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**Situating person memory: The role of the visual context on memory for  
behavioral information**

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**Abstract**

Person memory has been mainly investigated as an individual process. In contrast, we argue that person memory results from the interplay between the individual and the context. Thus, the way people acquire and retrieve social information is constrained by the context in which these processes take place. This argument was explored in three experiments. In an impression formation paradigm, we manipulated the meaningfulness of contextual information (objects) for a stereotypical target. Results showed that meaningful contextual information presented during encoding of behavioral information improved memory for the behavioral information but also for the contextual information (Experiment 1-2), that this memory advantage only occurs when the encoding goal requires some degree of cognitive organization (Experiment 2) and finally, that meaningful contextual information also enhances memory when presented at retrieval (Experiment 3). These results are convergent with a situated cognition perspective according to which the context where cognitive activities take place can be used to facilitate cognitive activity. We discuss the implications of these results for the standard person memory view and identify new routes for future research.

**Keywords:** person memory, impression formation, situated cognition, physical contexts, distributed memory

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*[W]hen entities and events occur in their expected situations, processing is relatively easy and effective. (Barsalou, 2008, p. 242)*

Impressions of others are fundamental tools to navigate a complex social world. The research on impression formation and person memory has occupied center stage in social psychology ever since its early beginnings and has inspired various theories and led to increasingly sophisticated methods to identify the cognitive structures and processes driving it (for reviews, see Carlston & E. R. Smith, 1996; E. R. Smith, 1998; Skowronski, McCarthy, & Wells, in press). However, one common criticism that has been made of the field has been its individualistic approach that has typically guided person memory research (e.g., E. R. Smith & Semin, 2004; Smith & Collins, 2010). Despite the significant progress towards understanding how social targets are perceived and represented in concrete social situations, the field is still highly shaped by an information processing approach that whereby impressions are conceptualized as abstract memory representations, which are stored and retrieved from memory through inner processes regardless the context in which they unfold (e.g., Wyer & Srull, 1989).

Recent research, inspired by the ‘situated cognition’ perspective (e.g., E. R. Smith & Semin, 2004; Yeh & Barsalou, 2006), has started to investigate the role played by factors external to perceivers in shaping mental representations about others. For example, research has shown that some features of the physical (e.g., Ijzerman & Semin, 2009; Semin & Garrido, 2011; Williams & Bargh, 2008) and social context can shape the impressions we form about a target (Garcia-Marques, Garrido,

Hamilton, & Ferreira, 2012; Garrido, Garcia-Marques, & Hamilton, 2012a, 2012b; E. R. Smith & Collins, 2009).

In the current work, we extend this research by investigating the influence of another contextual variable<sup>1</sup>, namely the visual context in which the target's behavioral information is acquired and retrieved. In the following, we begin by presenting research illustrating how context has been addressed in the study of person memory. We then review relevant findings illustrating how physical and social contexts can influence cognition and memory from a situated cognition perspective. Finally, we outline three studies designed to investigate how specific visually presented physical contexts can influence person memory.

### **Person Memory: From individual traits to complex behaviors**

Solomon Asch's seminal work (1946) placed the study of impression formation in the spotlight and shaped the path of what would become 'person memory' research (Hastie & Carlston, 1980). Asch (1946) was interested in understanding how people form coherent impressions of others based solely on individual personality traits and in identifying which principles determine the integration of these traits into a coherent impression. As this research area developed, interest increased in understanding the processes by which these impression formation processes unfold in the social context. Thus, the information about target-persons became richer and included behavioral descriptions in specific contexts (e.g., "He helped an elderly person to use the ATM", Palma, Garrido, & Semin, 2011). Implicit in the use of these kinds of stimulus materials was the notion that the target behavior is interpreted by taking into account different types of information about the context in which the behavior is displayed. Some of the questions that guided this research

were, for example, what is the role of the context in influencing what is encoded and retrieved about a person and whether the information that is recalled is also used in judgment (see Carlston & E. R. Smith, 1996; E. R. Smith, 1998; Skowronski et al., 2013).

Although the research on impression formation and person memory has made some progress towards contextualization, the main theoretical focus and research endeavors are still on the isolated cognitive processes taking place exclusively within the individual mind. Factors like participants' processing goals (Hamilton, Katz, & Leirer, 1980; Garcia-Marques & Hamilton, 1996), their cognitive resources at encoding (e.g., Bargh & Thein, 1985; Macrae, Hewstone, & Griffiths, 1993; Sherman & Hamilton, 1994; Srull, 1981; Srull, Lichtenstein, & Rothbart, 1985) and at retrieval (Garcia-Marques, Hamilton, & Maddox, 2002), or the (mis)match between the targets' traits and stereotype-based expectancies and its behaviors (e.g., Bodenhausen, 1988; Crawford & Skowronski, 1998; Hastie & Kumar, 1979; Wyer & Srull 1989), are some of the most common factors featuring in explanations for the amount and type of information that can be retrieved about the target. However, like most cognitive activities, person memory is often established in concrete physical and social contexts that can influence our ability to encode and retrieve information about other people.

In the next section we introduce the situated cognition approach (e.g., E. R. Smith & Semin, 2004) that argues that contextual information is fundamental for cognition and often facilitates information processing and refer to some studies that directly examine the role of contextual information in impression formation processes.

### **Cognition As the Interaction Between the Individual and the Context**

William James, Vygotsky, or Bartlett's views that mental representations emerge from dynamic and adaptive sensorimotor interactions with the physical and social context have regained currency with the emergence of the "situated cognition" approach (e.g., E. R. Smith & Semin, 2004; Semin & E. R. Smith, 2000; Semin, Garrido, & Palma, 2012, 2013; Yeh & Barsalou, 2006). One of the core principles of this new conceptual approach is the idea that cognition – such as person memory - extends beyond the individual perceiver to physical and social contexts (Clark, 1997; Clancey, 2009). Indeed, a substantial amount of research across the cognitive sciences shows that cognition can be distributed across objects and tools, which effectively facilitate and structure cognition (e.g., Clark & Chalmers, 1998; Hutchins, 1995; Kirsch, 1995; Kirsch & Maglio, 1994; Yeh & Barsalou, 2008).

