .59$; $\alpha_{\text{other}} = .43$), openness ($\alpha_{\text{self}} = .45$; $\alpha_{\text{other}} = .47$), intelligence ($\alpha_{\text{self}} = .57$; $\alpha_{\text{other}} = .65$), and leadership ($\alpha_{\text{self}} = .46$; $\alpha_{\text{other}} = .79$). These constructs are therefore not used in the analysis.

Results

Residents spent 9.25 minutes on average decorating their assigned room. Unlike in Experiment 1, women and men did not differ in the amount of time spent decorating, although a similar trend was observed, $t(61) = 1.32, p = .192, M_{\text{women}} = 9.84, M_{\text{men}} = 8.51$. The two puzzle tasks differed greatly in the time required to complete them. The competitive puzzle task was completed in 92 seconds on average, whereas the cooperative puzzle task required 586 seconds on average. This was not surprising, however, as the latter puzzle required twice as many pieces to complete. Men and women did not differ in the time required to complete the competitive puzzle, $t(64) = 1.09, p = .278, M_{\text{women}} = 84 \text{ s}, M_{\text{men}} = 100 \text{ s}$, nor did male groups and female groups differ in the time required to complete the cooperative puzzle task, $t(28) = 0.66, p = .511, M_{\text{women}} = 622 \text{ s}, M_{\text{men}} = 523 \text{ s}$.

Puzzle Block Descriptions

Dyadic mixed effect models were employed to evaluate differences in participants' descriptions of the block locations, including room status (resident versus visitor), puzzle status (competitive versus cooperative), and their interaction. Because residents and visitors are distinguishable members of each dyad, different levels of variance were allowed for each type of member using heterogeneous compound symmetry. In terms of total amount of words used, the error terms for the two dyad members were significantly correlated, CSH $\rho = .480$, Wald $Z = 4.88, p < .001$. A marginally significant main effect was found for type of puzzle, $b = 6.94, t(61) = 1.89, p = .063$, with those in the cooperative condition tending to be more descriptive. No main effect was found for room condition, $t(61) = 0.89, p = .378$, but a marginally significant

interaction was observed, $b = 3.74$, $t(61) = 1.70$, $p = .094$. The mean number of words used by each group is shown in Table 1. Visitors tended to use more words in the cooperative condition, whereas residents showed little difference across puzzles.

Table 1 also shows the frequencies of both self- and other-references within these descriptions. The majority of participants did not make reference to either, with 46% acknowledging their own perspective and just 14% explicitly describing the other participant's viewpoint. Instead, most participants described the location of the puzzle blocks using only location and direction terms (e.g., across from, to the right) without specifying whom it was relative to. Notably, no participant *only* referenced the other person's perspective; rather, references to the other person occurred only among those who also noted their own vantage point at some point in his or her descriptions.

Zero-inflated negative binomial regression was employed to test the effects of residency and puzzle type on participants' block descriptions. This statistical method is used for the modeling of count variables (e.g., number of self-references) with an excessive number of zero values. There are two parts of the zero-inflated model: a binary model, which estimates the factors associated with the zero outcome, and the negative binomial model, which estimates the factors associated with the count variable. Looking first at self-references, no statistically significant main effects or interaction effect was found for the negative binomial count component of the model, $t_s \leq 0.95$. However, a marginally significant main effect was found in the logit inflation model for residency status, $b = 0.327$, $t(61) = 1.77$, $p = .077$, indicating that giving no self-references was slightly more common among residents. For the analysis of other-references, here too no statistically significant main effects or interaction effect was found for the negative

binomial count component of the model, $ts \leq 1.19$. However, a marginally significant main effect was found in the logit inflation model for puzzle type, $b = 0.467$, $t(61) = 1.67$, $p = .095$, indicating that giving no other-references was slightly more common in the competitive context.

Competitive Puzzle Task Performance

After controlling for dyad, no statistically significant difference was found when comparing the time required to solve the puzzle between residents and visitors in the competitive condition, $b = 5.39$, $t(32) = 0.35$, $p = .726$. However, the variance for performance was quite large, particularly in the resident condition, $SD_{\text{Resident}} = 75.11$ seconds, $SD_{\text{Visitor}} = 32.27$ seconds. When instead looking at outcomes just in terms of win-loss, the resident finished the puzzle before the visitor in 21 of the 33 competitive dyads, or 63.6% of all matches. Although slightly higher than the rates found in most sports (approximately 60%, according to Jamieson, 2010), the sample size was insufficient to allow this binary home winning percentage to reach statistical significance, $\chi^2(1) = 2.46$, $p = .117$.

To observe the consequences of participants' performance on the puzzle, an Actor Partner Interdependence Model was employed, regressing self-reported affect on the participant's time, the opponent's time, and their interaction with residency. A significant main effect was found for the participant's own puzzle time, $b = -0.003$, $t(57.31) = -2.15$, $p = .036$, and a marginally significant effect was found for the opponent's time, $b = 0.003$, $t(54.55) = 1.89$, $p = .065$. As would be expected, participants had a more positive mood when they solved the puzzle quickly, but a more negative mood when their opponent solved the puzzle quickly. A significant interaction was also observed between

the participant's own time and his or her residency status, $b = -0.003$, $t(57.58) = 2.05$, $p = .045$. The simple slopes for this interaction are shown in Figure 4. Although resident affect was relatively unaffected by their puzzle performance, visitors showed a much more closely coupled relationship between mood and performance, with slower performance predicting a more negative mood. No statistically significant interaction was found for the opponent's speed, $b = -0.002$, $t(54.77) = 1.52$, $p = .133$.

Additional Actor-Partner Interdependence models were also run to test for similar interactions between residency and puzzle performance on the other self-report measures, including self-determination, satisfaction with basic needs, and construal level. The only statistically significant interaction effect observed across these models was for sense of autonomy, $b = -0.005$, $t(55.27) = 2.39$, $p = .020$. This interaction is plotted in Figure 5. Although visitors' poor performance on the puzzle task had a negative effect on their feelings of personal autonomy, residents actually reported higher levels following a slow puzzle time.

Effect of Perspective-Taking on Performance

Competitive puzzle. To evaluate what influence attending to and referencing participants' perspectives had on competitive puzzle performance, an Actor-Partner Interdependence Model was again used. The extent to which participants clarified the perspective they were using was coded to classify participants as either: (a) those who used only directional words (e.g., "the left"), (b) those who only clarified the use of their own perspective (e.g., "to my left") at least once, or (c) those that included the other participant's perspective (e.g., "to his right") at least once. Thus, the analysis included residency, one's own use of perspective, one's opponent's use of perspective, and the

interactions between residency and perspective regressed on time required to complete the puzzle. No significant effects were found for any of the main effects, $t_s \leq 1.04$. However, a statistically significant interaction was found between residency status and the use of perspective in their descriptions, $F(2, 41.68) = 7.83, p = .001$. Specifically, a test of the simple effects revealed that residents who included their opponents' perspective did worse on the puzzle compared to those who used only directional words, $t(28) = 4.17, p = .001$, or only self-references, $t(28) = 3.70, p = .003$. Although the strength of this effect was driven in part by the particularly slow speed of one resident, who was approximately six standard deviations above the mean (Time = 459 sec), this interaction effect remained statistically significant after dropping this data point, $F(2, 52.33) = 3.41, p = .041$. This interaction, after removing the outlier, is plotted in Figure 6. Again, residents who included their opponents' perspective did worse on the puzzle compared to those who did not reference a perspective, $t(26.62) = 2.78, p = .030, d = 1.08$, or only used self-references, $t(26.62) = 2.55, p = .051, d = 0.99$. No interaction effect was found between residency status and the opponent's use of perspective descriptions, $F(1, 44.08) = 0.14, p = .707$.

Cooperative puzzle. To evaluate how cooperative puzzle performance was influenced by referencing perspectives, a pairwise dataset was created with dyads as the unit of analysis. An ANOVA was then employed, using the resident's perspective references and the visitor's perspective references as predictors of each pairs' puzzle time. A significant main effect was found for the resident's descriptions, $F(2, 22) = 4.45, p = .024, \eta^2_p = .29$. In contrast, no main effect was found for the visitor's use of self-references, $F(2, 22) = 0.61, p = .551$, nor was there a statistically significant interaction,

$F(3, 22) = 0.853, p = .480$. Dyad score means by resident and visitor perspective references are shown in Figure 7. Dyads where residents acknowledged either their own or their partners' perspective when describing the blocks ultimately solved the puzzle significantly faster than did those when the resident did not, $t(22) = 2.61, p = .016, d = 1.11$.

Questionnaire Items

To assess how the experimental manipulations altered attitudinal ratings, providing a replication of Experiment 1, dyadic mixed effect models were again employed using heterogeneous compound symmetry. For each outcome, room status (resident versus visitor) and puzzle status (competitive versus cooperative) were included, as well as their interaction. The time required to complete the puzzle was also included as a control variable, as questionnaire items were answered immediately following completion of the puzzle.

Ratings of the room. Figure 8 provides the means and standard errors for participants' ratings of the room. For identification with the room, a significant main effect was found for residency status, $b = 0.763, t(60.98) = 6.82, p < .001$, and a marginally significant effect was observed for the cooperative puzzle, $b = 0.255, t(60.97) = 1.87, p = .067$. No significant interaction was found, $t(60.98) = 0.10, p = .930$. Similarly, a significant main effect was also found residency status on ratings of comfort, $b = 0.427, t(60.99) = 3.67, p = .001$, and a marginally significant effect was found for puzzle type, $b = .271, t(60.83) = 1.73, p = .090$. There was no significant interaction, $t(60.99) = 0.23, p = .841$. A significant main effect was also found residency status on ratings on the spatial index, $b = 0.365, t(60.93) = 3.76, p < .001$. No main effect was

found for puzzle type, $t(61.42) = 1.46$, $p = .149$, nor was there an interaction, $t(60.93) = 0.15$, $p = .881$.

Unlike in Experiment 1, a main effect was also found for residency status on positive valence ratings of the room, $b = 0.272$, $t(61) = 3.66$, $p = .001$, as well as for puzzle type, $b = .225$, $t(61.65) = 2.21$, $p = .031$. There was no interaction, $t(61) = 0.30$, $p = .766$. Because this main effect for residency on valence ratings was found, it was important to ensure that the observed effects found for the other, relational room ratings were not dependent upon general positive valence. Therefore, the analyses were rerun including valence ratings as a covariate. Even when doing so, the main effects for residency status on all three outcomes remained statistically significant, $b_{\text{Identification}} = 0.592$, $t(66.29) = 5.82$, $p < .001$, $b_{\text{Comfort}} = 0.230$, $t(66.72) = 2.17$, $p = .034$, $b_{\text{Spatial}} = 0.258$, $t(66.9) = 2.64$, $p = .01$.

Because several participants gave a range in response to the potential number of people that could be in the room, their values were coded as the mean of that range (e.g., 3-4 was coded as 3.5). A marginally significant main effect was found for residency status, $b = -0.243$, $t(61.08) = 1.91$, $p = .062$, but no main effect was found for puzzle type, $t(67.21) = 0.01$, $p = .974$. As in Experiment 1, the effect of residency status on this value trends in the opposite direction of the effect on the spatial index, with residents tending to say that fewer people could fit in the room. Additionally, a marginally significant interaction effect was also observed, $b = -0.243$, $t(61.08) = 1.91$, $p = .062$, which is plotted in Figure 9. In the competitive condition, residents tended to report that fewer people could fit in the room than did visitors, $t(61.44) = 2.74$, $p = .008$, $d = 0.70$. However, in the cooperative condition, there was no difference between the two groups.

Self-Ratings. When controlling for puzzle performance, no significant main effect was found for residency status for mood, $t(60.78) = -0.04$, $p = .281$. The puzzle condition did have a marginally significant main effect, $b = 0.09$, $t(60.47) = 1.92$, $p = .059$, with participants in the cooperative condition reporting a more positive mood. However, this effect is qualified by a marginally significant interaction between the two factors, $b = 0.07$, $t(60.78) = 1.76$, $p = .084$. The means and standard errors for this interaction are plotted in Figure 10. Although resident mood remains essentially unchanged between puzzle conditions, visitors report more positive mood ratings following the cooperative puzzle task than after the competitive game, $t(77.89) = 2.66$, $p = .009$, $d = 0.60$. No main effects or interaction effects were found for any of the self-determination, basic needs, or construal level scales, $|t|s \leq 1.52$.

Discussion

The present study sought to expand on Experiment 1 by testing whether the procedure previously used to elicit territorial behaviors in a laboratory context would also provide residents with a home advantage. Of particular interest was whether an advantage would be found on tasks dependent on perceptual attention, but unlikely to benefit from aggressiveness. These two skills included perspective taking, a specifically prosocial action involving attunement to one's partner, and visuospatial ability, a capacity involving perceptual sensitivity to spatial relations in the physical world. Support for these hypotheses proved to be mixed.

Perspective Taking

In this experiment, perspective taking was measured by coding participants' descriptions of the layout of ten puzzle pieces laid out in front of them. Despite

experimental procedures meant to elicit perspective taking (e.g., only allowing them to touch certain pieces, making them believe their descriptions were for the table), less than half of all participants clarified their own point of view, and only a very small minority (14%) explicitly acknowledged the other participant's point of view. These results are consistent with accounts emphasizing the predominance of egocentrism when considering spatial layout (Epley, Keysar, et al., 2004; Epley, Morewedge, et al., 2004). It is worth noting, however, that this measure of perspective taking was taken just prior to beginning the actual task. It is certainly possible that attending to the other person's actions would increase dramatically during the task, as participants come to better realize the degree to which their own success is dependent upon their partner. Measuring these dynamic shifts in attention over the course of ongoing activity would of course require much more sensitive tools than was available for the present experiment.

Nevertheless, explicitly referring to one's partner was slightly more common in the cooperative puzzle condition, indicating that a collaborative context is likely to make participants more likely to explicitly refer to the other person's point of view. However, contrary to the primary hypothesis, residents were not more likely to overcome their egocentric bias in these descriptions. In fact, a trend emerged in the opposite direction when measuring self-perspective clarifications, with visitors slightly more likely to note that they were describing the pieces from their own frame of reference. Again, although self-references (e.g., my left, farthest from me) may appear to be examples of egocentrism, specifying that one is writing from one's own point of view is at least an implied acknowledgment that there is an alternative. In contrast, the majority of participants, who used only directional language (e.g., to the left, far end of table), appear

not to have considered this when providing their descriptions in purely objective phrasings. Thus, surprisingly, it was visitors that proved slightly more likely to clarify the subjectivity of their descriptions.

One possible explanation for this result may be derived from empirical work demonstrating that individuals do attend more to others when their outcomes are dependent on that individual (Erber & Fiske, 1984; Neuberg & Fiske, 1987; Ruscher & Fiske, 1990; Ruscher, Fiske, Miki, & Van Manen, 1991). Fiske (1993) has argued that this tendency reinforces existing power differences, with lower status individuals motivated to attend to those in power, but not vice versa. It is therefore possible that the trends found in this study may have resulted from a perceived status differences between residents and visitors, resulting in differing needs to attend to the other person. That is, visitors may have believed that their outcomes were more strongly dependent on residents, compared to how residents relied on visitors. Having said this, there is little evidence in the self-report data to bolster this argument: Residents and visitors did not differ in terms of their respective levels of self-determination, nor was self-determination statistically related to their block descriptions. It is therefore not entirely clear that visitors actually felt that their outcomes were more dependent on residents than the other way around. Nevertheless, the groups did clearly differ regarding their sense of fit with the physical environment, which may indirectly reflect differing levels of behavioral freedom. Future work assessing differing levels of attention and memory for certain attributes of residents and visitors may help to better test whether Fiske's (1993) expectations for power differences also apply in territorial relationships.

Although this outcome was used to assess participants' use of perspective taking, it is important to note that there is a difference between one's capacity to take another's perspective and deciding that it is necessary to do so. That is, although it is possible that residents may be able to more efficiently engage in perspective taking, it may have been the case that they also felt it less warranted to actually explicitly describe this perspective in the critical outcome variable used here. Because this task relied on deciding what to communicate to the experimenter, pragmatic considerations were likely relevant on top of any perceptual sensitivity to the other participants. For example, Grice's (1975) cooperative principle notes both a maxim of quantity (not making a contribution more informative than is required) and a maxim of manner, which includes avoiding unnecessary prolixity. Thus, the degree to which residents and visitors felt it necessary to describe a specific perspective may have differed, rather than their actual attunement towards it. Similarly, Surtees et al. (2012) note that there is a substantial difference between direct and indirect measures of perspective taking. The former, of which the current study is an example, requires that participants choose to respond in a specific way. As a result, even though participants may detect others' perspectives efficiently, deciding to report either one's own or someone else's perspective requires its own effortful, conscious decision that may be swayed by other factors (Qureshi, Apperly, & Samson, 2010). The benefits of being a resident may therefore be more subtle than what was measured here, requiring more sensitive measurement of perceptual activity. This aim will be the focus of Experiment 3.

Visuospatial Task Performance

Visuospatial ability was tested in this study using a block design task, which required participants to rearrange as quickly as possible several colored puzzle pieces into a presented design. Evidence for a performance difference by residency status on this task proved to be mixed. In the competitive condition, no statistically significant difference emerged in terms of the time required to complete the study. Ultimately, the amount of natural variability on this task likely made an effect rather difficult to find. It is certainly likely that having some type of neutral baseline measure of visuospatial ability to either control for or use to match opponents of similar skill would have helped to reveal any possible differences.

However, measuring the raw times may not be the ideal way to assess performance in a competitive context such as this. For studies done in sports contexts, home advantage is generally measured solely in terms of winning or losing, rather than by total number of points scored. This is done largely because strategies change after taking a lead. For example, a soccer team winning by 2 goals may choose to adopt a more defensive strategy, as there is generally little reason to continue trying to score more goals if the status quo ensures victory. In a similar way, it seems justified to consider winning percentage as a reflection of improved performance in this task as well. Once an opponent has finished first, it is likely that the other player may partially disengage from the task, having already lost. Certainly, at the very least, hearing the other person say “done” would be a substantial distraction and blow to one’s level of concentration. It is also possible that residents and visitors may react differently after seeing the other person finish, in light of the implications of losing in either one’s own or someone else’s

territory. Potentially, slower scores among residents may have been inflated following the visitor's victory because of the psychological blow this may have had. In the present experiment, rates of resident wins (64%) paralleled closely those traditionally found across many sports contexts (Jamieson, 2010). This provides some additional, albeit tentative, support for the experimental procedure's usefulness in studying territorial functioning. Importantly, this advantage was found on a task that relies on perceptual spatial abilities, but involves minimal interaction with one's opponent, thereby making the value of interpersonal aggression minimal.

Notably, the way in which residents clarified the perspectives they used in their puzzle block descriptions differentially altered their performance on the task, depending on their social context. Recently, researchers have noted that although perspective taking is typically associated with positive social interaction, in competitive contexts it can trigger hypercompetitive and highly antisocial, unethical behavior (J. R. Pierce, Kilduff, Galinsky, & Sivanathan, 2013). Attending to another perspective may equip an individual to be more likely to manipulate and cheat his or her opponent. Thus, an aggression based account of home advantage may expect the resident to attend to the intruder's perspective in a competitive context so as to better dominate and overcome that opponent. However, the results found in this study challenge any value that interpersonal aggression would have for a resident in this way. Spending time describing their opponent's perspective actually predicted worse performance on the puzzle task among residents in the competitive context. It therefore appears more likely that paying attention to the intruder was a distraction to residents, ultimately hampering their puzzle solving speed. The territorial defense account is unlikely to provide an explanation for this dampening effect,

as it predicts that competitive performance enhancement emerges specifically because residents witness an intruder and experience threat.

In stark contrast, when residents specified their perspective in the collaborative task, the dyad solved the puzzle task more efficiently than when using purely directional language. Notably, it was only the residents' descriptions of the blocks that predicted group performance, not the visitor's. This may reflect differing levels of leadership between the pair, reinforcing again the importance of hosting others as a component of territorial functioning. Unfortunately, determining the ways in which the resident's recognition of the visitor's perspective was manifested in subsequent behavior, as well as how this ultimately improved their coordinative skill as a joint unit, is beyond the ability of current study's measures to assess. It is possible, for example, that residents will be more likely to engage in behaviors traditionally associated with positions of greater authority, such as issuing instructions to the other person. Residents who are more attentive to the other person's perspective will likely provide more efficient and less ambiguous suggestions to his or her partner across the table. Alternatively, Conroy and Sundstrom (1977) found what they referred to as a "hospitality" effect, with residents less likely to show dominant speech patterns when speaking with someone they agree with. It is therefore possible that residents who pay more attention to their partner's perspective also show greater hospitality, allowing the visitor more freedom to act confidently and with less inhibition. It may be by this more subtle means that the dyad's performance improves.

Beyond just the amount and instructional nature of the speech one engages in, it is also important to note that bodily movement is critically involved in interpersonal

communication. Articulatory, facial, and gestural behaviors become coupled to the activity of one's communication partner. In other words, during public language use individuals accommodate to one another in multiple ways. Speakers coordinate both their external bodily movements (Fowler, Richardson, Marsh, & Shockley, 2008) as well as their articulatory gestures, thereby enhancing similarity of pronunciation and word use (Pardo, 2006; Pickering & Garrod, 2004). These forms of synchronization allow for effective social coordination (Wheatley, Kang, Parkinson, & Looser, 2012). In the context of a physical territory, the extent to which residents converge towards the behavioral patterns of their visitors may also predict the effectiveness of the pair's coordinated behavior. Understanding how the resident's social behavior may be uniquely important in predicting a dyad's outcome represents a critical future direction for explaining performance within particular physical territories.

Attitudinal Ratings of the Room

Self-report responses provided an opportunity to replicate the results found in Experiment 1 for participants' attitudes toward the room, thereby providing further support for the efficacy of the experimental procedure in producing territorial feelings toward the space. In addition to having a larger sample of participants, the measures collected in this experiment are also useful for expanding on the previous study because of the additional person present in the room during the questionnaire's completion. Replicating the effects under these circumstances therefore help to insure that the effects found for relational items (e.g., identification, comfort) are constant even when in the presence of an intruder or visitor. Consistent with the prior experiment, residents reported high levels of identification with the space, and they also rated it as more comfortable and

more spacious than did visitors. Importantly, these group differences remained statistically significant even after controlling for positive valence, again indicating that the effect was not dependent on generalized self-enhancement or the endowment effect (Kahneman et al., 1991; Knetsch & Sinden, 1984). These results show how one's relationship with a physical setting can drive participants' judgments about it.