Recently, researchers have extended these ideas to person perception with the argument that other people participate in the construction of mental representations and in the processing of information in a way that can extend our cognitive capacities (e.g., E. R. Smith & Collins, 2009). In the specific case of person memory, current research, examining the effects of collaboration in the encoding and retrieval of social information processing, has shown that the extent to which members of a collaborative recall group share similar representations of previously learned information determines the outcomes of their collaborative memory (Garcia-Marques, et al., 2012; Garrido, 2006; Garrido, Garcia-Marques, & Hamilton, 2013). However, other persons are not the only source of contextual information that we use when forming impressions. Recent studies using the standard Asch paradigm indicate that when people form impressions in a warm context they rate the target as being warmer and friendlier than when those impressions are formed in a cold context



(Williams & Bargh, 2008). Therefore these and other concrete physical contexts within which impressions are formed can also constitute important sources of information. For example, let's imagine we need to build a wall around our backyard and we want to hire a construction worker to do the job: it's very likely that we will find and interact with this person in a construction setting. What if we meet this person in a supermarket? Does the construction setting (or the supermarket setting), or the information that is typically present in such contexts (objects, tools, etc.), influence the way we encode and retrieve information about this target? This is exactly the question we pursued in this paper. Before introducing the details of our research, in the next section, we briefly review research on perception and categorization of faces and objects that illustrates the advantages of integrating the visual physical context in the cognitive system.

### **The Importance of the Visual Physical Context for Cognition**

Visual contextual information plays a significant role in a variety of cognitive and perceptual processes (for reviews, see Semin et al. 2012; Yeh & Barsalou, 2006). For example, emotion recognition research has shown that faces are not encoded in isolation but together with the context in which they are perceived (for a review, see Barrett, Mesquita, & Gendron, 2011). In a recent paper, Barrett and Kensinger (2010) showed that participants who were asked to categorize emotional faces remembered more contextual information than participants who had to make approach and avoidance affective judgments. Apparently, the goal to categorize the faces led participants to use all the information available to them – beyond the facial expressions - when computing their responses.

In social categorization, faces were more often categorized as ‘White’ when presented against an American scene context (e.g., house, city) and as ‘Asian’ when presented in a Chinese scene context. Interestingly, although participants’ categorizations were not influenced by the context in the face-context mismatch conditions (e.g., prototypical Asian face in an American scenario), they nevertheless showed a bias towards the opposite category associated with the background scene (e.g., White), as measured by participants’ computer mouse trajectories when selecting the desired response (Freeman, Ma, Han, & Ambady, 2011). These results suggest again, now in social categorization tasks, that people represent the context together with the target information (see also Freeman & Ambady, 2011).

In object categorization, contextual information is central to the representation and processing of objects (e.g., Barsalou, Sloman, & Chaigneu, 2004; Yeh & Barsalou, 2006). Compared with participants who did not received any contextual information, participants who received contextual information prior to being asked to organize a set unfamiliar objects in different clusters performed better in sorting the objects, in describing the clusters correctly, and in inferring the function of these objects (Chaigneu, Barsalou, & Zamani, 2009). As in the case of unfamiliar objects, also the processing of familiar objects benefits from the presence of contextual information. Although people are able to easily categorize familiar objects in the absence of context, when relevant contextual information is available categorization is faster. Furthermore, research has shown that when participants view familiar objects they also activate contextual information (Bar, 2004; Bar & Ullman, 1996), which supports the idea that concepts and contexts share a bidirectional relationship (see Yeh & Barsalou, 2006).

The findings presented in this section show that contexts exert powerful effects on the processing and representation of social and nonsocial concepts. However, how is contextual information integrated into representations? One possible explanation is that the storage of contextual information is an automatic side effect of processing goals (Barsalou, 1995). As processing is directed towards a target concept it also transverses its background context thus storing the contextual information that relates meaningfully with the target concept. This does not mean that people have the capacity to strategically turn off storage of irrelevant contextual information, but simply that the aspects of the context that are goal-relevant attract more attention and thus become linked to the concept (Barsalou, 1995; Yeh & Barsalou, 2006).

### **A Situated Approach to Person Memory: Overview of the Present**

#### **Research**

The research findings outlined in the previous section suggest that contextual information is stored in memory together with the target concepts. Contextual information activates a set of expectations that guide perception and action providing a gist around which target concepts can be organized and related to each other (for reviews, see Semin et al. 2012; Yeh & Barsalou, 2006). Based on these findings we argue that when we form or retrieve an impression of others, physical contexts – when meaningful - help to organize information in memory or retrieve information from memory, enhancing memory performance. More specifically, we hypothesized that forming and retrieving impressions about a specific target person in a physical context that is meaningfully related to the target introduces memory advantages for behavioral as well as for the contextual information<sup>2</sup>.

The experiments reported in this paper were designed to systematically test the above-mentioned prediction. In the first experiment, we manipulate the contextual information available during impression formation about a target to investigate whether contextual information acts as an organizing cue that facilitates the integration of behavioral information in memory. The second experiment examines the role of contextual information during encoding but under different processing goals. Finally, we report an experiment that tests the role of contextual information presented during the retrieval stage by manipulating the presence of meaningful cues during recall.

### **Experiment 1**

Experiment 1 was designed to test the hypothesis that forming impressions about a target-person in a context that matches the target's occupational category (i.e., where the relationship with the target-person is meaningful) will make the encoding of target related information more effective. Specifically, meaningful context conditions are expected to facilitate retrieval compared to a context - target occupation mismatch condition - where the relationship between context and target is arbitrary. The inclusion of a mismatch condition, where the context is not meaningful for the target-occupation, is based on the idea that impression formation is a heavily situated process that can take place in a multitude of contexts and therefore can be differently influenced by them (E. R. Smith & Semin, 2004). Additionally, a control condition with no contextual information was also included in order to clarify if meaningful contextual information does improve memory, as hypothesized, or if there is a memory interference or distraction introduced by non-meaningful contextual information.

To test the hypothesis, we used a modified impression formation paradigm. While forming impressions about a target-person (a construction worker or a cook) based on behavioral descriptions presented on a computer screen, participants also saw contextual information (objects typically found in a construction setting and in a kitchen setting) presented on the same screen. The behavioral descriptions were either congruent with the target-occupation or neutral. The contextual information was manipulated in three between-participants conditions. The contextual information either matched or mismatched the target occupation. In the control condition no contextual information was presented. At a later stage, memory was tested.

Because we assumed that contextual information is encoded together with behavioral information we asked participants not only to recall the behaviors but also to recall the contextual information presented before. We predicted that memory for behaviors and contextual information would show an advantage in the match conditions compared to the mismatch and control conditions, thereby supporting the idea of the benefits of integrating meaningful contextual information during impression formation. Importantly, only congruent behaviors were expected to benefit from match conditions and not neutral behaviors, since the latter are not diagnostic of the target-occupation and therefore have a lower impact on the impression (Wyer & Srull, 1989).

## **Method**

**Participants.** Two hundred forty one university students (134 females; mean age = 21.83,  $SD = 4.14$ ) were paid to participate in this experiment.

**Materials.** The experimental materials consisted of pictures of objects and behavioral descriptions about two target-persons.

**Context Objects:** Twenty-four objects (size: 400 x 400 pixels; color: grey scale) were selected from websites specialized in construction tools, cooking utensils and furniture. All objects had standard shapes and had no visible brands. The list of objects used is displayed in Appendix A. An independent sample of 41 students rated the objects on two dimensions – *prototypicality* (ranging from 1- not at all typical to 7 - very typical tool/utensil for a cook/construction worker) and *familiarity* (ranging from 1- not at all familiar to 7 - very familiar). Results confirmed that all construction tools and all cooking utensils are significantly prototypical of the respective occupation; in contrast none of the furniture items were considered prototypical of either occupation. Furthermore, all objects were familiar to participants and no differences in familiarity were found between the three types of objects.

**Behavioral descriptions.** Twenty-four behaviors describing actions typical of the construction worker occupation and the cook occupation were selected from a large pool of pre-tested behaviors (Garrido, Soeiro, & Palma, 2011). Eight of these behaviors were congruent or diagnostic of a construction-worker's occupation (e.g., "Fixed a broken shingle in a professional way") and eight of a cook's occupation (e.g., "He used different spices to get a special flavor"). The remaining eight behavioral descriptions were neutral or non-diagnostic for either occupational category (e.g., "He parked his car close to home"). Importantly, given that we manipulated the context by presenting objects, we made sure that none of the behavioral descriptions included the names of the objects used. The list of behaviors used can be found in Appendix B.

**Procedure.** Participants were tested in individual cubicles. Computerized instructions informed them that the aim of the study was to examine "the way people form impressions about others in everyday life when several tasks have to be performed

simultaneously”. They were then given some general information about the target person including the target’s name and occupation. For half of the participants the target person was a construction-worker while for the other half the target person was a cook. Then they were presented with sequences containing three stimuli: an object (or a blank screen), a colored circle and a behavior.

First participants saw an object in the middle of the screen for 2500 ms. The 16 objects were presented in a randomized order across participants. In the match conditions, eight of these objects were relevant for the target occupation (i.e., cooking utensils in the cook condition and construction tools in the construction-worker condition) and eight were filler objects (furniture items). In the mismatch conditions, participants saw the objects that were relevant for the other occupation (i.e., cooking utensils in the construction-worker condition and construction tools in the cook condition) together with the same eight filler objects. Participants in the *control* conditions saw a blank screen between behaviors instead of an object.

Immediately after seeing an object or the blank screen (inter trial interval of 100 ms), a blue or red circle appeared in the middle of the screen in a randomized order for 1500 ms. Participants’ task was simply to name the color of the circle by pressing the corresponding color-key on the keyboard. The color-naming task was introduced to participants as resembling a “real life” situation where people perform different tasks while they form impressions, and was used to make sure that participants were paying attention to the stimuli presented.

After naming the color of the circle or after the 1500 ms time window (blank screen), participants were presented with one of the behaviors in the middle of the screen for 6.000 ms. A total of 16 behaviors were presented in a randomized order for each target, eight congruent with the target occupation and eight neutral behaviors.

The sequence object + circle + behaviors was repeated 16 times, taking approximately 3 min.

After completing the impression formation task, participants were given a 5-minute filler task followed by two unexpected memory tasks: (a) a free recall task where they had to recall all the behaviors presented; (b) a free recall task where they had to recall the names of all objects they saw. Participants in the control conditions did not see any objects and were only asked to free recall the behaviors. The order in which these tasks were performed was counterbalanced across participants, namely half of the participants performed these tasks in the order presented earlier while the other half had to first perform the free recall of objects and then the free recall of behaviors<sup>3</sup>. Finally, participants were asked to write down what they thought the hypothesis of the study was. All participants were unaware of the actual hypothesis. They were then debriefed and thanked.

## Results

**Recall of behavioral descriptions.** A coder blind to the experimental conditions categorized the behaviors recalled by each participant using a lenient gist criterion (cf. Garcia-Marques & Hamilton, 1996). Recall intrusions (e.g., false memories or behaviors that mix two or more different behaviors) were infrequent (4.27%) and did not show a consistent pattern across experimental conditions.