Moreover, as in Experiment 1, spaciousness was a measure clearly distinct from the number of people participants believed could fit in the room. Whereas residents clearly felt that the setting was more spacious than did visitors, estimates of maximum occupancy by the resident varied depending on the social context. That is, residents reported that fewer people could fit in the room in the competitive condition, compared to those in the cooperative condition. This interaction supports the claim that residents are sensitive to the perceived encroachment of intruders into their space, resulting in a need for greater spatial claims (Lyman & Scott, 1967; Sommer & Becker, 1969). However, these increased spatial claims do not occur indiscriminately of who the visitors are. When hosting others in a collaborative context, residents were no different than visitors in terms of their estimates. Therefore, it is clear that characterizing the resident's relationship with others purely in terms of spatial defense is inadequate. Rather, it is clear that residents by and large view their territory as less physically restricting than do visitors and equally capable of supporting guests, unless these visitors are in some sense hostile.

Residency status also played a role in determining the emotional responses participants experienced following their task performance. As would be expected, visitors reported a more positive mood when they solved the puzzle quickly, and they had a worse mood when they did poorly. However, resident mood remained stable regardless of

how well they did on the puzzle task, with the room attenuating the negative emotional experience typically associated with poor performance. A similar result was found for participants' self-rating of personal autonomy, which, according to Self-Determination Theory, represents the belief that one is a causal agent of one's own behavior (Deci & Ryan, 2000). This result is contrary to expectations derived from ethological theorizing, which predicts that defeat at home is extremely costly (Hinsch & Komdeur, 2010). Should not a poor performance at home be more painful? Instead, many environmental psychologists have argued that humans personalize physical settings in large part in order to help regulate their emotions (Gosling et al., 2008; Korpela, 2003; Korpela et al., 2001; Rafaeli & Vilnai-Yavetz, 2004a; Scheiberg, 1990). Exposure to one's identity-oriented markings can help restore feelings of self-worth, with a scan of the environment essentially providing residents with the equivalent of a self-affirmation exercise. Additionally, behavioral residue (Gosling et al., 2008) from previous activities may provide evidence of earlier success in other tasks, thereby mitigating the damages of immediate failure. The stability of residents' emotional experience again represents a challenge to the territorial defense account of home advantage, which views negative arousal in response to threat as the catalyst for behavioral differences.

Chapter Summary

In this study, the previously validated procedure for inducing territorial feelings in the lab was employed to assess home advantage on a pair of perceptual skills. Residents and visitors engaged in a block design task, which assessed visuospatial ability and perspective taking. In a competitive context, residents did in fact finish prior to the visitor at rates similar to previous demonstrations of home advantage. In cooperative contexts,

dyads did better when the resident clarified his or her perspective, suggesting the uniquely important role the resident and his or her attentiveness to visitors play in successful group functioning. Nevertheless, contrary to the hypothesis, the residents were not more likely than visitors to attend to and describe their partner's perspective on the critical dependent measure. However, choosing not to report the other person's perspective is distinct from the efficiency with which one can attend to it, and so more subtle measures of perceptual activity may better shed light on such differences. In the next chapter, more sensitive measures are used to assess how perception and performance relate within territories.

Chapter 6

Experiment 3: Visual Search Behavior in Virtual Territories

As discussed in Chapter 3, a foundational principle of the ecological approach to psychology is the reciprocity between perception and action. In contrast to traditional, mechanistic formulations of perception, wherein sensory modalities passively receive external stimulation, the ecological view argues that the proper unit of analysis is not sense receptors, but instead a perception-action system (Turvey & Carello, 1986).

Awareness of the environment comes about from the physical activity of the perceiver moving within the ambient array of information structured by the physical environment. Moving one's eyes, head, or feet alters the structure of the optic array, while the person's body acts as an invariant across these changes. Complementarily, perceptual activity informs the actor of what is behaviorally possible within the environment. As Gibson (1958) stated in his early work, "The starting point for a theory of locomotion in the higher animals would be the fact that they have eyes...which can register not merely light but the objects of an illuminated environment" (p. 260). Perception guides behavior, and behavior alters perception. It is through the discovery of both variants and invariants in the process of exploratory perceptual activity that knowledge about the world and how to act in it comes about.

One's performance on a particular task therefore always involves not only motoric and behavioral skill, but also the perceptual activity needed to detect information specifying what, when, and how one can act in order to succeed at the task. Thus, a home advantage will involve more than just enhanced behavioral activity, but also enhanced perceptual activity that guides that behavior. In the current experiment, I evaluate how

visual search – one’s ability to efficiently detect particular information in the environment – may be facilitated within a virtual territory due to its self-associative nature. This hypothesis is tested using a difference detection procedure, which requires that participants visually scan two near identical images of a scene in search of discrepant information. This chapter begins with an overview of the factors known to influence human gaze during scene perception, before describing the relevance of these factors when viewing one’s own scene.

Visual Search and Human Gaze Control

What is involved when humans engage in visual search activity? When humans perceive scenes and seek relevant visual information, high acuity is generated only at the point of fixation, a limited spatial region that corresponds with the fovea. Visual quality declines rapidly from this center of one’s gaze. Because of this fact, eye movement in their sockets is characterized by rapid saccades – sharp, darting movements – occurring approximately three times every second, allowing the fovea to reorient to different regions. It is at the point of fixation, occurring between saccades, that information about the environment can be acquired (Henderson & Hollingworth, 1999). Thus, understanding where and for how long fixation points center on particular places and objects within a scene can be informative regarding how perceivers control and direct their gaze in certain environments, which will ultimately guide behavioral performance.

Research on gaze control has focused on exploring two drivers of fixations: bottom-up scene-based factors that attract attention and top-down memory-based knowledge that guides the perceiver’s attention (Henderson, 2003). In terms of the former, a wealth of empirical data has shown that fixations tend to occur at locations that

are interesting and informative, relative to the rest of the scene (Henderson & Hollingworth, 1999). Independent ratings of the informativeness of different regions in a picture correlate highly with perceiver fixations when viewing it (Antes, 1974; Mackworth & Morandi, 1967). For example, fixations tend to be drawn to regions containing objects, whereas homogenous, undifferentiated regions attract little spontaneous attention (Henderson, 2003). Additionally, objects that are inconsistent with the scene (e.g., a toaster in a bathroom) will also attract more attention, as these unusual objects are likely to be more informative when trying to understand what is important in the space (Hollingworth & Henderson, 2003). Regions that elicit interest among perceivers are not only attended to more, but are also more likely to be remembered. For example, Rensink, O'Regan, and Clark (1997) found that the phenomenon of change blindness – the inability to detect a change in a visual stimulus – is less severe when alterations occur in regions independently evaluated as interesting. Importantly, subsequent work by Shore and Klein (2000) found that the effect of interest on change detection was eliminated when the image was inverted, thereby losing its perceptual meaning. Thus, it is clear that attention is drawn naturally to areas that provide useful and meaningful information to the perceiver.

Although certain inherent features of the environment can attract attention, the knowledge, goals, and experience of the actor will also influence eye gaze patterns when perceiving and searching for particular information in an environment. Henderson (2003) identifies three ways in which perceiver knowledge drives gaze control. The first is *task-related knowledge*, which is the gaze-control strategy a perceiver may engage in that is relevant to the particular task at hand. For example, a video game player will

purposefully make periodic fixations at the top corner of the screen to monitor the health of his character, and a driver operating a vehicle will consciously check her rear windows at occasional intervals. In a similar way, empirical work has found that fixations during scene viewing differ depending on whether the perceiver is searching for an object or attempting to memorize the scene (Henderson, Weeks, & Hollingworth, 1999). Thus, what one hopes to accomplish will in part dictate how the perceiver visually scans the setting.

The second form of knowledge based gaze control is what Henderson (2003) refers to as *scene-schema knowledge*, which is generic knowledge about certain types of settings. A history of interaction with the physical milieu typically found within particular locations provides culturally dependent regularities to aid visual search. Certain types of objects can be expected to be found in certain types of scenes: e.g., a refrigerator in a kitchen, a television in a living room, or a shower in a bathroom. Recognizing the cultural meaning of a scene provides predictability for the types of objects one might find, as well as their expected locations within the setting (Brooks, Rasmussen, & Hollingworth, 2010; Castelhana, Pollatsek, & Cave, 2008; Ehinger, Hidalgo-Sotelo, Torralba, & Oliva, 2009; Võ & Wolfe, 2013). This background knowledge can facilitate the efficiency with which perceivers can find information. Participants are faster at finding objects presented in consistent or coherent environments, compared to when these objects are atypical of the location (Antes, Penland, & Metzger, 1981; Boyce, Pollatsek, & Rayner, 1989; Friedman, 1979). For example, a perceiver is likely to be quicker at finding a toaster in a kitchen than she would be at finding a microscope in that same kitchen. This difference in speed is due to the experience individuals have with the

typical content of such scenes, allowing participants to predict the likelihood of the spatial layout of the objects normally present in various different locations (Henderson & Hollingworth, 1999). With experience, one is able to anticipate that a toaster is more likely to be on the counter than on top of the refrigerator.

Finally, human gaze can also be guided by *episodic scene knowledge*, which is knowledge of a specific scene that is learned over time. In fact, research on contextual cuing has shown that meaningless scenes, consisting of arrays of various objects, can be learned very quickly from repeated exposure, even without the perceiver's explicit awareness (Chun & Jiang, 1998; Hoffmann & Sebold, 2005). Previous exposure and memory for the spatial structure of a scene, consisting of the configurations of surrounding objects, is able to facilitate later search (Hollingworth, 2006). This is true even when prior viewing of a scene did not include the object to be found, with memory for the general context of the setting also capable of improving visual search efficiency (Hollingworth, 2009). However, some studies assessing visual search when presented with basic stimuli arrangements have found that repeated exposure alone did not improve detection speed (Oliva, Wolfe, & Arsenio, 2004; Wolfe, Klempe, & Dahlen, 2000; Wolfe, Oliva, Butcher, & Arsenio, 2002). This work has shown that individuals, particularly when viewing simple displays, do not always rely on their memory to guide search. Instead, perceivers may continually engage in repeated, inefficient search patterns, with memory going unutilized. Thus, the benefits of previous knowledge on visual search speed appear to be dependent on certain task-relevant factors. Specifically, episodic memory appears to be most influential when search tasks are especially difficult, such as when the objects to be found are difficult to discriminate, the area to be visually

searched is large, or when very little semantic guidance is provided by the scene (Solman & Smilek, 2012; Vö & Wolfe, 2013). Additionally, distracting memory load can inhibit visual search and detection (Solman, Allan Cheyne, & Smilek, 2011), clearly showing the close linkage that can emerge between perceptual and memory-related processes.

In total, this literature outlines several ways in which human gaze, in search of information in the optic array, may be guided by several factors related to the goals and knowledge of the perceiver. Although this literature explicitly distinguishes between top-down and bottom-up factors (Henderson, 2003), it is clear that such distinctions are blurred over time. Features in the environment can become intrinsically interesting and informative as a result of activity in the setting over time, just as these inherent features constrain and guide what is remembered about the scene for later use. Importantly, these studies show how contextual factors can facilitate the visual detection of information, such as when searching for objects or noticing changes in a scene.

Visual Search in Territories

Applying these findings to the particular context of a resident's territory, it is possible to hypothesize differences in the efficiency with which residents and visitors engage in visual search activity. As discussed in Chapter 3, the ecological account of home advantage proposed here argues that residents are able to better regulate their behavior relative to the environment because of the two relationally defined factors, familiarity and self-association, that characterize territories. These factors are hypothesized to be responsible for facilitating the effective cycles of perception and action needed to function successfully in an environment. Importantly, they will therefore

also be highly relevant to both the bottom-up and top-down factors that influence visual fixations during scene viewing.

The well documented self-reference effect has demonstrated that information about the self is particularly salient and attracts greater levels of attention (Devue & Brédart, 2008; Gray et al., 2004; Sui et al., 2009). Not just restricted to explicit references to oneself, this effect also applies to possessions, as participants better attend to objects assigned to be theirs (Turk et al., 2011). Thus, the self-associative nature of territories can be expected to implicitly attract high levels of interest among residents, similar to the informativeness argued by Henderson (2003) to be a bottom-up, scene-based factor guiding human gaze. This enhanced interest has important implications. Bovasso and Rettig's (1997) work on visual illusions demonstrated that perceptual judgments are more accurate for self-referencing stimuli, which they suggest is the product of greater epistemic curiosity. Therefore, the nature of the perceptual array, in being the participant's own setting, can be proposed to increase the frequency of exploratory perceptual activity engaged in by the resident, which ultimately facilitates successful detection of relevant information.

In terms of knowledge-based, cognitive guidance, the benefits of episodic scene knowledge described above, in which memory for the specific environment aids in search, will also be particularly relevant in the context of a territory. In addition to the self-reference effect's role in attracting attentional focus, this prioritization of self-relevant information also enhances participant memory for this information (Turk et al., 2013). Again, these effects apply not just to trait concepts, but also to possessions. Cunningham et al. (2008) found that people show enhanced memory for their own

objects, even when they are arbitrarily assigned to be theirs by an experimenter. This finding suggests that episodic scene knowledge should be greater among residents, thereby allowing subsequent activity to further benefit from their ongoing experience in the setting. Greater episodic scene knowledge among residents can therefore be hypothesized to lead to more efficient visual search patterns.

In the present experiment, this hypothesis is tested by having participants seek to detect slight differences between a pair of images, which portray a scene that is experimentally manipulated to be either the participant's own virtual territory, someone else's virtual territory, or a scene generated randomly by a computer. This was accomplished by having participants select the type of furniture or objects they would choose to furnish the setting with. Previous work employing comparable difference detection procedures have demonstrated the difficulty perceivers have in noticing visual discrepancies, even when the stimuli is presented simultaneously (Brunel & Ninio, 1997; Scott-Brown, Baker, & Orbach, 2000; Shore & Klein, 2000). The challenge of detecting small image discrepancies should lead individuals to rely on memory to inform their visual search patterns, rather than engaging purely in spontaneous, random, or unguided perceptual activity (Solman et al., 2011; Solman & Smilek, 2012). Because it has been demonstrated that memory is enhanced for "owned" objects (Cunningham et al., 2008), it was hypothesized that residents in this task would benefit from the enhanced knowledge of their objects' locations and be able to more efficiently detect these differences than when viewing someone else's setting. Moreover, previous findings by Constable et al. (2011) and Meagher (2014; Meagher & Kang, 2013) suggest that participants' detection of and response to functional, perceptual information can be inhibited when presented

with objects that are socially off-limits (i.e., belonging to someone else or associated with a different social group). Thus, knowledge that one is viewing someone else's space was also hypothesized to inhibit performance in this visual search task, relative to a neutral location.

The prediction that visual search performance will be enhanced in one's own setting may at first seem contrary to previous work measuring the effect of self-referential information on attention. In the past, researchers have viewed the presence of self-referencing information as having a potentially negative effect on visual task performance (Breska, Israel, Maoz, Cohen, & Ben-Shakhar, 2011; Devue & Brédart, 2008; Sui et al., 2009; Turk et al., 2011). For example, when searching for a particular facial image, the presence of the participant's own face in the array of options produces a temporary distraction, thereby inhibiting performance. However, these negative effects have been shown in tasks measuring only very brief perceptual focus, lasting less than a few seconds. Its ability to distract should be less likely during longer presentations of stimuli that are more difficult, which will instead rely on additional cognitive and memory related factors that benefit from being self-referential.

In addition to manipulating the type of scene shown to participants, the differences to be detected within the scenes also varied in several important ways. First, discrepancies were either directly related to the objects participants had selected, or they were unrelated to the participants' choices. That is, certain differences in the scenes altered how one would use the objects that had been selected by the participant (e.g., alterations to the remote control after selecting a television, the pillows on one's chosen bed, or the location of the key used to open one's filing cabinet). If participants are

particularly sensitive to the specific objects they had chosen, rather than the scene as a whole, then residents should be especially quick at detecting differences directly related to the objects they had selected themselves. Second, discrepancies also varied in terms of how action-oriented they were. Certain differences were chosen to be purely aesthetic (e.g., color of a rug pattern), whereas other differences directly altered what one could do in the setting (e.g., presence or absence of a keyhole on the cabinet). Again, if residents are particularly attuned to functional information in their settings, they should also be quicker to notice these differences in their opportunities of action. Finally, discrepancies also varied in terms of their form. Specifically, a distinction was made between differences that were based on spatial orientation only (e.g., the height of a painting) versus those that involved either the absence or replacement of an object (e.g., having a different frame). If residents are concerned primarily with the defense of their space, they may be expected to be particularly sensitive to the latter category, which entails one version of their scene to be “missing” one of their possessions. Alternatively, if they are concerned primarily with how to move and act in the space, sensitivity to differences in spatial orientation would be greater.

Method

Participants

Eighty undergraduate students (48 women) participated in this experiment.

Procedure

Participants volunteered to take part in a study called “perceptual abilities and personal preferences.” The experiment was described to participants as being about how certain cognitive abilities may be related to individual aesthetic preferences. Participants

arrived to the experiment individually and were told that they would be playing a computerized task with another (ostensible) participant, who would be playing in another room down the hall. Participants were told that they would be Player 1 and that the other participant was Player 2. Critically, the social context in which the game was to be played was manipulated. Half of the participants were told that they were competing with the other student and that they should try to finish first. The other participants were told that they would be working jointly with the other student and that their times would be averaged for a single team score. This manipulation did not involve actually engaging in cooperation in a true sense, as participants were still attempting to finish each trial as fast as they themselves could. Nevertheless, the point of the condition was to reduce any type of negative or competitive defense motivation that players would feel towards the ostensible other person, who would be viewing the virtual scenes they had designed. The computer game was designed so that an initial loading screen was displayed for 20 seconds, to provide the illusion that the two computers were linked together.

Participants were also informed that eye movements would be tracked and recorded during the study. This was accomplished using a small tracking camera located directly below the monitor. Prior to beginning the game, the camera was calibrated to follow participants' eyes. However, participants were instructed to limit their head and body movement as much as possible.

The game itself consisted of nine trials. Figure 11 provides a pictorial depiction of the computer screens shown on a single trial. At each trial, participants were first told the type of scene that they would be shown. The settings used in this study included two bedrooms, two kitchens, two living rooms, two offices, and a dining room. Participants

then indicated their preference for three types of objects that would appear in the scene. For example, in one of the office scenes, participants chose which of three chairs, which of three desks, and which of three filing cabinets they would prefer in their space. Once these selections had been made, the program randomly assigned the trial to present Player 1's scene, Player 2's scene, or a random generation by the computer. On Player 1 trials, the objects selected by the participant were inserted into the scene to be presented. In Player 2 and Computer trials, objects not selected by the participant were inserted into the scene. Over nine trials, this manipulation provided three scenes where the participant was a virtual resident, three scenes where the participant was a virtual visitor, and three neutral scenes. After a 10 second exposure to the first image, a red cross appeared on the bottom corner of the screen, which participants were instructed to focus their attention on. A second image of the scene then appeared next to the original, which contained four slight discrepancies that the participant was instructed to find and click on. The software program recorded the time required to click on each difference. If participants did not find all four differences within three minutes, the trial ended and they were told that their time had run out. Objects that were not found were recorded with the upper time limit: 180 seconds. Participants failed to find at least one of the objects on 1.6% of all trials.

Materials

The computer game was programmed in the Unity game engine with 3D objects purchased from the website: <http://www.turbosquid.com>. Each scene required participants to make three preference selections, and each selection was chosen from three possible options. Table 2 lists the objects to be selected in each scene of the experiment. Participants played the game on a widescreen monitor at a resolution of 1600

x 900 pixels. For each trial, the software recorded the amount of seconds before the detection of each discrepancy.

Results

Table 3 provides the average time required to detect each discrepancy, as well as the coding used to categorize each type of difference. To assess how social factors influenced detection speed, mixed effects models were employed in a step-wise fashion. Coefficients are shown in Table 4. Random effects were specified for each participant (1-80), and each discrepancy (1-36) nested within each scene (1-9). In the first model, main effects were included for three control variables: participant gender (Women = -1, Men = 1), trial order, and a dummy-coded variable specifically for the participants' first trial, as there was no true practice trial prior to beginning. Critical main effects included: (a) the between-subject factor of social context (competitive = -1, cooperative = 1), and (b) the within-subject factor of residency status and visitor status. Neither social condition nor residency status proved to have a statistically significant effect, $t_s \leq 0.66$, $p_s \geq .511$. In the second model, the interactions between social condition and resident and visitor status were included. A log-likelihood ratio test revealed that this addition provided a statistically significant improvement to the model, $\chi^2(2) = 6.20$, $p = .045$. The interaction between social context and visitor status was marginally significant, $t(2725.90) = 1.91$, $p = .057$. The means for this interaction are graphed in Figure 12. In both the resident and computer-generated conditions, detection time is slightly slower in the competitive context. In contrast, when viewing a scene as a visitor, this difference trends in the opposite direction, with participants slower in a cooperative context. However, none of

the simple effects within residency condition were themselves statistically significant, $t_s \leq 1.25$, $p_s \geq .213$.

In the final model, the three within-trial factors of discrepancy type – selection, action, and spatial orientation – were included in the model, along with their interactions with social condition and residency status. Specifying the types of discrepancies in this way also improved the fit of the model, $\chi^2(12) = 37.44$, $p < .001$. A pair of interactions between residency status and the type of discrepancy assessed were found. The action-oriented nature of the difference had a statistically significant interaction with visitor status, $t(2757.79) = 2.13$, $p = .033$, as well as a marginally significant interaction with resident status, $t(2759.12) = 1.86$, $p = .063$. These interactions are shown in Figure 13. Although across all three conditions the action-relevant differences were the most difficult to detect, this difference only approached statistical significance within the computer-generated scenes, $t(33.18) = 1.77$, $p = .086$. An interaction was also found between resident status and spatial discrepancies, $t(2773.34) = 2.09$, $p = .037$, which is graphed in Figure 14. Residents tended to detect spatial discrepancies slightly more quickly than non-spatial differences, whereas the reverse pattern was true in the computer-generated trials. However, here too the simple main effects did not reveal statistically significant differences within the different residency condition trials, $t_s \leq 0.45$, $p_s \geq .652$.