The number of correctly recalled behaviors was entered in a 2 (Target Occupation: construction-worker vs. cook) X 3 (Context: match vs. mismatch vs. control) X 2 (Type of Behaviors: congruent vs. neutral) ANOVA, with target and context manipulated between participants. Since there was no significant interaction between target occupation and context ( $F(2, 235) = 1.16, p = .315$ ), we collapsed the



data from the two targets. The behavior recall means are displayed in Table 1. Two main effects were obtained: A marginal main effect of context,  $F(1, 238) = 2.47, p = .087, \eta_p^2 = .02$ , showing that participants in the match condition recalled more behaviors than participants in the mismatch condition and a main effect of the type of behaviors,  $F(1, 238) = 10.07, p = .002, \eta_p^2 = .04$ , with congruent behaviors being recalled better than neutral ones. More importantly, these main effects were qualified by the predicted interaction between context and type of behaviors,  $F(2, 238) = 6.08, p = .003, \eta_p^2 = .05$ . Consistent with our predictions, recall of congruent behaviors was higher in the match context than in the mismatch context,  $t(238) = 4.07, p < .001, d = .70$ , as well as in the control context,  $t(238) = 3.74, p < .001, d = .58$ . No reliable difference was found between the mismatch context and the control context ( $t = -.36, p > .72$ ).

This pattern of results shows that memory is facilitated, when there is a match between target and context information. The results also show that a mismatch between target and context does not interfere with memory given the similar performance in this condition and in the control condition. The recall of neutral behaviors was equivalent across all context conditions (all  $t$ s  $< .26$ , all  $p$ s  $> .79$ ).

**Recall of objects.** A coder blind to the experimental conditions counted the number of correctly recalled critical objects (construction tools and cooking utensils) and the number of false recalls, that is, objects related with the target occupation but that were not presented. Recall intrusions were infrequent (6.03%) and displayed a similar pattern across the two context conditions.

The number of correctly recalled critical objects was entered in a 2 (Target Occupation: construction-worker vs. cook) X 2 (Context: match vs. mismatch)

between participants ANOVA. The recalled objects for the construction-worker and cook were merged due to the non-significant interaction between target occupation and context ( $F < .08, p > .78$ ). As predicted, participants in the match contexts recalled more objects ( $M = 3.40, SD = 1.04$ ) than participants in the mismatch contexts ( $M = 2.28, SD = 1.49$ ),  $t(157) = 5.50, p < .001, d = .87$ . This finding supports our hypothesis that participants in the match condition integrate contextual information in memory to a greater extent than participants in the mismatch condition given that for the latter contextual information was not useful for the impression formation task.

**Correlation between recall of congruent behaviors and recall of objects.** To further examine the relation between recall of behaviors and objects we calculated the correlations between these two measures overall and separately for each context condition. Overall, the two measures showed a significant correlation coefficient,  $r(159) = .21, p = .007$ . However, this effect was due to participants' recall in the match context,  $r(80) = .28, p = .010$ , and was absent in the mismatch context,  $r(79) = -.02, p = .82$ . Thus this correlational evidence provides further support for our situated framework of impression formation.

## **Discussion**

As predicted, forming impressions in a context with meaningful contextual information facilitates memory for both behavioral and contextual information. Importantly, participants in the match condition recalled more behaviors than participants in the mismatch and control conditions. These results show that the memory advantage for participants in the match condition is due to the inclusion of

the meaningful contextual cues during the task of forming impressions rather than to the interference caused by the irrelevant contextual information in the mismatch condition, as reflected by the absence of a difference between recall in the mismatch and control conditions. This suggests that participants in the mismatch condition did not attend to the objects that were irrelevant for the impression formation task. Additional support for our hypothesis was provided by the significant correlation found between the recall of objects and behaviors in the match condition but not in the mismatch condition.

The second experiment was aimed to extend these findings by introducing a study that was designed to explore the moderating role of processing goals on the impact of meaningful contextual information in impressions (cf. Hamilton et al., 1980).

## **Experiment 2**

Experiment 1 furnishes evidence that the target-context match facilitates memory for congruent behaviors. The second experiment was designed to explore this effect further by examining its specificity to impression formation. Namely, does the goal with which people learn the target-stimuli determine this effect? Person-impressions entail integrative processes, when compared to memory tasks. This is the reason advanced for the enhanced memory performance observed when participants are instructed to form impressions about a target-person (impression formation goal) based on a set of behavioral information descriptions in comparison to conditions that instruct them to simply memorize that same set of behavioral descriptions (memory goal; Hamilton et al., 1980). The general account for this finding is that under an impression formation goal people tend to organize and relate the different pieces of

information about the target-person into a coherent impression (the Gestalt principle; Asch, 1946). According to an associative network framework, attempts to organize the information promote the development of associative links between the different kinds of information. Retrieval is therefore easier given the great number of paths and cues between the different kinds of information. In contrast, when asked to memorize, people do not engage in such an organizational process. Participants under a memory goal tend to focus on the isolated meaning of the presented information (Hamilton et al., 1980). Based on these assumptions, we argue that in memory goal conditions integrating the contextual information becomes less likely. Our argument here is that, the integrative processes triggered by impression formation goals may therefore be particularly likely to promote the incorporation of contextual information in the impressions that are being formed (for a similar argument on emotion recognition, see Barrett & Kensinger, 2010).

If, as we argue here, meaningful contextual information is encoded together with behavioral information during the formation of an impression, then one can predict that the contextual information will be more integrated in memory when participants (a) are asked to *form an impression*, than when they (b) are asked to *memorize* the information, irrespective of whether contextual information is meaningful or not. Consequently, participants *forming impressions* in a meaningful context should show better memory for both contextual and behavioral information than participants in the *memorizing* conditions. They should also show a better memory performance, as we have already shown, when forming an impression in match than in contextual information mismatch conditions.

To test these hypotheses half of the participants received standard impression formation instructions, as in Experiment 1, while the other half was asked to

memorize a set of sentences (i.e., the same behavioral descriptions used in the impression formation condition). The contextual information was present in the background of the screen (see Figure 1). We changed the context manipulation in order to make it less prominent and hence enhancing the similarity with standard person memory incidental learning paradigms. Thus, participants of the two processing goals conditions were presented with a set of behavioral descriptions in a computer screen with several objects displayed in the background. Half of these objects were meaningful (match condition) or irrelevant (mismatch condition) for the target-person and behavioral descriptions. After a filler task, two free recall tests were administered to assess the recall of behaviors and objects.

We predicted that forming impressions in a meaningful context would facilitate memory for both behavioral and contextual information when compared with memorizing in a meaningful context. Moreover, we expected to replicate the results obtained in the first experiment, namely better memory for behaviors and objects when the impression formation task was performed in a meaningful context than in an irrelevant context. We had no expectation regarding memory performance in these two (match and mismatch) conditions for participants in the memory goal condition. Again our hypotheses focus only in the target-congruent behaviors.

## **Method**

**Participants.** Seventy-nine university students (50 females; mean age = 21.49,  $SD = 4.73$ ) were paid to participate in this experiment.

**Materials.** The experimental materials consisted of objects and behavioral descriptions about a target-person.

**Context Objects.** We used 24 objects: 10 construction tools, 10 cooking utensils and four fillers. The objects were transformed into Windows-type icons and presented in greyscale (see Appendix A). Two different screen backgrounds were constructed: One background contained 10 construction tools and four standard Windows icons that served as fillers (recycle bin, msn, internet explorer, and my computer), placed on the left side of a Windows 7 Basic Theme screen. The other background contained 10 cooking utensils instead of the construction tools. The only difference between the two backgrounds was the critical icons (see Figure 1). In order to control for possible differences in the visual characteristics of the two sets of icons (construction tools vs. cooking utensils) in memory we conducted a small pilot with two groups of students ( $n$ 's of 8 and 9) not participating in the actual experiment. Each group saw one of the backgrounds for two minutes and afterwards they were presented with a surprise free recall task where they had to write down the name of the objects represented by each icon. Results showed equal recall for both types of objects.

**Behavioral descriptions.** A total of 24 behavioral descriptions were used. From these, 12 were congruent with the occupation of construction-worker and 12 were neutral. We used eight construction-worker behaviors from Experiment 1 to which we added four new behaviors. Four new neutral behaviors were also added. The new behaviors (four congruent and four neutral) were selected from the same pool of pre-tested behaviors (Garrido, et al., 2011). See Appendix B.

**Procedure.** Participants were tested in individual cubicles. Computerized instructions informed them about the goal of the study. Participants in the impression formation condition were told that the study intended to “investigate the way we form impressions of a person based on his actions”. They were told that they would be

presented with a list of behaviors performed by a given person and were encouraged to form an overall impression of him. They were then given the target's name and occupation – construction-worker. In this experiment, we only used one target occupation given that the previous experiment had revealed that the results replicate across target occupations. Participants in the memory condition were told that the goal of the study was to “investigate the way we process and retain verbal descriptions of actions” and their task was to memorize those descriptions. Impression formation was never mentioned to these participants.

After the instructions participants started the impression formation or memory task. They were presented with 24 behaviors (12 congruent and 12 neutral) that were presented in a randomized order in the middle of the screen for 6.000 ms at a time. For half of the participants these behaviors were presented against a background with construction tools (match context) while the other half the background had cooking utensils (mismatch context).

After this task, participants performed a filler task for 5 minutes.

Subsequently, they received two unexpected recall tasks: (a) free recall of behaviors; and (b) free recall of the objects represented in the icons. The order in which participants performed the tasks was always the same because we found no task order effects in Experiment 1. Finally, participants were asked to write down what they thought the study was about. None of the participants guessed the goal of the study. Then, they were debriefed and thanked.

## Results

**Recall of behavioral descriptions.** A coder blind to the experimental conditions categorized the recall data, using a lenient gist criterion. Recall intrusions (8.56%) showed a similar pattern across conditions.

The number of correctly recalled behaviors was entered in a 2 (Processing Goal: impression formation, memory) X 2 (Context: match vs. mismatch) X 2 (Type of Behaviors: congruent vs. neutral) ANOVA, with processing goal and context as between-participants factors. All cell means are shown in Table 2. Three main effects emerged: a main effect for processing goals,  $F(1, 75) = 84.67, p < .001, \eta_p^2 = .53$ , showing the expected superior recall in the impression formation condition compared with the memory condition; a marginal main effect of context,  $F(1, 75) = 3.63, p = .060, \eta_p^2 = .05$ , showing that participants in the match condition recalled more behaviors than participants in the mismatch condition; and a main effect of type of behaviors,  $F(1, 75) = 5.48, p = .022, \eta_p^2 = .07$ , with congruent behaviors being recalled better than neutral ones. A three-way interaction between Processing Goals X Context X Type of Behaviors also emerged,  $F(1, 75) = 3.96, p = .050, \eta_p^2 = .05$ . A planned comparison between processing goals showed as predicted that participants who formed impressions in the match condition recalled more congruent behaviors than participants who were asked to memorize those behaviors in the same context condition,  $t(75) = 8.33, p < .001, d = 2.48$ .

To further inspect our hypothesis, we performed single analyses separately for each processing goal group (see Table 2 for the means). For the impression formation group, a 2 (Context: match vs. mismatch) X 2 (Type of Behaviors: congruent vs. neutral) ANOVA, with context as a between-participants factor, yielded only two main effects, namely a main effect of context,  $F(1, 38) = 4.61, p = .038, \eta_p^2 = .11$ , and



a main effect of type of behaviors,  $F(1, 38) = 8.82, p = .005, \eta_p^2 = .19$  (cf. Table 2).

Despite the absence of a significant interaction between context and type of behaviors,  $F < .14, p > .706$ , we examined whether the results of Experiment 1 for congruent behaviors were replicated. Planned comparisons within each type of behavior showed that participants in the match context recalled more congruent behaviors than participants in the mismatch context,  $t(38) = 2.04, p = .049, d = .65$ , thus replicating the memory advantage previously observed for congruent behaviors in the match condition.

The number of behaviors recalled by participants in the memory condition was also submitted to a 2 (Context: match vs. mismatch) X 2 (Type of Behaviors: congruent vs. neutral) ANOVA, with context as a between-participants factor. Only the interaction between context and type of behaviors was reliable,  $F(1, 37) = 8.71, p = .017, \eta_p^2 = .14$ . Importantly, planned comparisons on the recall of congruent behaviors showed no recall advantage if the match condition over the mismatch condition. The recall of neutral behaviors was also not significantly different between conditions.