Discussion

The current experiment sought to assess whether differences in visual search ability would emerge in virtual territories, that is, in static scene images that were in part personalized by either the participant or an ostensible other. Contrary to the hypothesis

the participants would perform better in scenes that were self-referential, no difference was found between resident, visitor, and control trials in terms of detecting discrepancies between two images. Moreover, performance in residency and visitor trials did not notably differ in terms of the type of discrepancy measured (i.e., selection-relevant, action-oriented, spatial orientation). Rather, the statistically significant interactions observed in this respect tended to differentiate the computer-generated, control trials from both the resident and visitor trials. Specifically, participants were distinctly worse at detecting action-oriented and spatial differences when in computer-generated trials, relative to aesthetic and non-spatial discrepancies, respectively. In contrast, these patterns were quite similar between residents and visitors, indicating that the person to whom the space referred to did not substantially alter attunement to these features. However, it is notable that when the space did not refer to anyone, attention to spatial and behavioral information declined. The cause of this shift in attention is unclear. No main effects on detection time were found for discrepancy type, so this attunement difference is not tied to the general difficulty of finding each item. There was also no main effect for residency status, so it is not as though participants were less engaged generally in the task on computer-generated trials. Potentially, computer trials may be in some ways less immersive or less “real” than settings that had been knowingly created by another human being, leading to less attention to behavioral information. Rather than being concerned with what could be done in the setting, participants adopted a focus on aesthetic and color differences. Such a conclusion is, of course, purely speculative.

In terms of the lack of distinction between resident, visitor, and computer-generated trials, there are several potential explanations for this study’s failure to support

the primary hypothesis. One possibility is that the search task used here was not sufficiently difficult to produce performance differences. Wolfe and colleagues (Oliva et al., 2004; Wolfe et al., 2000; Wolfe et al., 2002) have found that visual search patterns of fairly simple object arrays are often highly inefficient, even when participants have prior exposure to the scene and the objects that they are searching for. Thus, facilitated memory could have played little role in aiding performance if participants did not utilize this knowledge when visually searching during the task. However, it is unlikely that the current task was less difficult than those used in studies that have found memory effects (e.g., Hollingworth, 2006). In fact, in light of the well-documented challenge perceivers have with change detection paradigms, it is far more likely that this task was more difficult than the object search procedures previously demonstrating the effect.

A second potential limitation of the study was the extent to which resident trials were truly self-referential. Due to practical issues regarding software programming, the degree to which settings could truly feel like virtual territories was ultimately limited. Participants selected three objects displayed in each scene. Although an effort was made to ensure that these furnishings would be prominent, the environment was also littered with many additional objects that were not chosen by the participant. Although this was deemed necessary to make the search task sufficiently difficult, it ultimately will have tempered the extent to which the environment felt like one's own. Additionally, participants could only select an object from three options. The degree to which participants truly liked any of the three options is also unclear, which again limits how much they are likely to identify with the setting. Ideally, participants would have a much wider range of choices and more time to consider what types of objects to place in each

of their rooms, as well as how they would arrange them. Nevertheless, it is notable that previous empirical work has found self-reference effects on memory and attention for objects that are arbitrarily assigned to participants (Cunningham et al., 2008; Turk et al., 2011), which involves even less participant choice than was used here. However, it is possible that a single owned object differs in this respect from an entire physical setting, which contains multiple objects of varying levels of personal relevance.

Finally, it is also possible that the discrepancy detection paradigm used here was a visual attention task that inherently weakened the potential impact of a self-referential space. The account of home advantage outlined in Chapter 3 emphasizes the mutuality between perception and action. However, the minimal ecological validity of the current experiment limits the coupling between perceiving and acting in the present task. Participants viewed a pair of static, two dimensional images, which was therefore not itself behaviorally immersive. It is unclear how similar perceptual processes in the current experiment are with how a person would actually survey a physical setting through which he or she could move. A large component of exploring and learning about a physical setting involves physical activity, which is impossible in the simplified experimental procedure used here. In fact, detecting behavioral information in these static scenes is in actuality an error of commission (McArthur & Baron, 1983), as none of these affordances can be truly realized in a pictorial representation. Moreover, having two images of the scene visible at once will have further removed any sense of being truly immersed in an actual home environment. In addition to its effect on perceptual activity, having dual images could also have weakened participants' sense of identification with the space in residency trials. Home environments are uniquely important and distinct settings

to residents, so having multiple versions of the scene appear simultaneously may inhibit particularly strong attachment to any one version of it.

Despite the limitations of the experimental design, it is nevertheless notable that the patterns of perceptual performance observed here were clearly unrelated to any potential benefit that would come from more aggressiveness or even motivation during resident trials. The social context of the experiment did not have a main effect on detection speed, so making participants more competitive did not improve their performance. In fact, participants in the competitive condition tended to do slightly worse in the residency trials, compared to when they believed they would share a team score with the other student. It was instead when participants were in the visiting trials that they showed faster detection speed during competition, relative to those working cooperatively. This difference in response to the social framing of the task was the only measured effect on which resident and visitor trials substantially differed. The cause of this surprising interaction effect is not entirely clear. It had been hypothesized that perceptual performance would be inhibited when in the role of visitor by virtue of the social information restricting one's behavioral freedom when in someone else's space. However, this potential inhibition may in fact likely be limited to social contexts where one actually cares about the owner, or at least accepts his or her unique rights to the space or object. It would make sense then that a cooperative context would more often elicit such an attitude, whereas competition may attenuate concern and attention for socially restrictive information.

Chapter Summary

In this chapter, I assessed performance on a visual search task when viewing scene images as either a virtual resident, visitor, and during neutral, control trials. I hypothesized that the self-referential nature of one's own setting would facilitate attention and memory, thereby improving performance during resident trials. Contrary to this expectation, no difference in performance was found across these three conditions. However, results indicate slight differences in attunement to particular types of environmental features, depending on whether the setting was believed to be designed by someone (self or other) or randomly generated by a computer. The territorial defense account also did not receive empirical support from this study. Creating a competitive social context did not improve performance speed among residents, nor were they more likely to notice discrepancies that involved the loss or replacement of objects in their territory. Nevertheless, the extent to which the procedure successfully induced territorial feelings towards scenes in the residency trials is unclear, as participants' ability to customize the setting was fairly limited. In the next chapter, I will avoid the challenges of inducing territoriality by assessing behavioral differences within actual, long-term physical territories.

Chapter 7

Experiment 4: Resistance to Ego-Depletion in Home Environments

In the experiments reported thus far, I assessed home advantage in terms of participants' efficiency at performing several specific perceptual skills (e.g., perspective taking, visuospatial ability, visual search). However, more than just being able to better attend to critical information in the short term, outperforming an opponent will also typically require the ability to *remain* better engaged across a potentially lengthy interaction. Several ethologists have pointed to this factor as critical in predicting the prior residence effect in a number of different species, incorporating it into their own simulated models of animal conflict. Specifically, resource-value asymmetry has been proposed as an influential factor predicting not only spatial outcomes, but also the length of time needed to settle disputes (Leimar & Enquist, 1984). According to this account, residents prevail in territorial battles in part because the setting is of greater value to them. Consistent with this argument, studies on spiders (Riechert, 1979) and fish (Johnsson & Forser, 2002; Nijman & Heuts, 2000) have found that owners better defend resource-rich areas compared to relatively impoverished territories.

Rather than being due just to the amount of aggression displayed by animals, resource value-asymmetry predicts that prior residents will have greater persistence during a conflict and show an unwillingness to yield, relative to intruders (Hammerstein & Parker, 1982). For example, Haley's (1994) observations of territorial battles among elephant seals reveal that such contests are characterized by a war of attrition, with outcomes dependent on which animal is prepared to fight longer. In fact, "it was not uncommon, for example, to see a male in a long fight, who had been consistently driven

backwards and frequently struck with vigorous blows, suddenly win when his opponent gave up and retreated” (p. 433). The asymmetric importance of the setting for prior residents makes them most likely to win long fights, which are particularly costly for combatants to engage in.

In a physical conflict, combatants must inhibit the desire for safety and relief in the present in order to achieve greater reward in the future by overcoming one’s foe. In humans, the capacity to consciously overcome temptation, purposively alter one’s own behaviors, and make self-corrective adjustments is a behavioral skill referred to as self-regulation (Baumeister & Vohs, 2007; Vohs & Baumeister, 2011). Self-regulation is typically characterized as a generalized form of self-control, reflecting the ability to override alternative, negative impulses and distractions. The predominant framework for understanding self-regulation in social psychology has been the limited strength model, which argues that humans have a limited supply of willpower to devote to self-controlled behavior (Bauer & Baumeister, 2011; Baumeister, Vohs, & Tice, 2007). As a result, individuals show a reduced ability to resist temptation, persist at difficult tasks, or engage in complex decision making after employing high levels of self-control, a phenomenon known as *ego depletion* (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Baumeister et al., 2000; Hagger, Wood, Stiff, & Chatzisarantis, 2010). For example, an early study on the topic found that participants urged to resist eating desirable cookies at the beginning of a study would later give up more quickly on a subsequent, unsolvable figure-tracing task, compared to participants that did not need to exert self-control (Baumeister et al., 1998). Research employing other depleting tasks, including thought suppression, self-

monitoring, and emotional control, have also produced similar declines in persistence and self-control for subsequent activity (Bauer & Baumeister, 2011; Hagger et al., 2010).

This account of self-control is notable, as it differs dramatically from earlier representational frameworks for understanding the construct. For example, conceptualizing self-control as a stable schema or knowledge structure would lead to the prediction that initial exertions would activate self-regulatory schemas, leading to increased accessibility and greater subsequent self-regulatory ability (Bauer & Baumeister, 2011). Nevertheless, evidence for ego depletion indicates that self-control involves more than just representations, instead depending on the physical processes and resources of the entire actor. Baumeister and colleagues (Bauer & Baumeister, 2011; Baumeister et al., 2007; Gailliot et al., 2007) have argued for a physiological account of self-control, employing a muscle metaphor to explain this phenomenon. However, more than being just a metaphor, there is evidence to support the claim that self-control draws on an actual limited energy supply in the body: blood glucose levels. Supporting this claim, low levels of glucose after an initial task predict worse self-control in a subsequent task, but drinking a beverage with high glucose content can eliminate this decline (Gailliot et al., 2007). Glucose is used to perform physical and mental functions in the body, and it appears to be particularly necessary for highly demanding, controlled behaviors.

Resistance to Ego-Depletion

Despite the evidence for ego depletion's ties to physiological energy levels, researchers have found several moderating factors capable of attenuating the detrimental, short-term effects of self-control exertion. Moreover, several recent studies have found

moderators that challenge the comprehensiveness of explaining self-control purely in terms of physical energy. For example, holding certain beliefs about the strength of one's own willpower may eliminate reductions in self-control after a depleting task (Job, Dweck, & Walton, 2010). That is, individuals who believe they have unlimited willpower actually exhibit greater self-control over the multiple tasks requiring it. Additionally, Schmeichel and Vohs (2009) found that giving participants the opportunity to engage in a self-affirmation exercise (e.g., writing about a cherished value) buffered participants from the ego-depletion effect. They argue that self-control appeared to replenish itself as a result of reflecting on important beliefs.

Findings such as these have lent support to a handful of recent theories that suggest a key role for attention-related perceptual processes in predicting when self-regulatory failures occur (Kaplan & Berman, 2010; Zanesco, King, MacLean, & Saron, 2013). Inzlicht and Schmeichel (2012) have recently proposed just such a model of ego depletion, which was designed specifically to explain the aforementioned findings. They argue that exerting self-control leads to a shift in attention and motivation that undermines later attempts to exert self-control. Specifically, the process involves "a shift in attention away from cues signaling the need to exert control and toward cues signaling gratification" (p. 451). Factors that can attenuate ego depletion therefore involve maintaining attention on cues signaling control. Thus, people who believe that willpower is a limited capacity will be more apt to notice their own fatigue and thus weaken their motivation. Those who believe that willpower is unlimited, in contrast, are instead attuned to information indicating that they must work harder. Similarly, self-affirmation involves attunement to information regarding one's superordinate goals, beliefs, and

values. This higher level of abstraction allows the individual to pay less attention to their mental fatigue and thereby stave off depletion (Fujita, Trope, Liberman, & Levin-Sagi, 2006). Hanif et al. (2012) found complementary results, in a study that trained participants to have either a broad focus or narrow focus of attention, using Navon-type stimuli (e.g., a big letter ‘H’ made out of small letter ‘S’s; Navon, 1977). They found that broad attentional focus facilitated greater self-regulatory ability, an effect they explain as an attentional biasing away from immediate negative information, such as feelings of fatigue.

Work by Kaplan (1995, 2001; Kaplan & Berman, 2010) offers a second attention-based theory of ego-depletion, known as Attention Restoration Theory (ART), derived in part from the classic work of William James (1892). According to ART, there are two distinct types of attention. The first, *involuntary attention*, is attention that requires no effort and that may be elicited by the particular objects in the environment, such as those that are exciting or interesting. In contrast, *directed attention* requires that the individual concentrate on something that is not particularly interesting, requiring some level of effort. As with ego-depletion, directed attention is hypothesized to weaken after extended use, but involuntary attention does not appear to be effortful. Alcohol, for example, dramatically impairs directed attention, but does not appear to affect automatic attention (Abroms, Gottlob, & Fillmore, 2006), suggesting a functional and structural distinction between these two processes. ART proposes that self-regulatory failures result from the fatigue of excessive periods of directed attention, so recovery will occur when directed attention is able to rest. ART-based intervention strategies involve placing individuals in environments believed to be restorative (Staats, 2012), that is, environments where

directed attention is minimized and involuntary attention is elicited by features of the physical setting. Intervention strategies by Kaplan (1995) have involved visits to natural environments, such as parks and gardens, as prototypical examples of such settings. These types of places are believed to be capable of attracting so-called *soft fascination*, having features that attract involuntary attention without interfering with other thoughts. This quality is contrasted with *hard fascination*, which precludes simultaneously thinking about other things (e.g., watching violence or engrossing competition). ART therefore proposes that entering a restorative environment is capable of mitigating the negative effects of ego depletion by minimizing the need for directed attention.

Resisting Ego-Depletion in Territories

The goal of the present experiment is to evaluate whether self-control, or resistance to ego depletion, will be strengthened as a result of being in one's own territory. It is hypothesized that, as in the previous experiments, benefits for residents will emerge as a product of the differential perceptual and attentional activities engaged in by those within the setting. Notably, although the present, attention-based theory predicts a home advantage in terms of persistence, the aggression-based territorial defense account is much less likely to hypothesize such a difference. Instead, several studies have demonstrated a negative relationship between displays of aggression and self-control (Denson, DeWall, & Finkel, 2012; DeWall, Baumeister, Stillman, & Gailliot, 2007). Not only do self-control failures frequently lead to increased aggression, but self-control training has been shown to decrease aggressive tendencies (Denson, Capper, Oaten, Friese, & Schofield, 2011). Testing for a difference between residents and visitors in

terms of resistance to ego depletion therefore represents another opportunity to contrast these alternative accounts of home advantage.

Based on the pair of theories described above, there are several reasons to expect that the relational information present within a territory will facilitate persistence for its occupant. First, the structure of the environment provides the resident with social information that, in keeping with the model proposed by Inzlicht and Schmeichel (2012), should strengthen perceived willpower. Territories are personalized by residents with two forms of markers: control-oriented markings and identity-oriented markings (G. Brown, 2009). These markings communicate aspects of the residents' personality, beliefs, and values (Gosling et al., 2008; Gosling et al., 2002). Thus, one's territory is full of objects and decorations that reinforce the resident's sense of self-efficacy and provides a history of long term goals and behaviors. This should succeed in providing what is essentially ambient self-affirmation for the resident, providing cues to broaden global attention and greater belief in one's own capacities (Schmeichel & Vohs, 2009).

Secondly, based on the criteria outlined by ART (Kaplan, 2001; Kaplan & Berman, 2010), territories may also be thought of as potentially restorative environments. Restorative environments are those that require minimal directed attention to function in effectively, yet nevertheless elicit soft involuntary attention. As discussed in Chapter 3, territories are characterized in part by the resident's familiarity. A behavioral history in the setting provides residents with knowledge of its invariant structure and behavioral opportunities, a fact that eases motoric and process skills (Hoppes et al., 2003; Provencher et al., 2012; Provencher et al., 2009; Raina et al., 2007). Because of this past behavior of physically and perceptually exploring the space, residents will be able to

regulate themselves in it with little need for concerted attentional effort. This should make the need for directed attention outside of the immediate task at hand relatively minimal. Moreover, the self-associative nature of the territory is also likely to elicit the soft fascination characteristic of restorative environments. Individuals do tend to show perceptual and cognitive biases toward information relevant to the self (Cunningham et al., 2008; Turk et al., 2011), so one's own home environment will generally be perceptually interesting. Additionally, this interest will be general, involuntary, and gentle enough so as to not interfere with other thoughts, as would occur with objects, events, or settings that evoke hard fascination.³ In contrast, those entering a new setting, or one that belongs to another person, must engage in a much greater amount of directed attention to discover what can be done in the space. This will involve attending to not just the physical information in the environment, but also, when a visitor, monitoring the social cues informing them about the resident. Thus, residents in their own territory should have more attentional resources on which to draw when taking part in a difficult task.

Tentative support demonstrating the relationship between self-regulatory strength and home advantage does exist. Any advantage derived from inhibiting an ego depletion effect should be especially prominent during tasks that require constant self-control. Consistent with this, home advantage tends to be stronger in sports with more continuous play (e.g., soccer, rugby, basketball) compared to those with frequent breaks (e.g., baseball, golf, cricket; Jamieson, 2010). These continuous play sports require more prolonged focus by players, whereas the latter allows frequent opportunities for athletes

³ In certain cases, a territory may elicit hard fascination in residents. For example, if the resident is cleaning or noticing problems with the space, as was the case in Experiment 1, certain features of the environment for which one is responsible may attract more urgent and engrossing levels of attention.

to collect themselves and regain focus. Although this observation has been pointed out by previous researchers (Gómez et al., 2011; Stefani, 2008; Tsonis & Tsonis, 2001), this relationship has yet to be tested directly and empirically.

In the current study, I test whether participants in their home environment (i.e., their dorm room) demonstrate greater persistence following a depleting task, relative to those either visiting someone else's room or in a neutral, laboratory environment. Ego depletion has been found to occur following a diverse range of challenging cognitive tasks (Baumeister et al., 2007; Hagger et al., 2010). Here, with a goal towards testing the robustness of the effect, two previously validated procedures were used to deplete participant resources: (a) focusing attention on a single target while consciously ignoring other objects in the perceptual field (DeWall, Baumeister, Gailliot, & Maner, 2008), and (b) suppressing their emotions while watching an evocative video (Baumeister et al., 1998; Muraven, Tice, & Baumeister, 1998). In both cases, participants exert effort to resist dominant tendencies by monitoring only particular information (i.e., either the specified target in the attention video or their own facial/physiological activity in the emotion video). Following the depletion procedure, participants attempted to solve several impossible anagrams, a task that allows for the measurement of persistence. It was hypothesized that no differences between the experimental groups would emerge when resources were not depleted. However, when in the depleting conditions, residents would persist longer at the impossible task than would visitors or those in the neutral laboratory location.

Method

Participants

Two hundred fourteen undergraduate students (151 women) participated in this experiment.

Procedure

Participants volunteered to take part in a study called “student differences by living location.” The experiment was described to participants as being about how different types of people with different types of abilities come to live in specific locations on campus. After signing up to take part, participants were emailed by the experimenter to inform them of where their session would take place. One third of participants were assigned to complete the study in a lab room on campus (the control condition). One third of participants were assigned to complete the study in the dorm room of an undergraduate research assistant (the visitor condition). The final third of participants were assigned to complete the study in their own dorm room (the resident condition), which required having the experimenter come to their building to administer the study there. In both the visitor and resident conditions, the experimenter was always the same sex as the participant. The unusual location of the study was explained to participants as due to the researcher’s interest in assessing the architectural and social features of particular residence halls on campus. In all conditions participants completed the study alone in their respective room with only the experimenter present, as any roommates were asked to leave prior to beginning.

Participants were randomly assigned to either an emotion condition or an attention condition. Following previously employed methodology (Muraven et al., 1998),

participants in the emotion condition watched a 6 minute video of a nature documentary, which includes scenes of sick and dying animals meant to be upsetting. In the control group of the emotion condition, participants were instructed to watch the video as they normally would, as if they were watching television. In the depletion condition, however, participants were told that the study was interested in the extent to which people can control their emotions. Because of this, their goal was to resist as best they could expressing any type of emotional reaction to the video, so they were instructed to pay attention to their responses and to keep their facial expression as neutral as possible. The attention condition also employed a previously used manipulation (DeWall et al., 2008; DeWall et al., 2007; Schmeichel, Vohs, & Baumeister, 2003), wherein participants watch a 6-minute video (without audio) of a woman being interviewed, during which a series of neutral words are presented at the bottom of the screen for 10 seconds each. As before, in the control group participants were instructed to watch the video as they normally would, as if they were watching television. In contrast, participants in the depleting condition were told that the study was interested in how people pay attention to others and form impressions about them. They were therefore asked to focus their attention just on this woman and to ignore as best they could looking at any of the words that appeared on the screen.

After watching the video, participants continued the study by following the instructions that appeared on the screen. First, their mood was assessed following the experimental manipulation. They were next presented with a screen that contained seven anagrams to solve. However, unbeknownst to them, only one of the anagrams had a solution, and the rest were unsolvable. The instructions told them to work on the words

for as long as they wanted, and that when they believed they had solved as many as they could and wanted to stop, they could click on the arrow to move to the next page. Time spent on this page was recorded by the software program, thereby providing a measure of persistence on the task (Muraven et al., 1998). Once they had given up trying to solve the anagrams, participants then completed the rest of the questionnaire on the computer.

Measures and Materials

All participants completed the study on a 10.1 inch Dell mini laptop provided by the experimenter. Participants in the laboratory condition completed the experiment in the Bousfield Psychology building. Those assigned to the visitor condition completed the study in the dorm room of one of four possible research assistants (two men and two women), ranging in size from 17.84 m² to 20.07 m². In all locations participants completed the study while sitting at a desk, while the experimenter sat nearby in the same room. The video watched in the emotion condition was an excerpt of the Italian documentary, *Mondo Cane*, which depicts the consequences of nuclear contamination on native species in the Marshall Islands. The video watched in the attention condition was taken from the Baumeister and Tice social psychology lab website at Florida State University: <http://www.psy.fsu.edu/~baumeisterticelab/>.