**Recall of objects.** A coder counted the number of correctly recalled critical objects and the number of false recalls. A 2 (Processing Goal: impression formation vs. memory) X 2 (Context: match vs. mismatch) ANOVA on the number of false recalls (13.30%) revealed only a main effect for processing goal,  $F(1, 75) = 4.94, p = .029$ , with more false recalls in the impression formation condition than in the memory condition, which suggests that participants in the impression formation condition went beyond the information given and inferred having seen objects that weren't present in the computer background (see Brewer & Treyrens, 1981, and Cantor, Mischel, &

Schwartz, 1982, for the role of scene schemata and situation prototypes in memory).

The pattern of false recalls was similar across match and mismatch conditions.

The number of correctly recalled objects was analyzed in a 2 (Processing Goals: impression formation vs. memory) X 2 (Context: match vs. mismatch) ANOVA between-participants. Results showed a strong main effect of processing goal,  $F(1, 75) = 58.71, p < .001, \eta_p^2 = .44$ , indicating that participants in impression formation conditions recalled more objects ( $M = 2.87, SD = 1.24$ ) than participants in memory conditions ( $M = 1.23, SD = .71$ ). A main effect of context was also observed,  $F(1, 75) = 8.16, p = .005, \eta_p^2 = .10$ , indicating that recall of objects was better in the match condition ( $M = 2.34, SD = 1.50$ ) than in the mismatch condition ( $M = 1.74, SD = .98$ ). Finally, the predicted interaction between processing goals and context was significant,  $F(1, 75) = 7.13, p = .009, \eta_p^2 = .09$ . Simple comparisons confirmed our predictions. Participants with an impression formation goal in the match condition recalled more objects ( $M = 3.43, SD = 1.21$ ) than participants with the same processing goal in the mismatch context ( $M = 2.26, SD = .99$ ),  $t(38) = 3.32, p = .002, d = 1.05$ , replicating the results of Experiment 1. The same comparison was not significant for memory-goal groups,  $t < 1, p > .895$ . Importantly, participants who formed impressions in a meaningful context recalled more objects ( $M = 3.43, SD = 1.21$ ) than participants who memorized the information in the same context, ( $M = 1.25, SD = .79$ ). These results are consistent with the idea that participants in the memory condition attend less to the context than participants in the impression condition.

**Correlation between recall of congruent behaviors and recall of objects.** To further explore the relationship between the recall of behavioral and contextual information we correlated the overall congruent behaviors recalled with recall of

objects within each context condition as a function of the processing goals variable. All correlation coefficients ( $r$ ) are presented in Table 3. For participants who formed impressions, results showed a significant correlation coefficient in the match context, but not in the mismatch context, thus replicating the pattern of results obtained in Experiment 1. No significant correlation between recall of behaviors and objects was obtained for participants who were asked to memorize the behaviors. These results support the argument that contextual information is more integrated in impressions when the context is meaningful for the task at hand, namely when it matches the target occupation, and only when participants have the goal of forming impressions.

### **Discussion**

In Experiment 2 we investigated the moderating role of processing goals in the encoding of contextual and behavioral information. We predicted and found that meaningful contextual information is encoded together with congruent behavioral information to a greater extent when participants' goal induces a level of cognitive integration, which is less likely when they are given a memory goal (Hamilton, et al., 1980; see also Barrett & Kensinger, 2010). Participants who formed impressions in a 'meaningful' context recalled more behavioral and contextual information than participants with memory instructions in the same context. Furthermore, we replicated the results of Experiment 1. Participants with the impression instruction in the match condition showed a better memory for both behavioral and contextual information compared to participants in the mismatch condition. Correlations between recall of behaviors and recall of objects as a function of processing goals and context provided extra support for our hypothesis.

In the next experiment, we focus on retrieval processes, often neglected in person memory research (cf. Garcia-Marques & Hamilton, 1996; Garrido et al., 2012a, 2012b), and explore the role of the context at retrieval.

### **Experiment 3**

In the first two experiments, we studied the impact of the context during encoding of behavioral information with the assumption that contextual information is used as an extra organizational cue to form impressions thus facilitating memory retrieval. In this experiment we focused on the role of contextual information at retrieval, namely as providing retrieval cues to access social information. The idea driving this experiment was inspired by the argument that, retrieval cues, namely “the information present in the individual’s cognitive environment when retrieval occurs” (Tulving, 1974, p.74) plays a crucial role in determining the information that is retrieved from memory. A substantial body of research on cued retrieval and the encoding specificity principle shows that providing retrieval cues that match any meaningful dimension of the encoded material enhances the accessibility of encoded information thus improving memory (for a comprehensive review, see Roediger & Guynn, 1996). For example, in the seminal study by Tulving and Pearlstone (1966) participants were initially presented with word lists consisting of a category name followed by words that belonged to that category (e.g., articles of clothing: blouse, sweater). Afterwards, they were given either a free-recall test, in which they had a blank sheet of paper to write down as many words they could recall as possible, or a cued-recall test, in which they were given the category names of each word list. Results indicated that participants in the cued recall test condition recalled almost twice as many words compared to the free recall group.

In this experiment, we tested the hypothesis that providing a relevant context at retrieval increases the accessibility of behavioral information encoded during the impression formation task thereby facilitating memory compared to an irrelevant context. To implement this idea we first asked participants to form impressions about a target-person in a scenario without any contextual information. After this task, they were given a surprise free recall test for the behavioral and subsequently for contextual information. Participants were randomly assigned to one of two retrieval conditions: in one condition they had to recall the behaviors in a context with meaningful (relevant) information while contextual information was irrelevant in the other condition. If the meaningful contextual information was used as retrieval cues to access behavioral information then not only memory for behaviors should be higher in this condition but memory for contextual information as well.

### **Method**

**Participants.** Forty university students (25 females; mean age = 22.45,  $SD = 3.83$ ) were paid to participate in this experiment.