As before, participants' affective state was assessed using the PANAS ($\alpha = .70$). Self-ratings again included the Self-Determination Scale, measuring self-awareness ($\alpha = .73$) and sense of choice ($\alpha = .71$). The Behavior Identification Form was again used as a measure of construal level ($\alpha = .83$), which, based on Inzlicht and Schmeichel (2012), should mediate the effect of residency on persistence time. Measures of personality factors were also collected, but as in Experiment 2 reliabilities were very low:

extraversion ($\alpha = .68$), agreeableness ($\alpha = .42$), conscientiousness ($\alpha = .53$), neuroticism ($\alpha = .55$), openness ($\alpha = .35$), intelligence ($\alpha = .64$), and leadership ($\alpha = .61$). Ratings of the room were assessed with composite measures created for a spatial index ($\alpha = .79$), a comfort index ($\alpha = .87$), a positive valence index ($\alpha = .77$), and identification with the room ($\alpha = .92$). Finally, participants estimated “How many people do you think could fit comfortably in this room?”

Results

Persistence on Task

A 3 (location: resident, visitor, or lab) x 2 (video type: attention or emotion) x 2 (depletion or control) ANOVA was employed to assess the effects of the experimental manipulations on time spent working on the anagrams. Figure 15 shows the means and standard errors for this outcome. The only statistically significant effect was an interaction between video type and depletion, $F(1, 202) = 4.57, p = .034, \eta^2_p = .02$. Surprisingly, the attention manipulation failed to produce a reduction in persistence. In fact, the data trends in the reverse direction, with participants devoting more time to the puzzle when they were instructed to resist attending to the peripheral distractor words, $t(202) = 1.95, p = .053, M_{\text{control}} = 258.59 \text{ s}, M_{\text{depletion}} = 317.37 \text{ s}$, a finding that was consistent across all three locations. The emotion condition was somewhat more successful in decreasing time spent on the impossible anagrams, $M_{\text{control}} = 303.91 \text{ s}, M_{\text{depletion}} = 272.07 \text{ s}$, although this was not a statistically significant effect, $t(202) = 1.06, p = .291$.

Because the emotion manipulation was the only procedure that produced a trend in the expected direction, only on this condition was the proposed hypothesis tested using

planned contrasts. Specifically, residents were compared to those in either the visitor or laboratory conditions. Consistent with the hypothesis, residents who were instructed to monitor and control their emotions spent significantly more time on the anagrams than did those given the same instructions in either of the other two settings, $t(202) = 2.24$, $p = .026$, $d = 0.32$. When resources were not depleted, residents did not differ from the other two groups, $t(202) = 0.09$, $p = .928$.

Correlates of Task Persistence

The majority of self-report measures showed no statistically significant relationship with time spent on the anagrams, including construal level, $r = -.040$, $p = .557$, self-awareness, $r = .035$, $p = .613$, and sense of choice, $r = .054$, $p = .433$. Only affect, measured just prior to beginning the anagrams, showed a positive, statistically significant relationship with persistence, $r = .143$, $p = .037$. However, this relationship was true only in the attention manipulation condition, $r = .268$, $p = .006$, and not for those in the emotion manipulation condition, $r = .019$, $p = .846$. Moreover, conducting the 2 x 2 x 3 ANOVA used earlier with affect as the outcome revealed no main effect for location, $F(2, 202) = 0.20$, $p = .823$, indicating that the participants did not differ in mood by residency status. There was also no statistically significant interaction between location and either manipulation type or depletion. The only statistically significant effect was a main effect for manipulation type, with those in the emotion condition reporting worse mood than those in the attention condition, $F(1, 202) = 22.51$, $p < .001$, $\eta^2_p = .10$, $M_{\text{attention}} = 4.28$, $M_{\text{emotion}} = 4.04$.

Ratings of the Room

The means and standard errors for ratings of the experimental settings are shown in Figure 16. For each measure, a 3 (location: resident, visitor, or lab) x 2 (video type: attention or emotion) x 2 (depletion or control) ANOVA was employed to assess how impressions of the environment differed as a result of the experimental conditions. For identification with the space, the main effect for location was the only statistically significant effect observed, $F(1, 201) = 85.25, p < .001, \eta^2_p = .46$. Post-hoc tests applying a Bonferroni correction reveal that residents reported greater identification than either visitors, $t(201) = 7.88, p < .001, d = 1.11$, or those in a lab, $t(201) = 13.00, p < .001, d = 1.83$. Visitors also reported higher levels than lab participants, $t(201) = 4.41, p < .001, d = 0.62$. The analysis of participants' rating of the room's comfort had similar results, with the only statistically significant effect being the location, $F(1, 202) = 58.81, p < .001, \eta^2_p = .37$. Here too, residents rated the room as more comfortable than either visitors, $t(202) = 3.75, p < .001, d = 0.53$, or those in a lab, $t(202) = 10.67, p < .001, d = 1.50$, and visitors also rated the room as more comfortable than did those rating the lab, $t(202) = 6.48, p < .001, d = 0.91$.

Ratings of the room's positive valence also differed by location, $F(1, 202) = 16.80, p < .001, \eta^2_p = .14$. Both residents, $t(202) = 5.17, p < .001, d = 0.73$, and visitors, $t(202) = 4.60, p < .001, d = 0.65$, rated the dorm room more positively than the lab, but they did not differ from each other. Additionally, a main effect was also found for depletion, $F(1, 202) = 4.07, p = .045, \eta^2_p = .02$. Participants who watched a depleting video rated the room more positively than did those in the control conditions, $M_{\text{deplete}} = 4.96, M_{\text{control}} = 4.72$. Finally, ratings on the spatial index also differed by location, $F(1,$

202) = 11.26, $p < .001$, $\eta^2_p = .10$. Visitors rated the room they were in as more spacious than either residents, $t(202) = 3.02$, $p = .009$, $d = 0.43$, or participants in the lab, $t(202) = 4.71$, $p < .001$, $d = 0.66$. Residents and participants in the lab did not differ, $t(202) = 1.59$, $p = .337$. A main effect was also found for depletion, $F(1, 202) = 5.21$, $p = .024$, $\eta^2_p = .03$. Participants who watched a depleting video rated the room as more spacious than did those in the control conditions, $M_{\text{deplete}} = 4.44$, $M_{\text{control}} = 4.08$.

Nevertheless, ratings of the room did not significantly correlate with time spent on the impossible anagrams: $r_{\text{identification}} = .024$, $p = .727$, $r_{\text{spatial}} = -.090$, $p = .188$, $r_{\text{valence}} = .105$, $p = .126$, and $r_{\text{comfort}} = .040$, $p = .558$. However, when considering only residents, persistence time was positively correlated with valence ratings of their room, $r = .297$, $p = .013$.

Discussion

This experiment evaluated whether a participant's relationship with their present physical location – being at home, visiting someone else's home, or entering a laboratory – would alter his or her capacity to resist the effects of ego depletion. The hypothesized distinction emerged for participants asked to monitor and restrain their emotions while watching a distressing video. Following this depleting exercise, residents persisted longer than those in other locations on an impossible task, demonstrating clear resistance to the depleting effects on self-control that participants in the other settings succumbed to. This result provides a further demonstration of the regulatory benefits associated with being in one's own environment.

One possible alternative explanation for this result is to attribute differences simply to social convention. That is, residents had no reason to be motivated to leave

their own dormitory. Visitors, on the other hand, may feel as though they were intruding on the host's time and space by being in their room an extended period of time.

Differences between the groups would therefore be based primarily on social norms and expectations for politeness, rather than an actual regulatory advantage. However, this alternative explanation for this experiment's results is limited, in light of the fact that no difference in persistence emerged between the three groups when resources were not depleted. The lack of such a difference indicates that the distinction between participants was not based on a global difference in baseline motivation between the groups, nor was it the product of residents showing a more general stubbornness or contrarian resistance in response to the experimenter and the presented task. The benefit for residents was instead their ability to resist a decline in persistence following the exertion of self-control.

This observed effect is particularly noteworthy, in light of the procedural circumstances that may have been expected to undercut residents' persistence. If a primary motivation for a resident is to defend their physical space and expel intruders, the presence of an experimenter – who was instructing participants to continue an undesirable behavior – would presumably produce an increased desire to get the experimenter to leave. In the context of this experiment, the fastest way to do so would be to give up on the anagram task as quickly as possible, thereby finishing the experiment and causing the researcher to leave. However, this behavior was not observed. Instead, residents persisted longer than those in alternative settings after this depletion procedure.

In contrast to the emotional monitoring methodology, the other procedure used to deplete regulatory resources – having participants ignore distractor words while watching a video of a woman – failed to produce declines in self-control, even in the laboratory

context. In fact, persistence times trended in the opposite direction, with those in the control condition giving up earlier than those in the depletion condition. Because of this trend, it is difficult to draw conclusions about the potential effects of residency status from this particular manipulation. This methodological failure was surprising, in light of the frequent use of this procedure in previous work (DeWall et al., 2008; DeWall et al., 2007; Schmeichel et al., 2003). The cause of this failure to replicate is unclear.

Potentially, the particularly small size of the screen used in this experiment (i.e., participants' use of a mini laptop instead of a desktop monitor) may have made the task differ perceptually from the previous published work in some important way.

Alternatively, it is also worth noting that it is unknown whether participants followed the instructions to ignore the distractor words, as, unlike in the emotional control procedure, the experimenter was unable to actually monitor participants' attempts to constrain their behavior. It is therefore possible that participants were not depleted because they did not follow the instructions. Finally, another relevant factor is that the silent, 6-minute video was a particularly boring clip to watch, especially when compared to the dramatic excerpt from *Monde Cane* used in the emotion condition. Giving participants a goal to attend to only part of the video may have raised interest in the task for certain participants, relative to those in the control condition without explicit instructions. Yerkes and Dodson's (1908) well-known law of motivation argues that some degree of arousal is required for adequate performance. Participants in the control condition may therefore have been demotivated to engage in the experiment and therefore more likely to give up in the subsequent task due to lack of interest. Nevertheless, it is unclear why boredom in the

control condition would have caused the observed effect in the present experiment but not in previous empirical uses of the procedure.

In the current study, the only self-report measure associated with task persistence was participants' mood. This finding is consistent with previous experimental evidence showing that positive affect can improve self-regulatory ability after ego depletion (Tice, Baumeister, Shmueli, & Muraven, 2007). However, this linkage does not support the territorial defense account of home advantage. Critically, Tice et al. (2007) found that it was the valence of one's mood that predicts increased self-control, not the level of arousal. That is, being in a good mood predicted greater self-regulatory strength, but being in a negative mood did not. According to the authors, the experience of positive emotion informs individuals that their current circumstances are desirable, thereby increasing the likelihood of persisting in the face of a challenge. Clearly then, this perspective is inconsistent with the territorial defense account of home advantage, which views performance enhancement as emerging from negative arousal in response to a social threat.

Some sports scientists have also suggested that differences in mood and anxiety may be predictive of differential outcomes between residents and visitors (Bray, Jones, & Owen, 2002; Bray & Martin, 2003; Thelwell et al., 2009). However, despite the observed association between mood and persistence found in the present study, this relationship was ultimately unrelated to the experimental effect of residency status. Residents did not have a more positive mood than visitors, and the relationship between mood and persistence was negligible in the emotion regulation condition, which was where the experimental effect was actually observed. Therefore, the home advantage found here for

self-control does not appear to be reducible to greater emotional stability in a liked environment (Korpela, 1992, 2003).

It is also notable that construal level, operationalized with the Behavior Identification Form, did not predict task persistence. Higher levels of cognitive construal have been an important moderator predicting greater resistance to ego depletion in previous work (Hanif et al., 2012; Schmeichel & Vohs, 2009). These authors have argued that higher level construal, focused on long term goals, beliefs, and values, allow individuals to better disregard short term challenges and fatigue. This expectation frames much of the argument made by Inzlicht and Schmeichel (2012), which had suggested that the self-affirmative nature of territorial markings in one's home may enhance self-regulatory strength by leading to higher construal levels. Nevertheless, this claim was not supported by the present data. There are a pair of potential explanations for the lack of this relationship. First, the vast majority of experimental work on construal level has involved manipulating participants' construal level, rather than measuring individual differences on it. As a result, it is possible that explicit self-reports using the Behavior Identification Form simply failed to adequately measure the construct, as empirical validation for this measure's ties to attentional construal have not been robustly evaluated. Secondly, self-affirmation provided by exposure to one's own identity-oriented markings may follow only from conscious observation and reflection by the resident. When in the midst of a difficult task, residents may not have had the time to pay attention to the objects around them that would be capable of reinforcing their long-term goals and values. Potentially, the benefits of these environmental features may be measureable only after longer periods of time in the space, when residents are given the

opportunity to pause and scan their surroundings in a more prolonged and purposeful way.

Nevertheless, residents still showed greater resistance to depletion, even though construal level proved to be uninvolved in this effect. However, it is still possible that the self-affirmative nature of their home environment played a role in the process, unmediated by altering construal levels. The alternative theoretical framework described earlier was the ART account, which proposes that restorative environments minimize the need for effortful, directed attention among occupants (Kaplan, 1995, 2001; Kaplan & Berman, 2010). The ecological framework described in this document has similarly argued that home advantage is the product of efficient cycles of perception and action that are facilitated by the enhanced capacities for flexibility, prospectivity, and retrospectivity enjoyed by residents. Functioning within any environment, viz., learning what one can do and how one can best do it, requires exploratory perceptual activity and the detection of relational properties in the physical and, for humans, social environment. Learning about a physical setting is a continual, dynamic process that requires time and effort. Residents' familiarity with the setting, as well as the behavioral freedom they have to act in it as they wish, reduces the amount of effortful, directed attention required to function effectively within it. This, in turn, should provide them with the capacity to recover quickly following engagement in challenging tasks, thereby limiting the negative costs of exerting self-control.

Although the vast majority of work on restorative settings by environmental psychologists has focused on the beneficial effects of natural settings (Staats, 2012), the present study offers support for comparable benefits from a home territory. Importantly,

deviating somewhat from the standard ART account described by (Kaplan, 1995, 2001; Kaplan & Berman, 2010), the account proposed here suggests that an environment's ability to be restorative is not dependent upon independent, objective features of that physical setting. Rather, the effects produced within a territory are relational. The restorative nature of the territory does not come from the objective physical structure of the environment, nor does it stem from particular beliefs or representations that the occupant has about the space. Rather, it emerges from the unitary resident-territory system, which has a dynamic, historical relationship that facilitates efficient activity. The need to exert high levels of effort to understand a setting (e.g., uncovering where certain pathways lead, discovering which seats are most comfortable, determining what behavior would be socially acceptable) is minimized by the relationship between the person and the setting. Although recent work by environmental psychologists has focused on uncovering objective features of the environment predictive of restoration, such as particular texture gradients (Berman, 2014), the ecological framework understands these restorative outcomes in terms of fit between residents and territories.

Chapter Summary

Experiment 4 sought to expand on the previous chapters by testing how facilitated perceptual attention by residency status influences not only performance on the specific task at hand, but may also lead to increased persistence among residents in subsequent challenges. Building off of Attention Restoration Theory (Kaplan, 2001; Kaplan & Berman, 2010), it was hypothesized that residents should be able to better resist the detrimental effects of ego-depletion because of their embeddedness in an environment for which the need for effortful, directed attention is minimal to function effectively.

Consistent with this hypothesis, participants who exerted self-control by monitoring and controlling their emotional expression persisted longer at an impossible task when they were in their own dorm room, relative to those in either a lab space or visiting someone else's room.

Chapter 8

General Discussion

The preceding set of experiments sought to evaluate how one's behavior and performance may differ as a result of being in a territory. As discussed in the introductory chapters, prior work has demonstrated enhanced performance for residents during competitive contexts, and the most prevalent explanation for this effect has been motivational and physiological: residents feel threatened, experience a hormonal change, and respond with higher levels of aggression. In contrast, it was argued here that differences between residents and visitors would not be dominance based, but instead be tied to their respective perceptual and attentional activity. I sought to develop a more comprehensive account, wherein performance – whether competing, cooperating, or acting alone – is necessarily tied to an actor's ability to perceive information relevant to the task at hand. This perspective adopts an ecological framework for understanding the prior-residence effect, which is centered upon the concept of organism-environment mutuality. That is, all psychological phenomena are thought of as contingent on not just the mind of the animal, nor just on pressure from environmental stimuli, but instead on the self-organizational processes of the system of which both are a part.

Behavioral performance generally and home advantage specifically should therefore involve more than just internal, hormonal reactions to particular external stimulation. Superior performance was instead proposed to come from the patterns of perception and action that emerge from the resident-territory relationship. This resident-territory relationship, characterized by familiarity and self-association, reflects a system containing an actor embedded in a perceptual array of information that is fluent, easily

detected, and self-affirmative. Because of this fact, home advantage may be tied to the efficiency with which such information is detected. I therefore hypothesized that individuals in their own territory would be better attuned to critical features of the environment that would facilitate successful regulatory activity. In this document, that hypothesis was tested in a variety of ways, including in multiple types of territories (e.g., temporary lab settings, virtual computerized scenes, and actual dormitory environments) and with multiple types of outcome measures (e.g., spontaneous behavior, visuospatial ability, perspective taking, visual search, and persistence).

In Experiment 1, I developed and evaluated a procedure for inducing differences in territorial behavior after a brief period of time in the laboratory. Using a script designed to increase anticipated use, control, and identification with a small office space, it was found that resident participants were more likely to notice and respond to the presence of litter and an incorrect clock than were those entering a different setting. This difference reflects greater sensitivity on the part of residents to particular types of affordances in the environment, that is, those providing opportunities for responsible action, or maintenance. Moreover, self-reported impressions of the room revealed differences in terms of both the reported comfort and spaciousness of the small office – findings that would be replicated again in Experiment 2. Importantly, these judgments are of relational properties, reflecting one's fit with the immediate physical environment. Consistent with Meagher and Marsh's (in press) proposed affordance-based theory of spaciousness, residents' comparatively high ratings on attributes such as these reflect the enhanced opportunities for action provided by their own territory, relative to the inhibiting social information visitors must be sensitive to. These results reveal the

existence of behavioral and perceptual differences between residents and visitors that are unrelated to aggression or dominance motivation.

In Experiment 2, I employed this lab procedure to test whether performance differences would also emerge between residents and visitors within this laboratory setting on tasks requiring perceptual skill and attention: specifically, visuospatial ability and spontaneous perspective taking. Only equivocal support was found for this hypothesis. The time required to complete a block design puzzle, measuring visuospatial ability, did not differ between groups. However, when comparing the two groups in terms of win-loss percentage, residents did tend to finish the puzzle first in the competitive context a disproportionate amount of the time (64%). This ratio is quite similar to those found across a range of athletic contests (Jamieson, 2010), which is particularly notable in light of the fact that these settings were very new territories, having been occupied by the resident for just 10 to 15 minutes. Moreover, as a task only involving working in parallel, there was no interpersonal contact between participants, making aggressive, domineering behavior less likely to be beneficial.

It was also found that residents and visitors responded quite differently to their respective performances. As one would expect, visitors reported a more positive mood when they solved the puzzle quickly, but a worse mood when they did poorly. In contrast, the residents' mood remained stable regardless of how well they did on the puzzle task. The stability of residents' emotional experience found here poses a challenge to the territorial defense account of home advantage. If competitive activity represents a symbolic invasion of one's home, doing poorly should be seen as a symbolic expulsion, leading one to expect more negative reactions from residents who do poorly. Moreover,

previous work has shown that the centrality of a given task or skill to an individual is positively related to more negative feelings following disappointment (Boldero & Francis, 2005). It is for this reason that individuals often seek to disengage from activities expected to confirm negative biases about themselves, thereby excluding that domain from their self-concept (Major, Spencer, Schmader, Wolfe, & Crocker, 1998). This would presumably be an unlikely strategy for residents, who are embedded in an environment that is itself central.

How then were residents buffered by their territory? One of the reasons a territory comes to be central to an individuals' self-concept is because it contains markings and artifacts that reinforce a positive image of themselves (Gosling et al., 2008). Importantly, many environmental psychologists have argued that humans personalize physical settings in oftentimes strategic ways, specifically as a means of helping to regulate their emotions (Gosling et al., 2008; Korpela, 2003; Korpela et al., 2001; Rafaeli & Vilnai-Yavetz, 2004a; Scheiberg, 1990). For example, placing a photo of a romantic partner on one's desk provides the occupant with social information reinforcing his or her social value, a particularly critical component of self-esteem (Leary & Guadagno, 2011). Having this information about themselves in the environment provides residents with a tool for eliciting a given emotion when needed. Moreover, behavioral residue from other, previous activities can provide the resident with examples of their own success in other tasks, thereby mitigating the damages of immediate failure. As a result, doing poorly on a single task should feel far less bad if one is surrounded by evidence about one's own competence in other areas. Thus, perhaps counter-intuitively, a home environment can in fact facilitate a resident's ability to disidentify with the single outcome or skill he or she

did badly on within it. In this way, a resident has additional methods of coping with defeat available within the environment on which to draw: She has personal markings designed to elicit other, more positive feelings, and she has a behavioral history of more successful activity with which she can more strongly identify with.

Although the current study focused exclusively on a single emotional dimension of positive or negative affect, it is also likely that residents and visitors differ on more specific types of emotional responses following performance. Critically, these differences are likely to be moderated by certain social conditions. For example, unlike the puzzle task used in this experiment, athletic competitions are generally performed in front of an audience of spectators. This additional social element will likely increase self-monitoring concerns for residents, who are expected to do well by their fans. This, in turn, will increase the likelihood that residents will feel certain emotions that are particularly social, such as shame or embarrassment, following defeat (Baumeister & Steinhilber, 1984; Butler & Baumeister, 1998; Wallace, Baumeister, & Vohs, 2005). Although, on the evidence of the current study, being in one's territory can aid in emotional control, the additional pressure that comes from the presence of many spectators may swamp this effect in sporting contexts. Conversely, winning a competitive contest can also be expected to differ emotionally for residents and visitors. The former, already expecting to do well, may in fact experience little more than relief following victory, whereas visitors would experience greater surprise and, as a result, excitement. Thus, the mitigating social circumstances embodied in different types of competitions, including personal and social expectations, will bleed into how residents and visitors evaluate and respond to their performance on any given task.

However, inconsistent with the hypothesis for this experiment, residents were not more likely to acknowledge the other student's perspective when providing their descriptions of the puzzle pieces. It had been proposed that residents' greater sense of responsibility for maintaining the activities within the setting would better attune them to social information facilitating cooperative activity, in this case their partners' viewpoint. Nevertheless, the expected effect was not found for either explicit mentions of their partner or for implied acknowledgment when clarifying that they were writing from their own perspective. It is possible that other experimental paradigms that are independent of the pragmatic, communicative component of the present study's measure, such as egocentric adjustments in eye gaze (Epley, Morewedge, et al., 2004; Wu & Keysar, 2007), may be needed to detect subtle differences in social attunement. However, perspective taking is just one way in which individuals may show evidence of attending to another person. Another potential avenue for future testing is whether residents will be more likely to attend to someone else when this person is in actual need of help. For example, classic work on prosocial behavior by Latane and Darley (1968) predicts that helping is most likely to occur when bystanders notice an emergency and feel responsibility to act. It is reasonable to predict that both of these factors would likely be enhanced in a territory, in light of the increased vigilance and action observed among residents in Experiment 1 for non-social maintenance. If a resident is more attentive to opportunities for responsible action generally, she would presumably be more likely to notice and come to the aid of a visitor who is in need of help. In contrast, the presumed need to engage in perspective taking in Experiment 2 may have been comparatively inadequate to elicit detectable differences between residents and visitors. Differences

between these two groups may have been more likely to emerge if the necessity and benefits of doing so were greater.