**Materials.** We used the exact same objects and behavioral descriptions as in Experiment 2.

**Procedure.** The procedure of Experiment 2 was replicated with only one important exception: whereas in the previous experiment the context was manipulated during the encoding of the behaviors, here context was manipulated during recall. In the impression formation phase, all participants were presented with the behaviors about the construction-worker on the computer screen with a blank background. At retrieval, participants had to type the recalled behaviors in a text entry box in the middle of the screen that was surrounded by one of two different screen backgrounds used in Experiment 2. Participants were randomly allocated to the condition where the

background objects matched the target occupation ( $n = 20$  participants) or to the condition where there was a mismatch between the background objects and the target occupation ( $n = 20$  participants). After completing this task the background with the icons disappeared. They were then asked to recall the names of the objects represented as icons displayed on the background of the screen while they were writing down the recalled behaviors.

**Recall of behavioral descriptions.** A coder blind to the experimental conditions categorized the recall data, using a lenient gist criterion. Recall intrusions were infrequent (4.56%). They were however more frequent in the mismatch than in the match condition,  $F(1,38) = 5.40, p = .026$ .

The number of correctly recalled behaviors was submitted to a 2 (Context: match vs. mismatch) X 2 (Type of Behaviors: congruent vs. neutral) ANOVA with context as a between-participants factor. The predicted two-way interaction between context relevance and type of behaviors was marginally significant,  $F(1,38) = 3.73, p = .061, \eta_p^2 = .09$ . Consistent with our predictions, recall of congruent behaviors was significantly higher when the context matched the target occupation ( $M = 6.30, SD = 1.08$ ) than when there was a mismatch between context and target occupation ( $M = 5.15, SD = 1.66$ ),  $t(38) = 2.59, p = .013, d = .82$ , while the recall for neutral behaviors was equal in both contexts ( $t < .31, p > .71$ ).

**Recall of objects.** A coder counted the number of correctly recalled critical objects and the number of false recalls. The number of false recalls (9.83%) had a similar pattern in both context conditions. The number of correctly recalled construction tools was compared with the number of correctly recalled cooking utensils. As predicted, participants in the match condition recalled more objects ( $M = 4.55, SD = 1.60$ ) than those in the mismatch condition ( $M = 3.10, SD = 1.65$ ),  $t(38) = 2.82, p = .008, d = .89$ .

**Correlation between recall of congruent behaviors and recall of objects.** As in the previous experiments, we calculated the correlations between the overall recall of congruent behaviors and the overall recall of objects, as well as separately for each context condition. Overall, the two measures showed a significant correlation coefficient,  $r(40) = .35, p = .023$ . This correlation coefficient was higher in the match context condition,  $r(20) = .54, p = .015$ , and non-significant in the mismatch context condition,  $r(20) = .05, p > .828$ .

### **Discussion**

The goal of the third experiment was to provide a test for the hypothesis that meaningful contextual information presented at retrieval serves as a cue for memory of congruent behaviors. If the context works as a retrieval cue than its impact on memory should be higher when the context is seen as meaningful for the target-person than when the context is irrelevant. The pattern of results obtained confirmed this prediction. Namely, participants who had meaningful contextual cues at retrieval showed a better memory for both behaviors and contextual cues than participants who received irrelevant contextual cues at retrieval. Furthermore, a reliable correlation between the recall of congruent behaviors and the recall of meaningful contextual information was obtained. In short, contextual information exerts influence in impression formation processes not only at encoding but also at retrieval, acting as a cue that enhances memory.

### **General Discussion**

The main goal of the present research was to examine the role of contextual information in person memory by combining standard research and theorizing on person memory and the emerging view on situated cognition (E. R. Smith & Semin,

2004). Inspired by different lines of research showing the impact of contextual information on cognition (e.g., Barrett & Kensinger, 2010; Chaigneu et al., 2010), we argued that the processes involved in encoding and retrieving information about social targets should be constrained by the physical context in which these processes take place.

The results of the three experiments reported here show that having meaningful contextual information (versus irrelevant contextual information) during the encoding of behavioral information about a target-person improves memory for the behavioral information as well as for the contextual information (Experiment 1-2). This effect was shown to be due to the presence of meaningful contextual information and not the result of any interference caused by irrelevant contextual information (Experiment 1). Second, we were able to show that this context driven memory advantage occurred only when participants had an encoding goal that requires a high degree of integrative processing, namely an impression formation goal but not a memory goal (Experiment 2). Finally, we found that meaningful contextual information also acts as a memory-enhancing cue when presented at retrieval (Experiment 3). Additionally, across the three experiments, a reliable correlation between the recall of congruent behaviors and the recall of meaningful contextual information was obtained, thus supporting the argument that person memory processes and the context where they occur are interdependent.

### **How is person memory situated?**

Our results showed that the encoding and retrieval of social information is affected by the presence of target-relevant physical contextual information. These results seem to converge with a situated view of cognition (e.g., E. R. Smith & Semin,



2004; Yeh & Barsalou, 2006) according to which cognitive activities are facilitated when framed by contextual information. However, the question that remains is how exactly does the context facilitate memory for social information? In the following we present three possible ways by which contextual information can influence person memory.

One possibility is that meaningful contextual information is indeed integrated in impressions facilitating the encoding and retrieval of person information. According to this possibility that is in line with the situated cognition approach, mental representations of other persons are context-specific as we interact with people in specific contexts. If that is the case, then it makes sense to assume that contextual information is an integral part of mental representations and that those contextual cues help organizing and retrieving information from memory (cf. Yeh & Barsalou, 2006).

Another possibility is that the contextual information changed the nature of the processing given to the behavioral information in the compatible conditions. More specifically, the contextual information in the compatible conditions might have primed the target-stereotype making it more accessible in participants' minds, compared to participants in the other conditions, and thus increasing its influence on processing the information. As previous research shows, stereotypes can drive attention towards congruent information at encoding and also serve as retrieval cues for that information (for a review, see Skowronski, et al., in press). Thus, the recall advantage in the compatible conditions might be due to differences in stereotype activation between conditions. This account could be easily put to test by including incongruent behavioral information. If the differences observed would derive from a higher stereotype activation then the recall of incongruent information should be enhanced.