Despite the fact that residents and visitors did not differ in terms of their frequency of acknowledging the other person's perspective, it is noteworthy that the outcomes associated with doing so were quite different for each group. Visitors' acknowledgment of the resident's perspective did not alter the speed with which either they or their dyad completed the puzzle. The resident's social attunement, however, was linked to both solo and social performance. When working competitively, taking note of their opponent's perspective was related to slower performance on the task, suggesting that visiting opposition could effectively distract residents if they attended too closely to their opponents' point of view. However, when working cooperatively, clarifying their perspective predicted a faster time for their dyad. It is unclear exactly how these residents improved their team's overall performance. Nevertheless, the fact that their social attunement mattered far more than the visitor's perspective taking did points to the uniquely important role residents play when in their own home environment. Determining the means by which residents' social attunement can improve cooperative group performance is yet to be explored. Residents' disproportionately important role in cooperative tasks may be manifested in explicit and directly observable behavior, such as speaking frequency or instructional language use. Alternatively, successful cooperation could be produced by various, more subtle forms of attunement and coordination initiated by the resident, such as enhanced behavioral synchronization (Marsh, Richardson, & Schmidt, 2009) or speech convergence (Pardo, 2006).

In Experiment 3, I assessed visual search ability across a range of interior scenes designed to simulate resident and visitor status in relation to the image. I had hypothesized that performance would be facilitated for scenes that contain self-referential information, which is a factor that has previously been demonstrated to elicit greater levels of attention, memory, and accuracy for owned objects (Bovasso & Rettig, 1997; Cunningham et al., 2008; Turk et al., 2011). However, contrary to this proposal, the procedure failed to demonstrate a performance difference during resident and visitor trials. What did emerge was a more subtle difference in performance across these types of trials in response to the social context in which visual search was taking place. Inconsistent with a territorial defense account, competitiveness improved performance during visitor trials but worsened performance during resident and control trials. The cause of this interaction is not clearly known, but I have proposed that social information in someone else's territory can be behaviorally inhibitory to residents. Experiments 1 and 2, for example, both found estimates of room spaciousness to be significantly lower among visitors, demonstrating how the nature of one's current social interactions can influence perceptually-derived feelings of physical constraint. However, behavioral inhibition such as this among visitor is likely far less relevant during highly competitive contexts, when the visitor is already acting in ways that at least symbolically reject the resident's unique behavioral claims to the setting. It is therefore possible that collaborative activities induce greater dependency and sensitivity to the residents' ties to the setting, thereby reducing visitor engagement with the environment. This experiment's finding of a distinct effect of social context on visitor trials therefore raises interesting

questions regarding how a visitor's relationship to both the physical and social environment drives their perceptual and behavioral activity within a particular setting.

Finally, in Experiment 4, residents demonstrated greater self-regulatory ability in terms of persistence on a set of impossible puzzles following a depleting task requiring the monitoring of their emotions. Drawing from Attention Restoration Theory (Kaplan & Berman, 2010), it was proposed that the familiar and self-associative nature of home territories would limit the need for resource dependent, directed attention, thereby allowing residents to recover more quickly from the negative effects of ego depletion. Interestingly, residents did not persist longer on the impossible measure following a non-depleting task, indicating that the difference observed was not dependent on a more generalized, higher baseline of motivation or stubbornness. Rather, the effect appeared instead to be tied to recovery from or resistance to typically depleting psychological activity. This finding helps widen the ways in which being embedded in a home environment can facilitate successful behavior. Not only may residents perform better at the particular task at hand, but the nature of the environment seems to facilitate the mental recovery needed for continuous, challenging activity.

Taken together, these studies begin to develop a broader understanding of how humans behave in the environments they inhabit. The resident-territory relationship entails far more than exclusivity, and a resident's behavior is motivated by more than just a desire for dominance over others. A territory represents a particular relationship between a person and an environment, which contains an array of relational information that provides a self-referential history of behavioral activity. It was the hypothesis of this document that residents are generally able to outperform others by nature of being

embedded within this specific type of perceptual array, which can facilitate and guide regulatory activity. Supporting this claim, the results found here show that, when compared to visitors, residents were more attuned to certain behavioral opportunities, more responsible for the outcomes of dyadic cooperation, and more resistant to the negative effects of depleting challenges. Again, these findings are largely inconsistent with an account of home advantage dependent on competitive and aggressive behavior. Across the varied studies, residents were more successful at employing skills unlikely to benefit from aggression (e.g., visuospatial ability) or likely to be hindered by aggression (e.g., cooperative activity, self-control), they did not benefit from making the social context more competitive (Experiment 3), and performing poorly in their territory did not produce disproportionately negative responses (Experiment 2). Although it is certainly likely that the violation of one's territory elicits anger (G. Brown & Robinson, 2011), and acting aggressively in response may in some circumstances lead to better outcomes (van Kleef et al., 2004), the present studies reveal that resident and visitor performance cannot be adequately understood just in terms of territorial defense. Understanding the relational properties of the person-environment system that may lead to more or less effective cycles of perception and action offers a rich, alternative means of explaining these behavioral differences.

Home Disadvantages

As reviewed in Chapter 3 and demonstrated in the original studies conducted here, home advantage appears to be a robust effect across a wide range of activities. Nevertheless, there may also be circumstances where performance would decline as a result of being in one's own territory. Framed in ecological terms, the question is whether

effective and efficient cycles of perception and action, in terms of the task an actor is engaged in, will on occasion be impeded by certain features of the resident-territory relationship. Although being in a highly familiar and self-referential environment should generally facilitate attention and self-regulation, in certain circumstances perceptual information in the environment that is uniquely related to the resident may in fact either distract or hinder the actor. Three potential contexts are likely candidates for producing this type of reversal.

High Self-Presentation Concerns

Territories often say a lot about the occupant. After all, one of the key ways in which territories are marked is in the form of other-directed identity claims (Gosling et al., 2002), which represent spaces and decorations explicitly designed to communicate to visitors particular information about the resident. Hosting events in one's home are often done with the expectation that one's guests will be particularly likely to form impressions of the residents in terms of their taste and hosting abilities. Thus, one's identity is particularly likely to be on display when at home with others. Moreover, in addition to these identity displays, factors related to perceived control, which are reinforced by both control-oriented markings and the social expectations of the host being in charge, will also have ramifications regarding impression management. Having a high degree of control over what is taking place is positively related to the extent to which one will be held responsible for any outcomes, a fact that is likely to increase concern about evaluation from others (Burger, 1989).

These self-presentational concerns about how one will be evaluated by visitors may ultimately produce more negative outcomes among residents. That is, residents will

attend to and monitor both themselves and their visitors in ways that distract them from doing well at the task at hand. Having to host others when one is embarrassed by the current state of their home (e.g., due to not being recently cleaned) will lead to increased concern and attention for distracting information, such as whether the guest noticed a particular faux pas. Knowing that the resident is supposed to be responsible for what takes place in their home may also lead to increased and detrimental monitoring, particularly when it is more control than the resident actually wants. For example, individuals with lower desires for control show increased stress and reduced performance when provided with greater control over proceedings (Parker, Jimmieson, & Amiot, 2009; Shapiro, Schwartz, & Astin, 1996).

Baumeister and colleagues (Baumeister & Steinhilber, 1984; Butler & Baumeister, 1998; Wallace et al., 2005) have applied this viewpoint to the context of home performance in sports, arguing that the self-presentation concerns that accompany increased control can reduce performance, causing home teams to “choke” under pressure. That is, being in front of an audience that expects you to do well produces excessive self-monitoring, thereby inhibiting skillful motoric behavior normally performed automatically. Although their initial archival work on high pressure situations found that home teams in baseball and basketball were more likely to lose the decisive game of a championship series (Baumeister & Steinhilber, 1984), subsequent evaluations of this effect in professional sports have not supported these conclusions (Jamieson, 2010). However, empirical studies in the laboratory have demonstrated that high social expectations from a supportive audience can hinder success on tasks that are highly challenging or require skill (Butler & Baumeister, 1998). In light of this work, the

facilitated perceptual activity that elicits a home advantage is likely to occur only when the resident is not highly motivated or obligated to attend to additional information about their visitors or themselves.

Distractions at Home

Based on the wealth of evidence in organizational research demonstrating the benefits of being in personalized and controlled environments (Avey et al., 2009; O'Neill, 1994; Robertson & Huang, 2006; Wells, 2000), it may be expected that employees or individuals who work at home would be particularly productive and successful. However, people very often explicitly choose not to work at home. In fact, libraries and coffee shops are regularly filled with individuals who opted not to stay home, instead venturing out to a public location to complete their work goals. Why would people choose to do this if they would likely produce better work at home?

One possible explanation for this behavior requires recognizing the fact that residents in their territories have a large number of degrees of behavioral freedom. The setting itself has been designed to facilitate activities that the resident presumably enjoys, such as the opportunity to watch television, engage in hobbies, or even just rest. Because there is so much that a resident can do in a territory, and the resident is well aware of these many affordances, attending to and staying focused on an unenjoyable task in this environment may in fact be quite difficult. Having access to more desirable activities in the setting may pose a substantial distraction. In contrast, those who put themselves in public places consciously limit the number and quality of the behavioral opportunities available to them. Being in a coffee shop that, for example, does not afford napping or

television watching reduces the possible actions one can take, thereby making the visitor more likely to continue working on the less enjoyable task.

Staats (2012) makes a similar point when discussing the limitations homes can have as restorative environments. In addition to facilitating many pleasant alternative behavioral options for a resident, the home is also a place that can be associated with negatively valenced activities, such as chores, upkeep, and unfinished obligations (Saxbe & Repetti, 2010). As Experiment 1 showed, residents are particularly sensitive to the maintenance needs of their territory. This sensitivity to potentially distracting information in the environment may ultimately limit residents' ability to engage fully on certain tasks. Thus, not only will excessive attention to visitors and their impressions negatively affect resident performance, but excess attention to certain affordances (whether negative or positive) in the environment itself will also likely be detrimental. In light of this point, home advantage will therefore be most likely to occur when individuals are engaged and invested in the task being assessed.

Lacking (Desirable) Difficulties during Learning

Although resident performance may be enhanced as a result of being in his or her territory, current performance on a particular task does not in and of itself predict mastery. That is, in assessing how well skills or knowledge are acquired, an important distinction is made between long term learning and present performance outcomes. How does a territory potentially influence resident learning? The physical environment in which learning takes place has long been recognized to be a relevant factor in later retrieval and knowledge use. For example, the phenomenon of encoding specificity links memory effects to the consistency between the context in which information or skills are

learned and the context in which this knowledge is recalled (S. M. Smith & Vela, 2001; Thomson & Tulving, 1970; Tulving & Thomson, 1973). The original setting in which information is learned is thought to provide individuals with a wide array of peripheral retrieval cues, thereby increasing the accessibility of these learned concepts among those who stay in the same location. Thus, the performance of a skill in a particular environment, such as a territory, will likely be enhanced if it was also learned in that environment. The large amount of time spent in one's home or office may increase the likelihood that the behaviors engaged in while in the setting were also learned there.

However, truly understanding a concept or acquiring a particular skill also requires generalizability, or the capacity to think and act with flexibility. If one claims to be an expert at throwing darts, for example, he or she should be able to throw well across a variety of situations – with different game rules, differently weighted darts, in different bars, and (for some) under different states of inebriation. Interestingly, a body of literature has begun to show that this type of learning most benefits from what have been called *desirable difficulties*, challenges during training that in the long term ultimately enhance learning. For both memory tasks (Bjork, 1994; Bjork & Bjork, 2006; R. A. Schmidt & Bjork, 1992) and motoric ability (Schöllhorn et al., 2006; Schöllhorn, Mayer-Kress, Newell, & Michelbrink, 2009), how well an individual does while being trained on a task does not reliably predict their final comprehension or skill. In fact, it may instead inhibit learning. For example, Bjork (1994) describes a number of training difficulties shown to improve recall, such as varying the conditions in which one practices, inducing interference from other information, and extending the length of time between practices.

Although these various manipulations worsen performance during training, they improve recall in the long term.

Bjork and Bjork (2006) explain these findings by distinguishing between retrieval strength, which is the momentary accessibility of an item of knowledge, and storage strength, which represents an item's entrenchment, or its connection to other knowledge. According to their theory of learning, the act of retrieving knowledge from memory increases both retrieval and storage strength. However, the stronger a particular item's current level of retrieval strength, the less this action will increase storage strength. Desirable difficulties improve storage strength by lowering the item's retrieval strength prior to the time of retrieval, thereby increasing storage strength following successful recall. Moreover, variability, interference, and other seemingly detrimental factors during successful retrieval help to increase the number of cues related to the information, increasing its storage strength. In turn, high storage strength reduces the speed with which retrieval strength declines, thereby making the knowledge more accessible.

These findings suggest that the greater fluency and ease with which tasks can be performed in one's territory may not be ideal for deeper learning. Rather, it is in contexts that contain surprises, variability, and disfluent information that more generalizable and interconnected knowledge emerges (Alter, 2013). Having the experience of playing a game as a visitor may therefore be more beneficial to skill improvement in the long term, compared to an individual that only played at home. The empirical literature investigating home advantage has focused exclusively on performance, rather than learning, leaving this possibility open for future testing.

Disentangling the Factors Constituting Territoriality

Physical territories are particular environments in the world that humans live and act in. A territory is therefore not an individual psychological factor in its own right. Rather, it represents a constellation of factors that together lead to a particular relationship or system, of which the resident is a part. For example, in this document an emphasis has been placed on the fact that information in a territory is generally, relative to the resident, both familiar and self-referential. A descriptive analysis of the homes and offices most likely to be characterized as territories would be unlikely to find places that had only one of these features, rather than both (Altman, 1975). Thus, in attempting to understand performance as it occurs in actual territories, the current document did not seek to meaningfully differentiate between these two features. However, the question can be raised as to whether familiarity and self-association are differentially important in producing behavioral differences, or whether these factors may do so in clearly distinct ways. In the current document, Experiments 1, 2, and 3 sought to induce territoriality after very brief periods of time, therefore relying primarily on self-association to produce key differences between the groups. Although these procedures did lead to distinct behavioral differences (Experiments 1 and 2) and differential responses to competition or cooperation (Experiments 2 and 3), a clear difference in terms of basic solo performance was less clear. Experiment 2 found only equivocal support for a home advantage in visuospatial ability, and Experiment 3 found no difference in terms of visual search performance. In contrast, when long-term home territories were used in Experiment 4, a clear distinction was observed in terms of self-regulatory strength. It is ultimately not yet

clear whether these two components of the territory-resident relationship are complementary or redundant in terms of their influence on performance.

In Chapter 3, I suggested that familiarity and self-association may differ in their importance to the three skills described by Eleanor Gibson (1994) as necessary for agency. A history of perceptual and behavioral exploration in the setting will facilitate both retrospectivity and prospectivity. With an existing knowledge of critical environmental invariants, residents are better able to predict future events, recognize critical changes in the setting, and have less need to expend limited cognitive resources discovering new information during critical task periods. Self-associative information, on the other hand, can enhance behavioral flexibility, as residents have far more behavioral degrees of freedom than do visitors, who are often dependent on residents to determine what constitutes allowable behavior.

In light of these claims, an important direction for future work is to explore more closely how perception and action cycles may be influenced by the social content of the objects or environments with which one is coupled. If a visitor exhibits less behavioral flexibility than residents, finding ways to measure the complexity or fractal structure of their behavior (Gilden, Thornton, & Mallon, 1995) will likely reveal such differences. Moreover, differences in the efficiency with which residents and visitors detect affordances could also be explored by having them attempt to discover new or unusual uses for objects within such settings (Ye, Cardwell, & Mark, 2009). Performing well on a task such as this requires transitioning between different modes of action, relative to a given object, in order to discover its various relational properties. Again, if visitors are socially constrained within someone else's territory in terms of their behavioral and

perceptual activity, their capacity to engage with objects in new and varying ways should be likewise attenuated. Work such as this will help to incorporate what role the social world can play within ecological theory (Heft, 2007; Hodges & Baron, 2007).

In a similar way, the procedure used to induce territorial feelings in Experiment 1 employed several methods to produce the observed differences between residents and visitors, including identity-oriented marking, control-oriented marking, and anticipated return. It is therefore unclear if any one of these factors could in isolation be sufficient to induce similar territorial behavior, or whether they work only in concert. Again, because the goal of this procedure was to simulate a genuine territory as well as possible, the need to separate these variables was unnecessary for the current study. However, it is quite possible that these different behaviors serve quite different psychological roles in connecting the resident to the physical setting, and would therefore have distinct influences on subsequent behavior. For example, identity-oriented markings may satisfy strivings for either self-affirmation or self-verification, control-oriented markings may enhance feelings of efficacy, and knowing that one can anticipate returning to the setting in the future may satiate uncertainty concerns. Residents turn to their territories for a variety of needs, and their subsequent behavior within the setting will be a product of which of these environmental features they attend to. Investigating how these different forms of marking serve different psychological functions therefore represents a viable avenue for future work seeking to understand the resident-territory relationship.

Conclusion

Taken together, these studies represent initial steps towards moving the study of territorial behavior away from a preoccupation with competitive defense to a broader

understanding of the resident-territory relationship. The approach used here has explicitly avoided explaining psychological outcomes in terms of internal, mental processes, such as representations of threat or physiological arousal. Rather, an emphasis has been placed on understanding how relational properties that link a person to a particular physical environment can guide subsequent perception, behavior, and ability. Although recent trends in social cognition have come to recognize the embodied nature of psychological processes (Landau, Meier, & Keefer, 2010; E. R. Smith & Semin, 2004), focus on the role of the physical environment as itself a genuine component of cognitive and behavioral psychological systems has lagged much farther behind, despite early acknowledgement of its importance in the early days of social psychology (Barker, 1968). Explicitly grounding social psychological processes within the world that humans occupy therefore represents a critical, yet comparatively under-developed area of inquiry (Reis, 2008). Of all the types of environments that humans occupy and act in, territories are perhaps the most ubiquitous and psychologically meaningful. Because of this fact, better understanding the role of these settings in all types of human activity – whether competitive, cooperative, or individual – will vastly enhance how well psychological theories can explain cognition, behavior, and performance as it occurs in the places humans most occupy. The research reported here has sought to offer several initial insights regarding this goal, as well as point to additional directions for its further pursuit.

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Tables

Table 1. Distribution of references to self and other in block descriptions in Experiment 2

	Competitive				Cooperative			
	Resident		Visitor		Resident		Visitor	
<i>Self-References</i>								
0	22	(67%)	17	(52%)	17	(57%)	12	(40%)
1	0		0		1	(3%)	0	
2	4	(12%)	4	(12%)	2	(7%)	2	(7%)
3	0		0		1	(3%)	2	(7%)
4	1	(3%)	4	(12%)	2	(7%)	5	(17%)
5	0		2	(6%)	1	(3%)	0	
6	4	(12%)	3	(9%)	2	(7%)	2	(7%)
7	0		0				0	
8	1	(3%)	2	(6%)	3	(10%)	2	(7%)
9	0		0				0	
10	1	(3%)	1	(3%)	1	(3%)	5	(17%)
<i>Other-References</i>								
0	29	(88%)	31	(94%)	24	(80%)	24	(80%)
1	0		0		0		1	
2	1	(3%)	1	(3%)	0		1	(3%)
3	1	(3%)	0		0		0	
4	2	(6%)	1	(3%)	5	(17%)	2	(7%)
5	0		0		1	(3%)	0	
6	0		0		0		1	(3%)
7	0		0		0		0	
8	0		0		0		0	
9	0		0		0		0	
10	0		0		0		1	(3%)
Mean # of words:	61.33		57.76		67.73		79.13	
SD:	29.95		30.35		30.81		43.44	

Table 2. Object preferences selected in Experiment 3.

Bedroom 1	Bedroom 2	Dining Room
Bed	Dresser	Chairs
End table	Lamp	Ceiling lamp
Painting	Poster	Dining table
Kitchen 1	Kitchen 2	Living Room 1
Cabinets	Countertop	Comfort Chair
Refrigerator	Sink	Lamp
Stove	Window blinds	Entertainment center
Living Room 2	Office 1	Office 2
Coffee table	Office chair	Wall clock
Floor lamp	Desk	Desk mat
Sofa	Filing cabinet	Desk lamp

Table 3. Means and coding system for the discrepancies shown in Experiment 3.

	<i>M</i>	<i>SD</i>	Discrepancy Coding		
			Selection-Relevant	Action-Relevant	Spatial Orientation
<i>Bedroom 1</i>					
Absence of keyhole in endtable	67.32	53.21	YES	YES	NO
Arrangement of pillows	12.92	11.61	YES	NO	YES
Style of light-switch frame	9.10	7.03	NO	NO	NO
Location of slippers	21.37	35.85	NO	NO	YES
<i>Bedroom 2</i>					
Rotation of candles	9.07	8.86	YES	NO	YES
Absence of lamp pull-string	14.17	11.70	YES	YES	NO
Absence of rug	9.32	6.02	NO	NO	NO
Location of towel	10.79	12.96	NO	NO	YES
<i>Dining Room</i>					
Rotation of chair	10.93	10.08	YES	NO	YES
Absence of glass	42.76	45.93	YES	YES	NO
Accessibility of wall outlet	60.46	55.37	NO	YES	YES
Height of painting	40.98	46.09	NO	NO	YES
<i>Kitchen 1</i>					
Type of note on door	11.33	9.38	YES	NO	NO
Arrangement of utensils	10.03	10.70	YES	NO	YES
Color of spices	14.93	10.93	NO	NO	NO
Absence of coffeemaker wire	7.63	7.90	NO	YES	NO
<i>Kitchen 2</i>					
Location of cleaning supplies	30.63	38.61	YES	NO	YES
Location of soap	22.06	29.91	YES	NO	YES
Setting of dishwasher knob	25.86	19.28	NO	YES	YES
Location of knife set	36.85	40.21	NO	NO	YES
<i>Living Room 1</i>					
Absence of paper	10.99	9.00	YES	NO	NO
Location of TV remote	27.42	23.17	YES	NO	YES
Location of laptop	21.63	14.55	NO	NO	YES
Location of plant	24.29	18.46	NO	NO	YES

Living Room 2

Location of pillows	21.59	24.64	YES	NO	YES
Absence of mug handle	31.84	40.81	YES	YES	NO
Location of candle	12.98	13.52	NO	NO	YES
Pattern on rug	90.48	60.72	NO	NO	NO

Office 1

Rotation of key	6.56	5.55	YES	NO	YES
Location of paper	13.39	14.33	YES	NO	YES
Location of plant	25.72	22.38	NO	NO	YES
Rotation of stapler	5.76	4.19	NO	NO	YES

Office 2

Absence of lamp wire	13.26	11.59	YES	YES	NO
Location of pens	25.45	23.89	YES	NO	YES
Location of monitor	56.89	49.47	NO	NO	YES
Location of mug	10.20	11.12	NO	NO	YES

Note. Means are the average latency to detect the discrepancy, in seconds.

Table 4. Coefficients for mean discrepancy detection time in Experiment 3

	Model 1		Model 2		Model 3	
	<i>b</i>	<i>SE</i>	<i>b</i>	<i>SE</i>	<i>b</i>	<i>SE</i>
Intercept	25.10	3.91	24.93	3.91	27.80	4.30
First Trial	12.37**	1.93	12.57**	1.93	12.62**	1.93
Trial Order	-0.65**	0.23	-0.62**	0.23	-0.62**	0.23
Participant Gender	-0.22	0.81	-0.22	0.81	-0.17	0.81
Social Context	-0.53	0.80	-0.12	0.88	-0.12	0.94
Resident	-0.16	0.62	-0.17	0.63	-0.58	0.75
Visitor	0.15	0.62	0.01	0.63	-0.63	0.76
Resident*Social Context	-	-	0.03	0.62	0.03	0.62
Visitor*Social Context	-	-	1.19±	0.63	1.25*	0.63
Selection-Relevant	-	-	-	-	-3.94	3.13
Action-Relevant	-	-	-	-	4.39	4.32
Spatial Orientation	-	-	-	-	-1.40	3.87
	-	-	-	-		
Resident X Selection-Relevant	-	-	-	-	-0.35	0.63
Resident X Action-Relevant	-	-	-	-	-1.58±	0.85
Resident X Spatial Orientation	-	-	-	-	-1.56*	0.75
Visitor X Selection-Relevant	-	-	-	-	-0.82	0.63
Visitor X Action-Relevant	-	-	-	-	-1.83*	0.86
Visitor X Spatial Orientation	-	-	-	-	-1.18	0.76
Social Context X Selection-Relevant	-	-	-	-	0.63	0.51
Social Context X Action-Relevant	-	-	-	-	-0.42	0.69
Social Context X Spatial Orientation	-	-	-	-	-0.80	0.61

Note. ** $p < .01$; * $p < .05$; ± $p < .10$

Figures

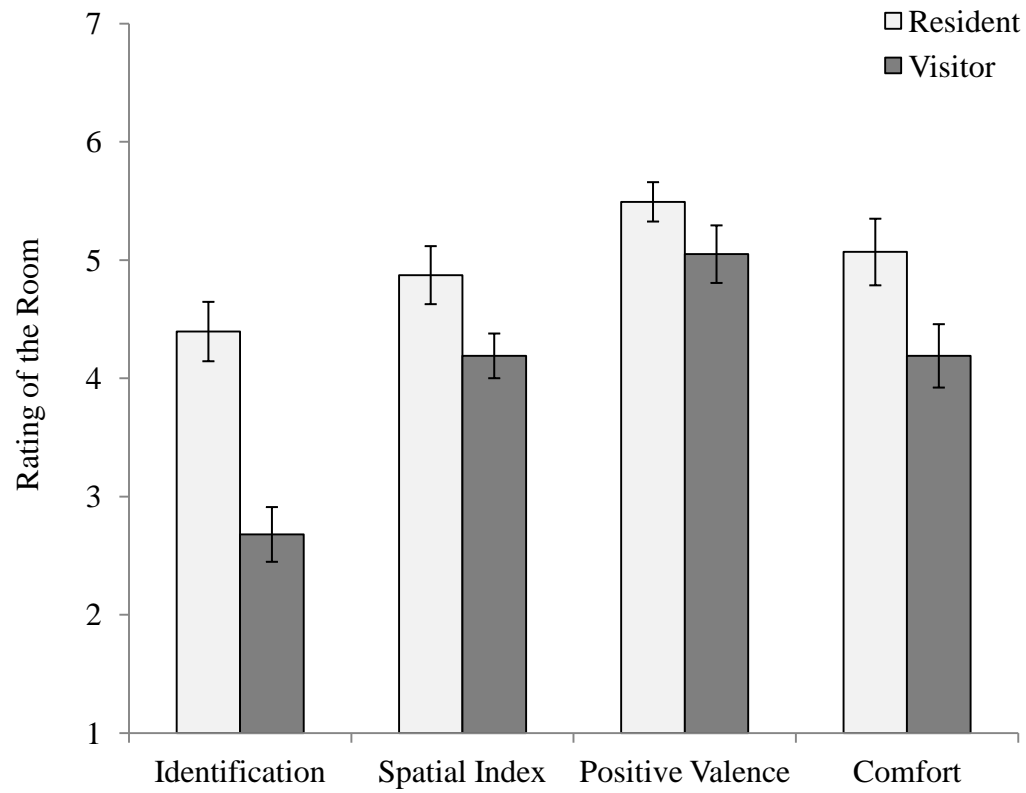


Figure 1. Means and standard errors on room ratings for residents and visitors in Experiment 1.

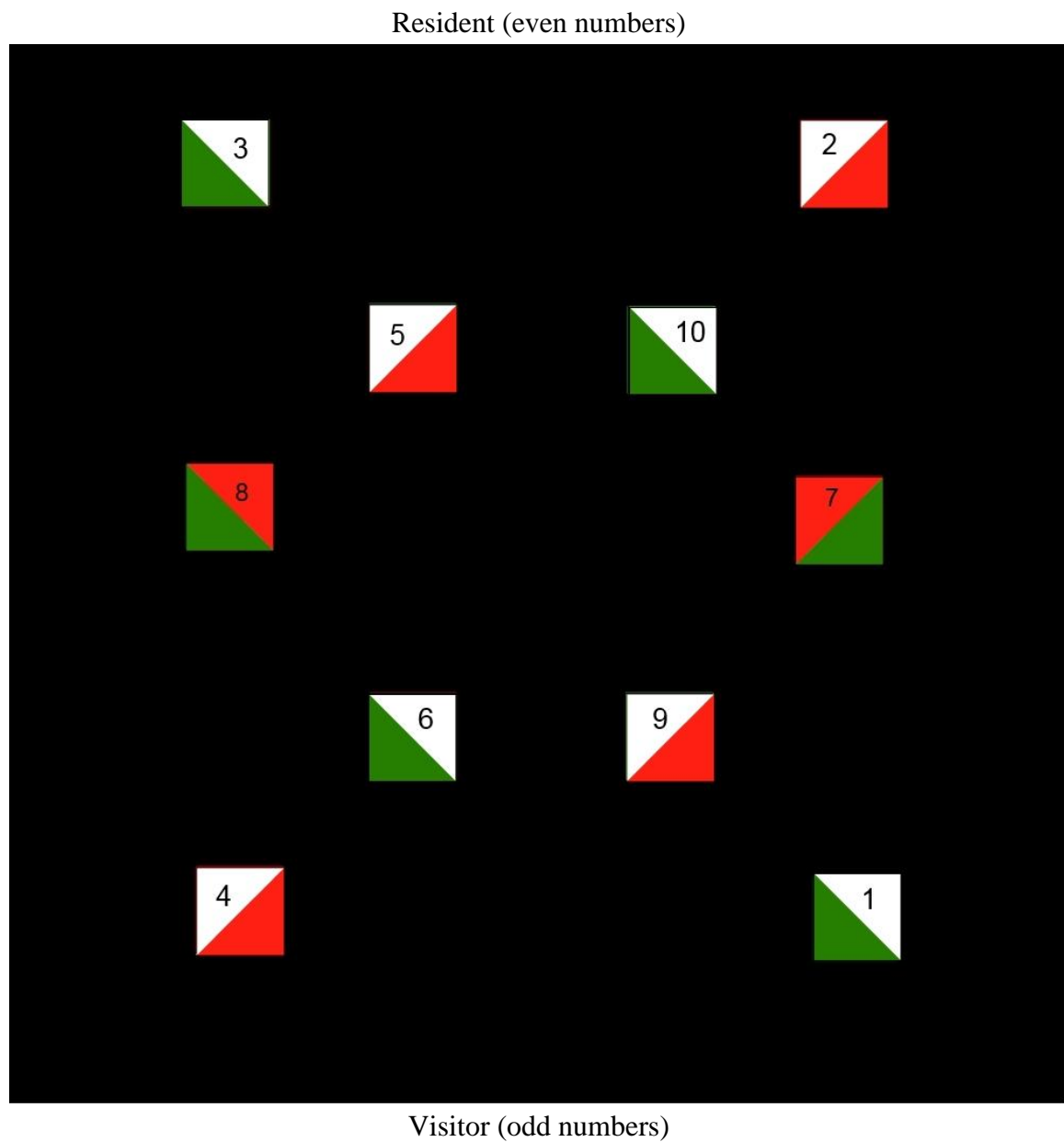


Figure 2. Bird's eye view of starting layout of puzzle pieces in block design task for Experiment 2. On actual puzzle blocks, numbers were placed on either side of each piece rather than the top.

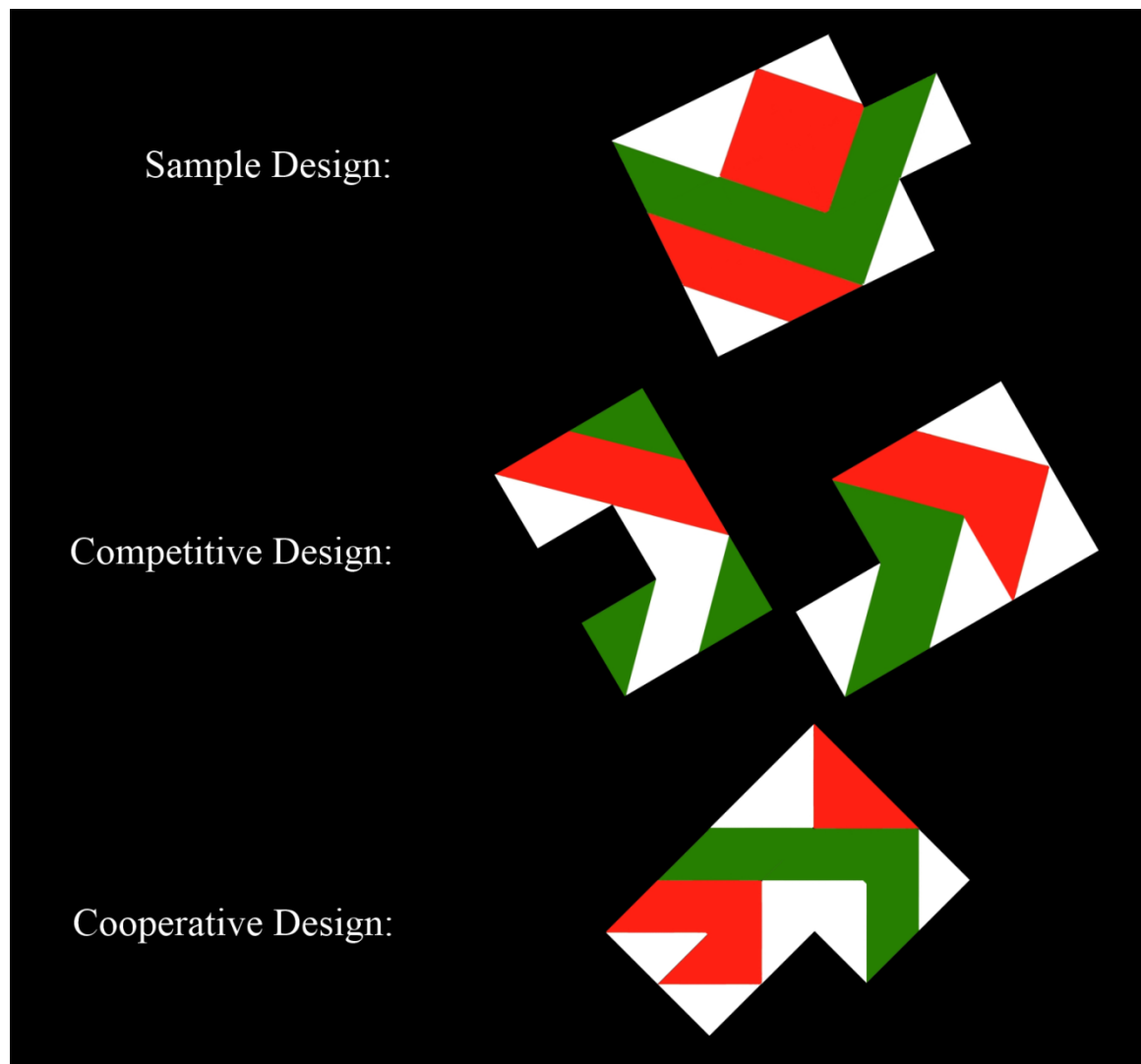


Figure 3. Designs shown in block design task for Experiment 2. In the competitive condition, participants were instructed to complete the design on the left first, say “done,” and then begin the design on the right.

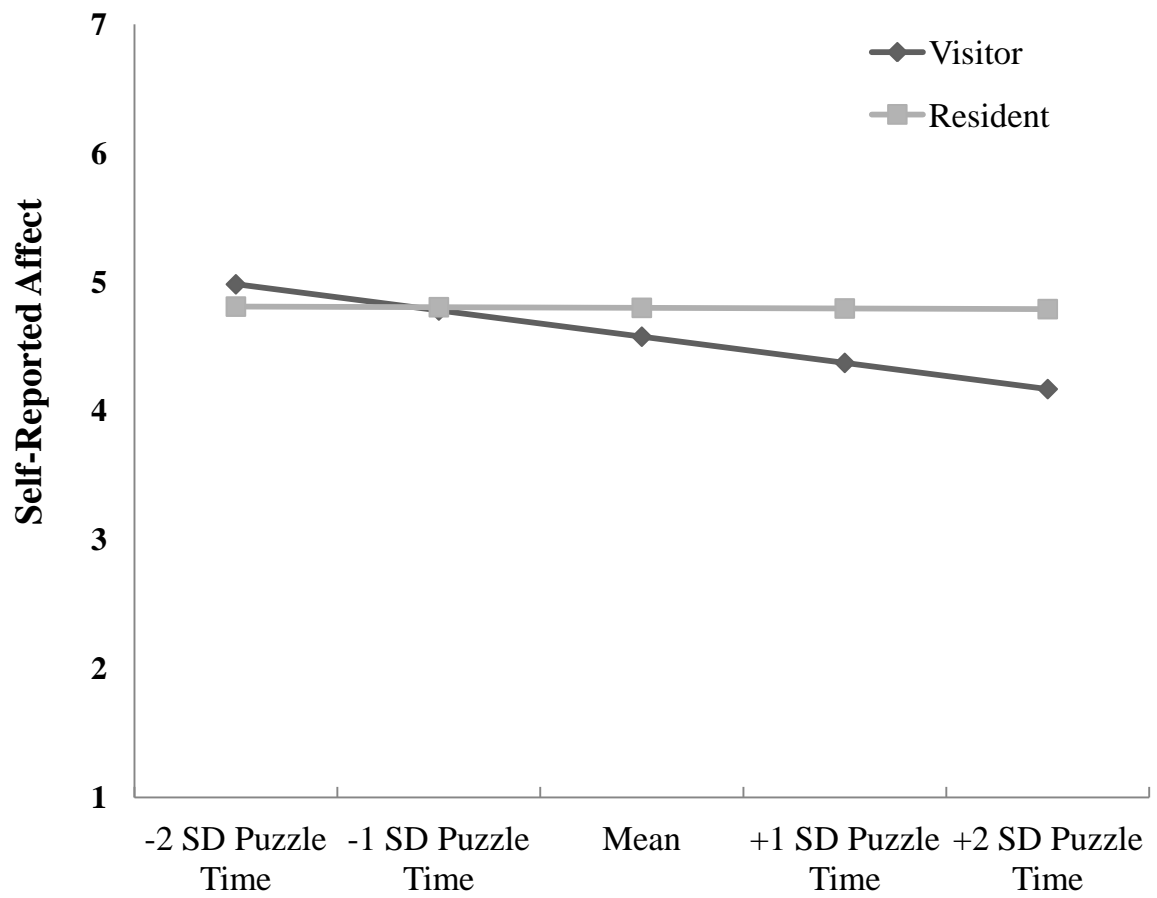


Figure 4. Self-reported affect following the competitive block design task in Experiment 2, as a product of residency status and time required to complete the puzzle.

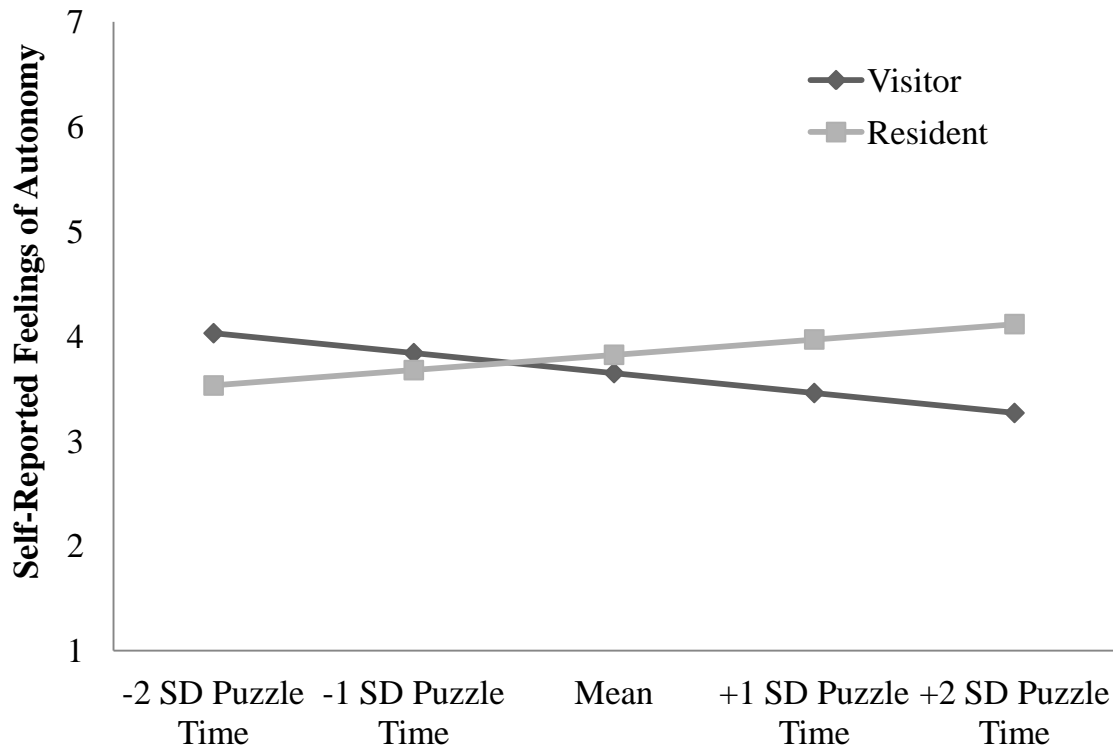


Figure 5. Self-reported sense of autonomy following the competitive block design task in Experiment 2, as a product of residency status and time required to complete the puzzle.

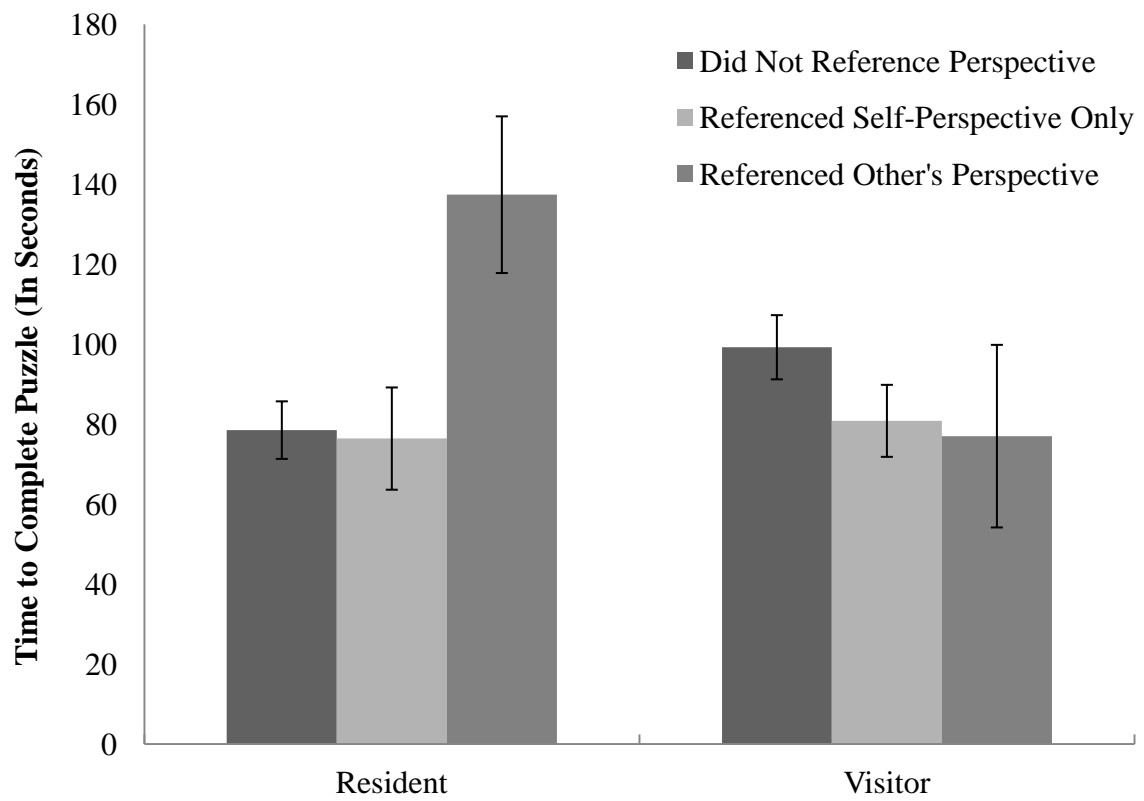


Figure 6. Estimated marginal means of puzzle performance in competitive condition of Experiment 2, by residency status and acknowledgment of perspectives. Data is shown following the removal of a single resident outlier, which exaggerated the effect (Time = 459 sec).

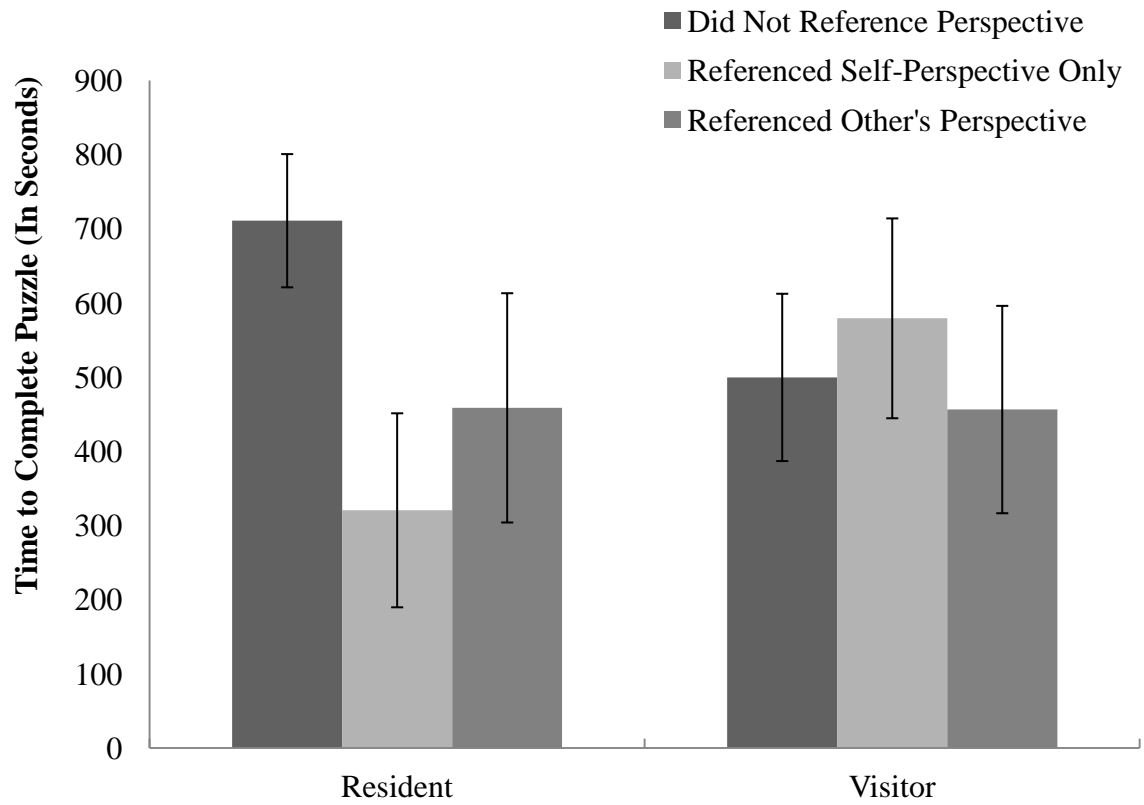


Figure 7. Means of puzzle performance in cooperative condition for dyads of Experiment 2, by residency status and acknowledgment of perspectives.

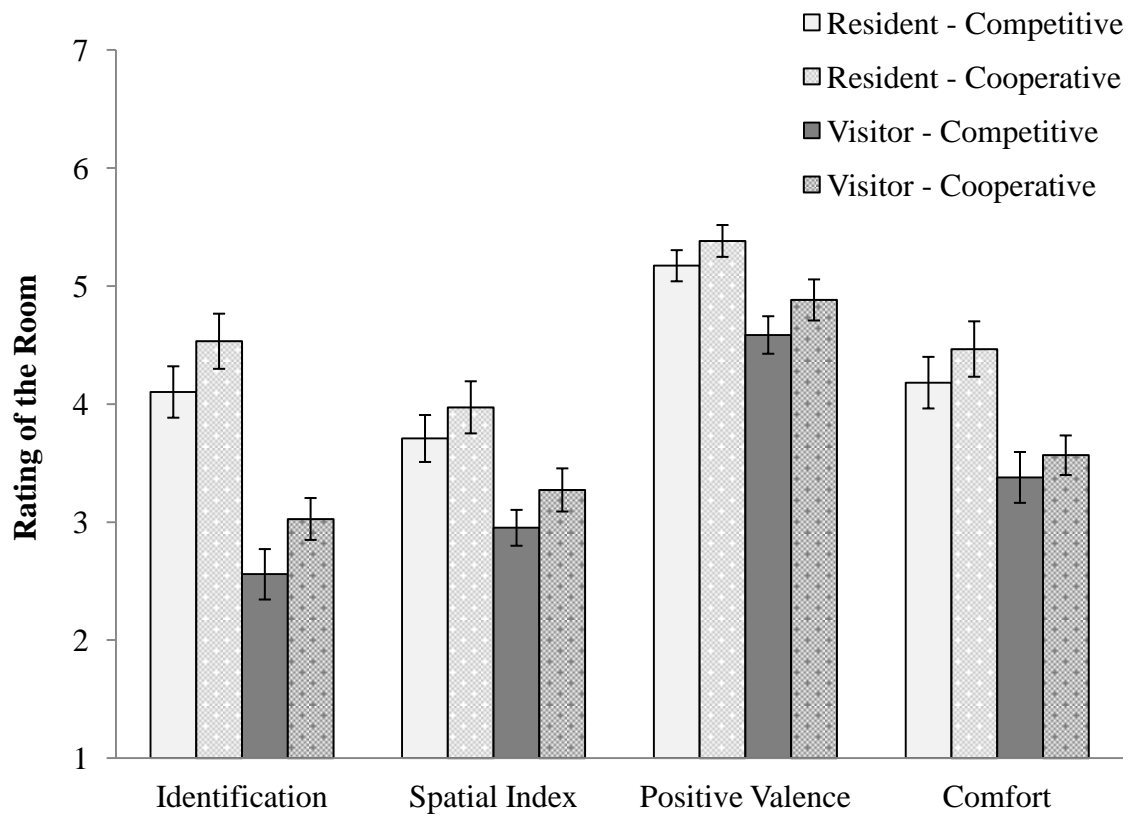


Figure 8. Ratings of the room in Experiment 2, as a product of residency status and puzzle condition.

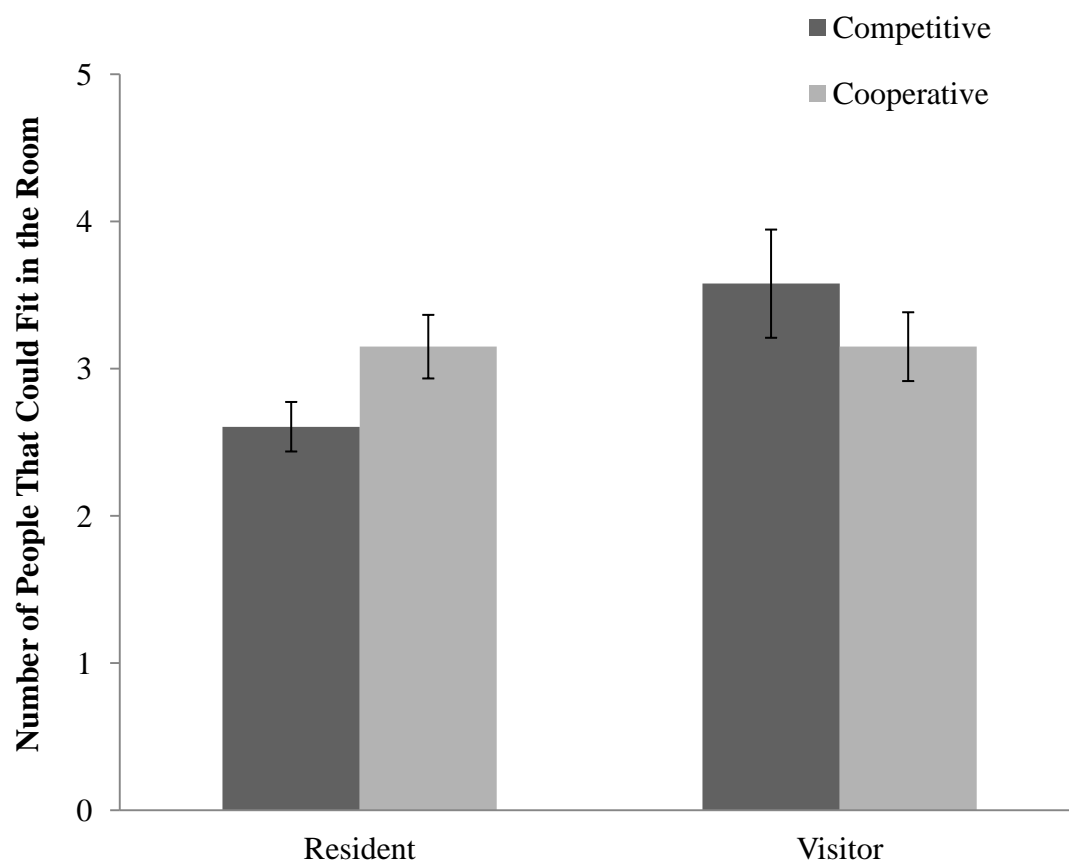


Figure 9. Estimated number of people that could fit in the room in Experiment 2 as a product of residency status and puzzle condition.

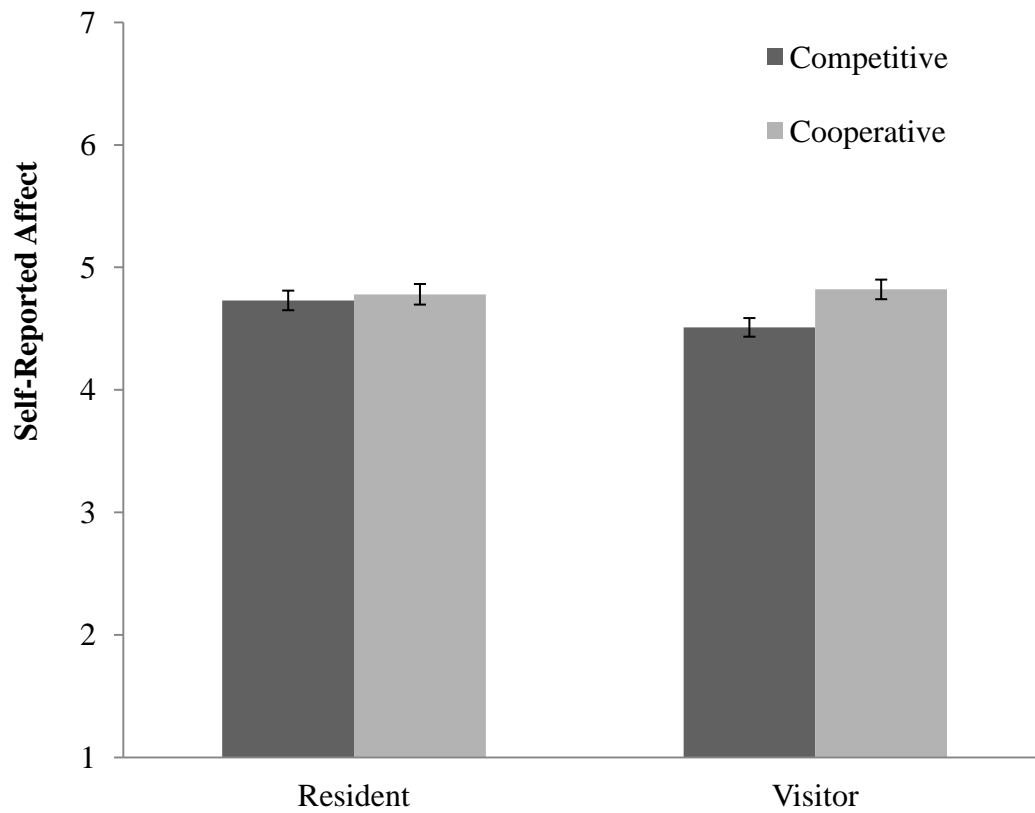


Figure 10. Self-reported affect following the competitive block design task in Experiment 2, as a product of residency status and puzzle condition, controlling for the time required to complete it.

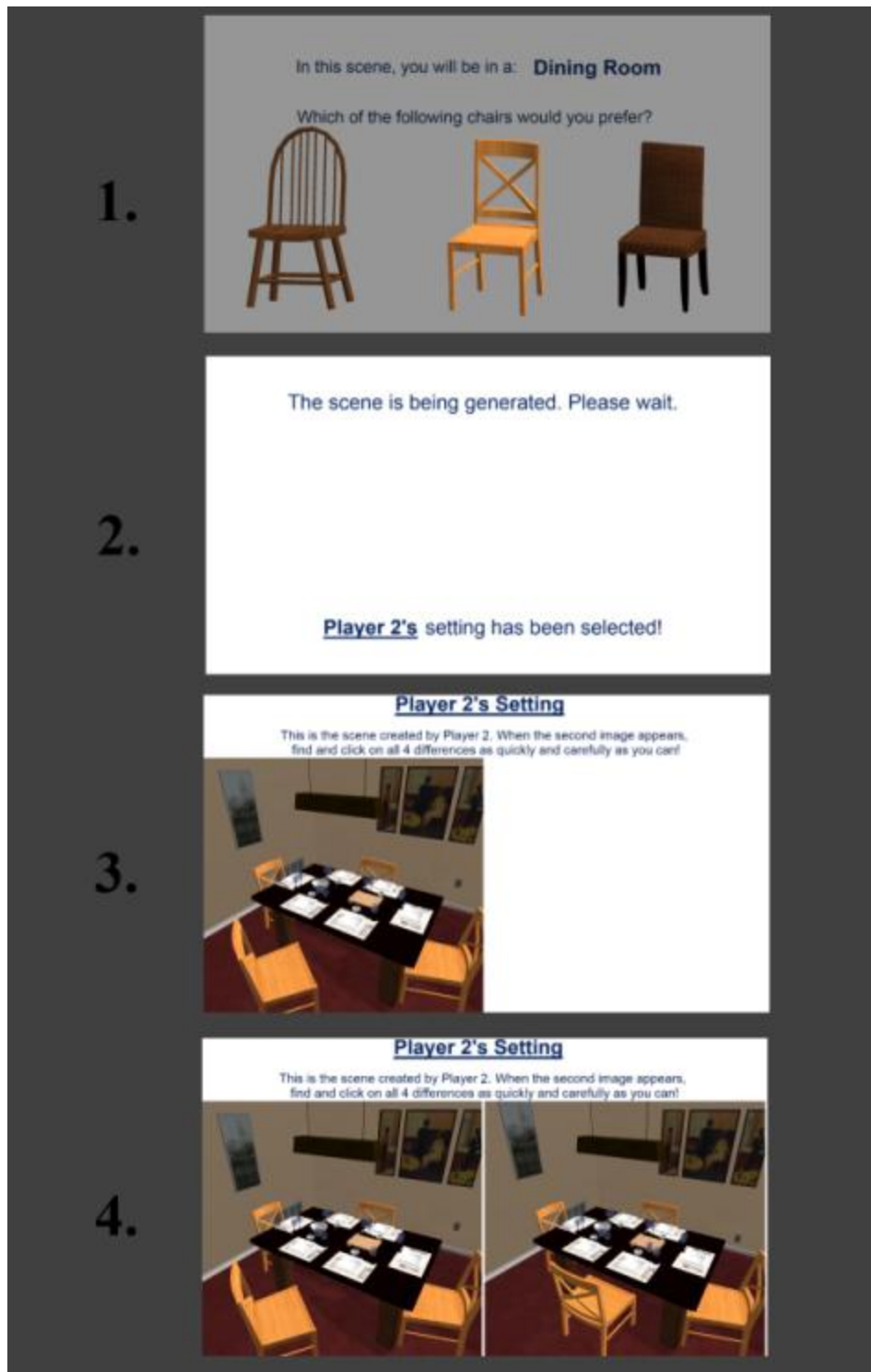


Figure 11. Screen progression in Experiment 3 for each trial. 1: Participants select furnishings for the scene. 2: Computer randomly selects Player 1's objects, or those not picked by the participant (Player 2 or Computer). 3: The scene is displayed for 10 seconds. 4: Near duplicate image is presented, and participants search for differences.

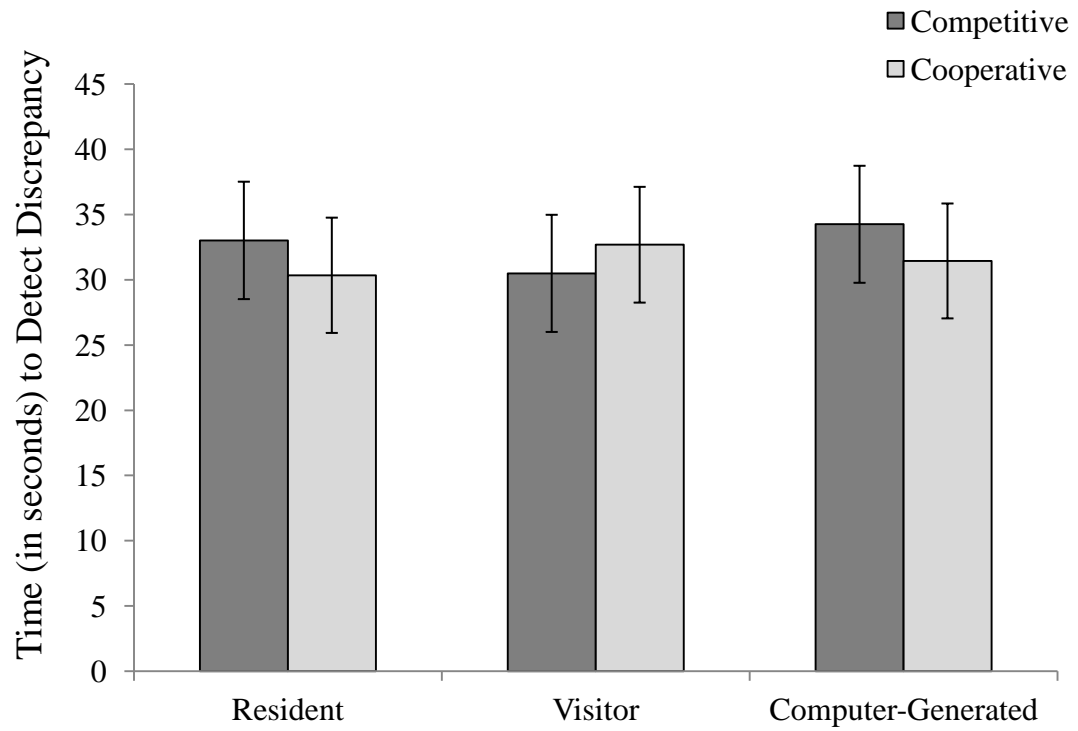


Figure 12. Estimated marginal means for time needed to detect differences between two scene images as a product of social context and residency status in Experiment 3.

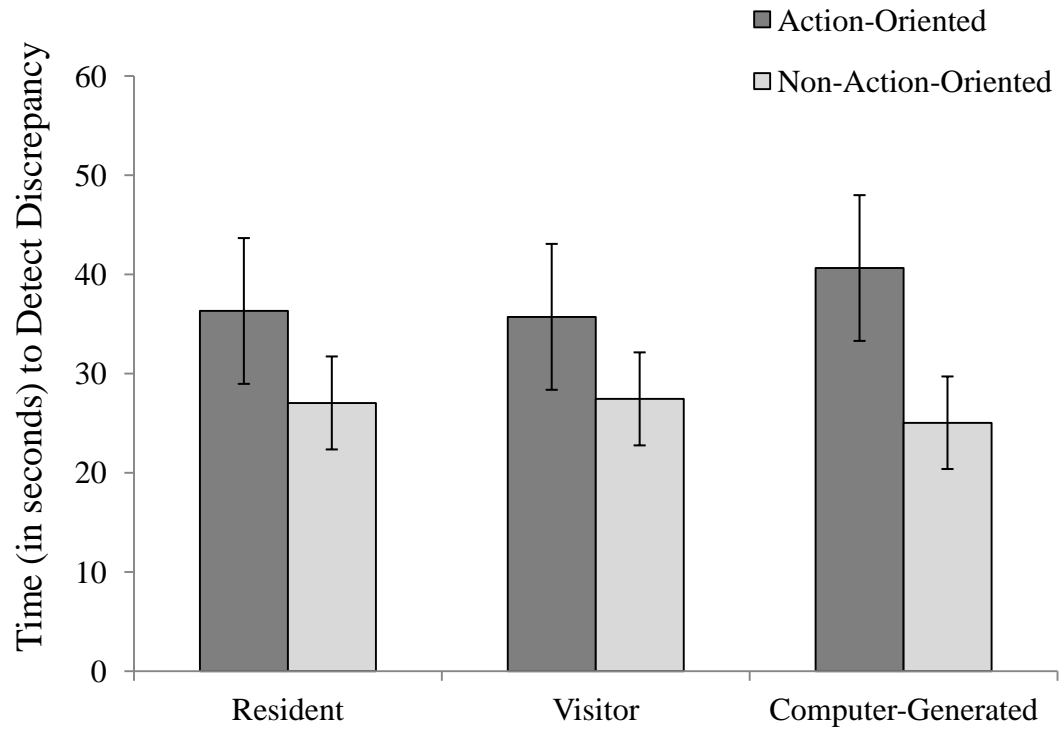


Figure 13. Estimated marginal means for time needed to detect differences between two scene images as a product of residency status and the action-oriented nature of the difference in Experiment 3.

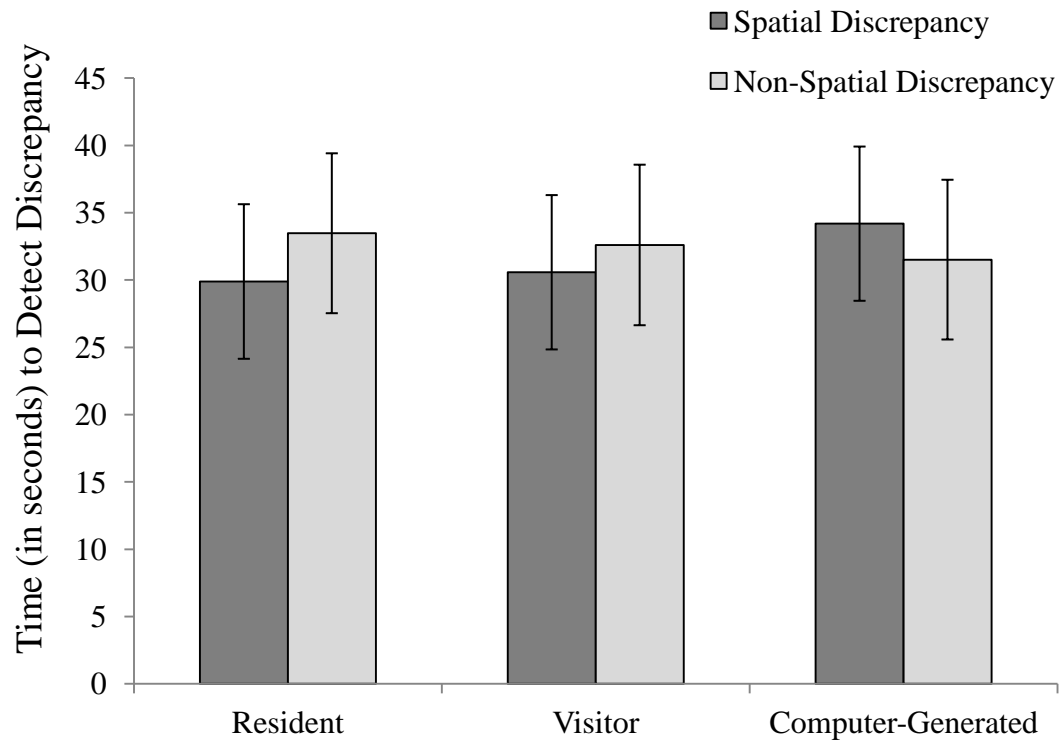


Figure 14. Estimated marginal means for time needed to detect differences between two scene images as a product of residency status and the spatial nature of the discrepancy in Experiment 3.

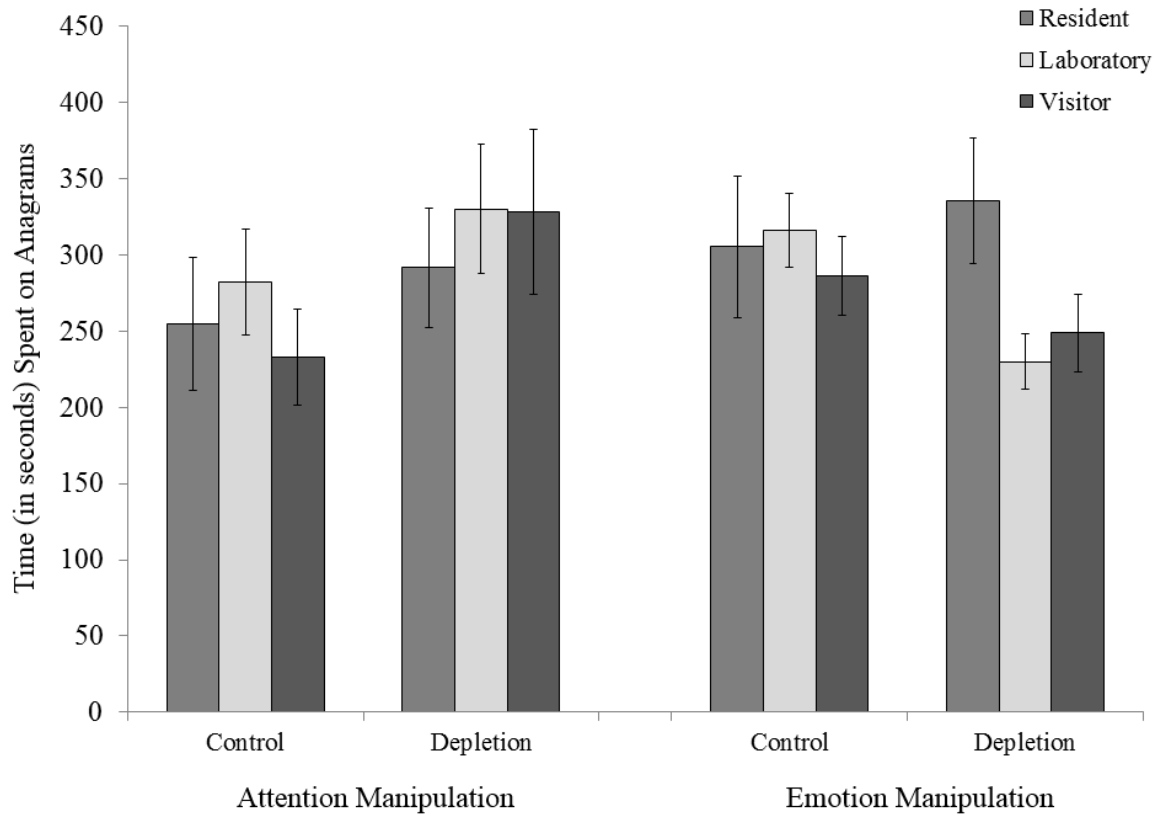


Figure 15. Time spent trying to solve impossible anagrams in Experiment 4, as a product of physical location, manipulation-type, and depletion.

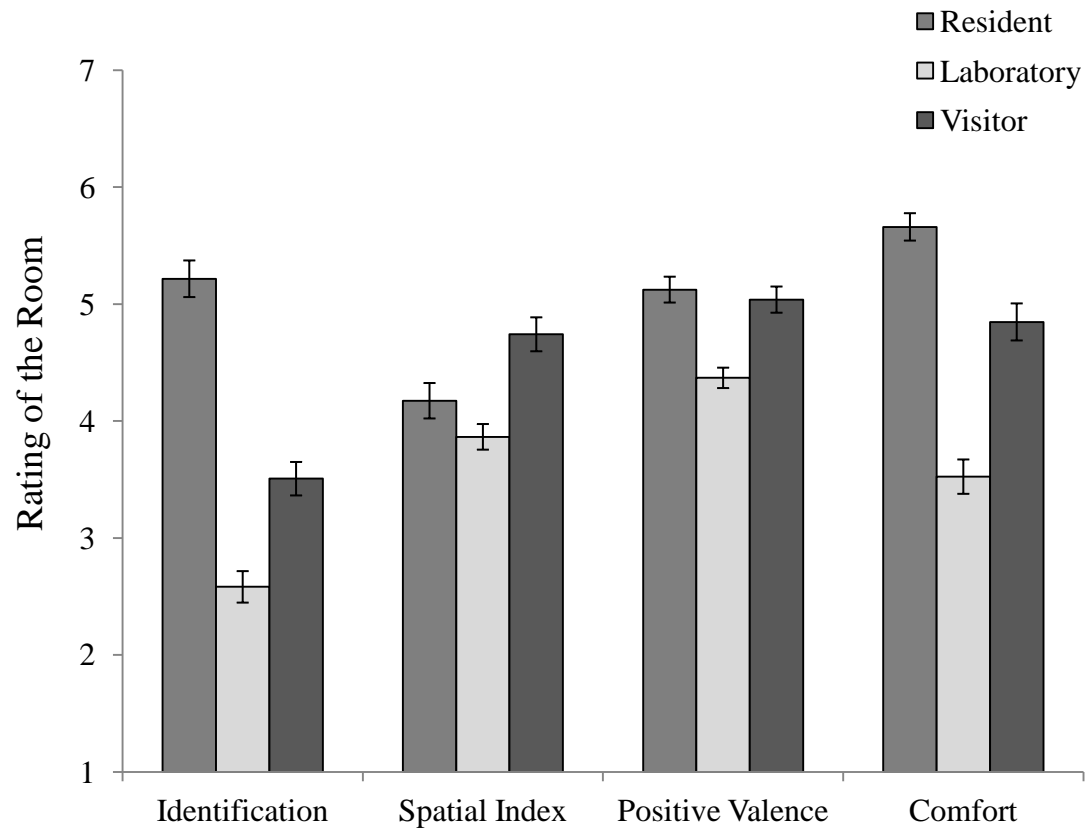


Figure 16. Ratings of the room in Experiment 4, as a product of residency status.

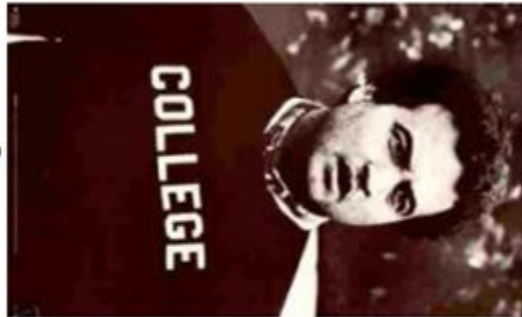
Appendices

Appendix A: Decoration Packet for Experiments 1 & 2

Please pick up to 2 posters to decorate your room with (continued on next 2 pages)



1



2



3



4



5



6



7



8



9



10



11



12



13



14



15



16



17



18



19



20

Please pick up to 6 postcards to decorate your room with (continued on next 3 pages)



1



2



3



4



5



6



7



8



9



10



11



12



13



14



15



16



17



18



19



20



21



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25



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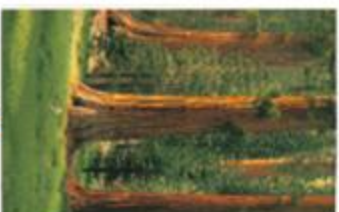
41



42



43



44



45



46



47



48



49



50



51



52

Please pick 2 writing instruments to use at your desk (continued on next page)



Wooden Pencil
1



Mechanical Pencil
2



Black Mechanical Pencil
3



UConn Pencil
4



Blue Pen
5



Black Pen
6



Green Pen
7



Ergonomic Pen
8



Purple Pen
9



Red Pen
10



Ball Pen
11



UConn Pen
12



Blue Ball Pen
13



Orange Pen
14

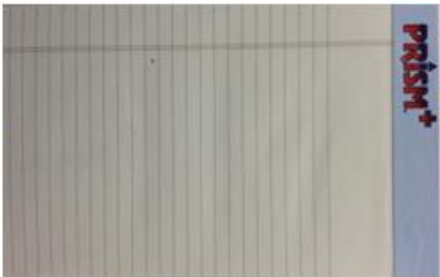


Black Pen
15

Please pick 1 notepad to write in at your desk



1



2



3



4



5

Please pick 1 folder color to have at your desk



1



2



3



4



5

Please pick 1 pencil cup to have on your desk



1



2



3



4



5



6



7

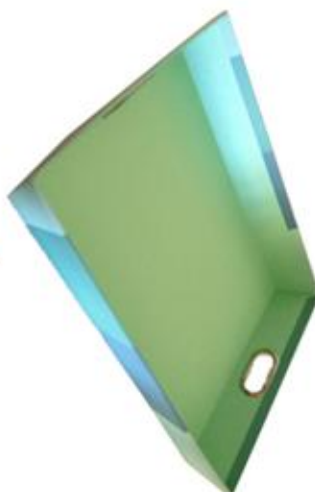


8



9

Please pick 1 paper tray to have on your desk



Appendix B:
Questionnaire Scales used in Experiments 1, 2, and 4

Any behavior can be described in many ways. For example, one person might describe a behavior as "writing a paper," while another person might describe the same behavior as "pushing keys on the keyboard." Yet another person might describe it as "expressing thoughts." This form focuses on your personal preferences for how a number of different behaviors should be described. Below you will find several behaviors listed. After each behavior will be two different ways in which the behavior might be identified. For example:

1. Attending class

- a. sitting in a chair
- b. looking at a teacher

Your task is to choose the identification, a or b, that best describes the behavior for you. Simply circle the letter next to the option you prefer. Be sure to respond to every item. Please mark only one alternative for each pair. Remember, mark the description that you personally believe is more appropriate for each pair.

1. Making a list

- a. Getting organized
- b. Writing things down

6. Chopping down a tree

- a. Wielding an axe
- b. Getting firewood

2. Reading

- a. Following lines of print
- b. Gaining knowledge

7. Measuring a room for carpeting

- a. Getting ready to remodel
- b. Using a yard stick

3. Joining the Army

- a. Helping the Nation's defense
- b. Signing up

8. Cleaning the house

- a. Showing one's cleanliness
- b. Vacuuming the floor

4. Washing clothes

- a. Removing odors from clothes
- b. Putting clothes into the machine

9. Painting a room

- a. Applying brush strokes
- b. Making the room look fresh

5. Picking an apple

- a. Getting something to eat
- b. Pulling an apple off a branch

10. Paying the rent

- a. Maintaining a place to live
- b. Writing a check

11. Caring for houseplants

- a. Watering plants
- b. Making the room look nice

12. Locking a door

- a. Putting a key in the lock
- b. Securing the house

13. Voting

- a. Influencing the election
- b. Marking a ballot

14. Climbing a tree

- a. Getting a good view
- b. Holding on to branches

15. Filling out a personality test

- a. Answering questions
- b. Revealing what you're like

16. Brushing your teeth

- a. Preventing tooth decay
- b. Moving a brush around in one's mouth

17. Taking a test

- a. Answering questions
- b. Showing one's knowledge

18. Greeting someone

- a. Saying hello
- b. Showing friendliness

19. Resisting temptation

- a. Saying "no"
- b. Showing moral courage

20. Eating

- a. Getting nutrition
- b. Chewing and swallowing

21. Growing a garden

- a. Planting seeds
- b. Getting fresh vegetables

22. Traveling by car

- a. Following a map
- b. Seeing countryside

23. Having a cavity filled

- a. Protecting your teeth
- b. Going to the dentist

24. Talking to a child

- a. Teaching a child something
- b. Using simple words

25. Pushing a doorbell

- a. Moving a finger
- b. Seeing if someone's home

Here are a number of personality traits that may or may not apply to you. Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement, using the scale shown below. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

Disagree Strongly	Disagree Moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree Moderately	Agree Strongly
1	2	3	4	5	6	7

[Column used only in Experiment 2]

I see myself as:

1. ____ Extraverted, enthusiastic
2. ____ Critical, quarrelsome
3. ____ Dependable, self-disciplined
4. ____ Anxious, easily upset.
5. ____ Open to new experiences, complex
6. ____ Reserved, quiet
7. ____ Slow, unskilled
8. ____ Sympathetic, warm
9. ____ A leader, in control
10. ____ Disorganized, careless
11. ____ Calm, emotionally stable
12. ____ Conventional, uncreative
13. ____ A follower, submissive
14. ____ Intelligent, competent

I see the other participant as:

1. ____ Extraverted, enthusiastic
2. ____ Critical, quarrelsome
3. ____ Dependable, self-disciplined
4. ____ Anxious, easily upset
5. ____ Open to new experiences, complex
6. ____ Reserved, quiet
7. ____ Slow, unskilled
8. ____ Sympathetic, warm
9. ____ A leader, in control
10. ____ Disorganized, careless
11. ____ Calm, emotionally stable
12. ____ Conventional, uncreative
13. ____ A follower, submissive
14. ____ Intelligent, competent

This scale consists of a number of words that describe different feelings and emotions. Read each item and then circle the number from the scale below next to each word. Indicate to what extent you feel this way right now, that is, at the present moment.

		Very Slightly or Not at All	A Little	Moderately	Quite a Bit	Extremely
1.	Interested	1	2	3	4	5
2.	Distressed	1	2	3	4	5
3.	Excited	1	2	3	4	5
4.	Upset	1	2	3	4	5
5.	Strong	1	2	3	4	5
6.	Guilty	1	2	3	4	5
7.	Scared	1	2	3	4	5
8.	Hostile	1	2	3	4	5
9.	Enthusiastic	1	2	3	4	5
10.	Proud	1	2	3	4	5
11.	Irritable	1	2	3	4	5
12.	Alert	1	2	3	4	5
13.	Ashamed	1	2	3	4	5
14.	Inspired	1	2	3	4	5
15.	Nervous	1	2	3	4	5
16.	Determined	1	2	3	4	5
17.	Attentive	1	2	3	4	5
18.	Jittery	1	2	3	4	5
19.	Active	1	2	3	4	5
20.	Afraid	1	2	3	4	5

Please read each of the following items carefully, thinking about how it relates to your life, and then indicate how true it is for you.

		Not at all true	Somewhat true			Very true
1.	I feel like I am free to decide for myself how to live my life.	1	2	3	4	5
2.	I really like the people I interact with.	1	2	3	4	5
3.	Often, I do not feel very competent.	1	2	3	4	5
4.	I feel pressured in my life.	1	2	3	4	5
5.	People I know tell me I am good at what I do.	1	2	3	4	5
6.	I get along with people I come into contact with.	1	2	3	4	5
7.	I pretty much keep to myself and don't have a lot of social contacts.	1	2	3	4	5
8.	I generally feel free to express my ideas and opinions.	1	2	3	4	5
9.	I consider the people I regularly interact with to be my friends.	1	2	3	4	5
10.	I have been able to learn interesting new skills recently.	1	2	3	4	5
11.	In my daily life, I frequently have to do what I am told.	1	2	3	4	5
12.	People in my life care about me.	1	2	3	4	5
13.	Most days I feel a sense of accomplishment from what I do.	1	2	3	4	5
14.	People I interact with on a daily basis tend to take my feelings into consideration.	1	2	3	4	5
15.	In my life I do not get much of a chance to show how capable I am.	1	2	3	4	5
16.	There are not many people that I am close to.	1	2	3	4	5
17.	I feel like I can pretty much be myself in my daily situations.	1	2	3	4	5
18.	The people I interact with regularly do not seem to like me much.	1	2	3	4	5
19.	I often do not feel very capable.	1	2	3	4	5
20.	There is not much opportunity for me to decide for myself how to do things in my daily life.	1	2	3	4	5
21.	People are generally pretty friendly towards me.	1	2	3	4	5

[This scale omitted in Experiment 4]

Please read the pairs of statements, one at a time, and think about which within the pair seems more true to you at this point in your life. If statement A feels completely true and statement B feels completely untrue, the appropriate response would be 1. If the two statements are equally true, the appropriate response would be a 3. If only statement B feels true, the appropriate response would be 5.

1. A. I always feel like I choose the things I do.
B. I sometimes feel that it's not really me choosing the things I do.

Only A feels true	1	2	3	4	5	Only B feels true
-------------------	---	---	---	---	---	-------------------
2. A. My emotions sometimes seem alien to me.
B. My emotions always seem to belong to me.

Only A feels true	1	2	3	4	5	Only B feels true
-------------------	---	---	---	---	---	-------------------
3. A. I choose to do what I have to do.
B. I do what I have to, but I don't feel like it is really my choice.

Only A feels true	1	2	3	4	5	Only B feels true
-------------------	---	---	---	---	---	-------------------
4. A. I feel that I am rarely myself.
B. I feel like I am always completely myself.

Only A feels true	1	2	3	4	5	Only B feels true
-------------------	---	---	---	---	---	-------------------
5. A. I do what I do because it interests me.
B. I do what I do because I have to.

Only A feels true	1	2	3	4	5	Only B feels true
-------------------	---	---	---	---	---	-------------------
6. A. When I accomplish something, I often feel it wasn't really me who did it.
B. When I accomplish something, I always feel it's me who did it.

Only A feels true	1	2	3	4	5	Only B feels true
-------------------	---	---	---	---	---	-------------------
7. A. I am free to do whatever I decide to do.
B. What I do is often not what I'd choose to do.

Only A feels true	1	2	3	4	5	Only B feels true
-------------------	---	---	---	---	---	-------------------
8. A. My body sometimes feels like a stranger to me.
B. My body always feels like me.

Only A feels true	1	2	3	4	5	Only B feels true
-------------------	---	---	---	---	---	-------------------
9. A. I feel pretty free to do whatever I choose to.
B. I often do things that I don't choose to do.

Only A feels true	1	2	3	4	5	Only B feels true
-------------------	---	---	---	---	---	-------------------
10. A. Sometimes I look into the mirror and see a stranger.
B. When I look into the mirror I see myself.

Only A feels true	1	2	3	4	5	Only B feels true
-------------------	---	---	---	---	---	-------------------

Below are a number of words that may or may not describe the room you are currently in right now. For each word, indicate the degree to which you think it applies to that room, where 7 means you agree strongly and 1 means you disagree strongly.

		Disagree Strongly	Disagree Moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree Moderately	Agree Strongly
1.	Pleasant	1	2	3	4	5	6	7
2.	Good	1	2	3	4	5	6	7
3.	Old	1	2	3	4	5	6	7
4.	Substandard	1	2	3	4	5	6	7
5.	Insufficient	1	2	3	4	5	6	7
6.	Well-lighted	1	2	3	4	5	6	7
7.	Crowded	1	2	3	4	5	6	7
8.	Clean	1	2	3	4	5	6	7
9.	Restricting	1	2	3	4	5	6	7
10.	Cozy	1	2	3	4	5	6	7
11.	Interesting	1	2	3	4	5	6	7
12.	Roomy	1	2	3	4	5	6	7
13.	Comfortable	1	2	3	4	5	6	7
14.	Adequate	1	2	3	4	5	6	7
15.	Spacious	1	2	3	4	5	6	7
16.	Cramped	1	2	3	4	5	6	7
17.	Unsuitable	1	2	3	4	5	6	7
18.	Boring	1	2	3	4	5	6	7

Please read the following statements about the room you are currently in right now. For each word, indicate how true it is for you.

	Not at all true			Somewhat true			Very true
1. I feel like I fit well in this setting.	1	2	3	4	5	6	7
2. I feel a sense of emotional attachment to this place.	1	2	3	4	5	6	7
3. My values are represented in this setting.	1	2	3	4	5	6	7
4. I feel like myself in this setting.	1	2	3	4	5	6	7
5. This place reflects the type of person I am.	1	2	3	4	5	6	7

How many people do you think could fit comfortably in this room? _____ people

Demographic Information

Current age: _____

Indicate your gender: Male Female

Indicate your ethnicity background (Circle all that apply):

White Black Hispanic Asian or Pacific
Islander Native American Other

Appendix C:
Puzzle Block Description Form for Experiment 2

You and the other participant have each been assigned to complete your own initial task. Because the starting location of each block may influence how quickly the puzzle is completed, your task for this session is to describe the current location of each block on the table, without using the numbers of the other blocks in the description. Think about how the two of you will be solving the puzzle, and then provide the best description of each block's location that you can.

Block #	Location
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Appendix D:
Anagrams used in Experiment 4

An anagram is a group of letters that need to be unscrambled, or placed in the proper order, to form a word. For example, the letters “atrhe” can be rearranged to spell the word “earth.”

Below are a few anagrams for you to try to solve. Work on them for as long as you want. When you have solved as many as you can and want to stop, click on the arrow at the bottom of the screen to move on to the next part of the study.

amoos _____

acelo _____

oneci _____

lelmo _____

haacl _____

rolgy _____

rtean _____