Yet another possible explanation for our results is that the meaningful contextual information led participants to engage in dual-mode processing of the information, verbal and visual, thus providing a retrieval advantage. This explanation is congruent with dual code Theory (e.g., Paivio, 1991). According to this theory, cognition is implemented by two qualitatively different systems, a verbal system specialized for dealing with language and a nonverbal system specialized for dealing with nonlinguistic objects and events in the form of mental images. Although these systems are independent there are connections between them, which allow them to operate together. In line with this theory, targets that are represented in both systems possess more retrieval cues and thus are easier to retrieve from memory.

### **Theoretical Implications and future directions for the study of Person Memory**

The term ‘context’ is a very broad one that “subsumes other types of knowledge structures that support specific focused information processing, and that have a setting and referential functions... such as schemata, frames, tasks, plans, or situations” (S. M. Smith, 2007, p. 111). In the course of the years, research on person memory has focused attention mainly on understanding how a target’s behaviors are organized and retrieved from memory as a function of expectancies and stereotypes (see Carlston & E. R. Smith, 1996; E. R. Smith, 1998; Skowronski et al., in press) and not so much in the possible influence that contextual factors, like other people or physical settings, might have on the perceivers ability to form and retrieve those impressions from memory. For example, according to associative network theories of person memory, social information that is acquired in a given context is represented in memory in abstract associative networks constituted by target and behavioral nodes, connected by pathways, organized in a hierarchical way. Recalling information is then

viewed as a process of following these pathways between target and behavioral nodes (e.g., Garcia-Marques & Hamilton, 1996; Hastie & Kumar, 1979).

Our studies indicate that relevant contexts facilitate memory. For example, construction tools are helpful as contextual features when one forms an impression about a construction worker. This however does not mean that a set of fixed contextual features is always coupled with a fixed set of behavioral information. In line with Barsalou's (2003) ideas of situated representations of categories as situated conceptualizations, we argue that particular contexts are 'disposable'. A given context that is relevant in one situation to form an impression about a person can become irrelevant to form an impression about the very same person in a different situation. According to this view, an impression of a construction worker, for example, is not a single generic and static representation but a situated one. These impressions are dynamically shaped depending on the particular goal that is relevant at that particular moment.

The next step would be therefore to show, in an impression formation setting that different behaviors exhibited by, say a cook, will determine the utensils she or he needs at the moment. Preparing a soufflé requires different tools than preparing a roast. The situated goals will change the contextual cues (say the utensils) that are relevant to perceive, understand and anticipate the target's behavior. Such tools will always vary with the goals that are pursued at a specific point in time and are therefore momentary. Thus, a situated approach is a functional one in that situated cues while relevant are transient and do not become additional baggage that is abstracted and immutably retained. They can be forgotten and replaced when the situation changes.

Another interesting research avenue that would illustrate the functional role of contexts in situating impressions would be to show that enabling participants to actively download information upon contextual meaningful objects would make them externalized memory aids thus reducing memory load completely. Thus, a possible extension of the studies we reported here would be to enable participants to perform what has been termed *epistemic actions* (Clark, 2008), namely actions that deliberately shape the environment actively and utilize it as a scaffold for memory (e.g., Beach, 1988; Kirsh, 1995). During the course of our everyday life we have to interact with a number of different people, in different environments. Being able to use the contextual information in order to cue and prioritize information processing is likely to make the task of navigating a complex social reality much easier.

Our research extends previous person memory research (e.g., E. R. Smith, 1998) and is in line with new findings showing that contextual factors, namely other people, also play an important role on impression formation and person memory. Our results suggest at least some degree of integration between the physical context and impressions such that memory performance is partly affected by the characteristics of the contextual information present during impression formation or retrieval. This evidence is also congruent with a growing body of research showing that other mental representations such as stereotypes (e.g., Garcia-Marques, Santos, & Mackie, 2006) or attitudes (e.g., Schwarz & Sudman, 1992) are not invariant knowledge structures (e.g., Allport, 1954) but show a considerable degree of sensitivity as a function of contextual changes and requirements (for a review, see Semin et al., 2012). Thus, we believe that the existing theoretical models of person memory should incorporate mechanisms specifying how cognition and context (e.g., other people, physical

settings) interact in order to fully account for the operation of cognition in the “real world” (E. R. Smith & Semin, 2004; Yeh & Barsalou, 2006; Wilson & Clark, 2009).

### **Conclusions**

The present research represents a new line of research that combines standard person memory research with the recent situated cognition approach. The studies that we report here show the importance of looking to other contextual features beyond the ones studied so far to understand the diverse sources we use in processing and representing information about others. Thus, with our research we intended to present a broader approach to person memory where the physical contextual information should be considered as an important factor constraining social information processing. However, the effort to combine these two areas is by no means concluded. Our results should be viewed as a small step towards a more integrated approach of person memory that takes into consideration the role of physical and social environmental features on how people encode and retrieve information about others.

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### References

- Allport, G. W. (1954). *The nature of prejudice*. Cambridge, MA: Addison-Wesley.
- Asch, S. E. (1946). Forming impressions of personality. *Journal of Abnormal and Social Psychology, 41*, 258-290.
- Anderson, J. R., & Bower, G. H. (1973). *Human associative memory*. Washington, DC: Winston & Sons.
- Bar, M. (2004). Visual objects in context. *Nature Reviews: Neuroscience, 5*, 617-629.
- Bar, M., & Ullman, S. (1996). Spatial context in recognition. *Perception, 25*, 343-352.
- Bargh, J. A., & Thein, R. (1985). Individual construct accessibility, person memory, and the recall-judgment link: The cause of information overload. *Journal of Personality and Social Psychology, 49*, 1129-1146.
- Barsalou, L. W. (1995). Storage side effects: Studying processing to understand learning. In A. Ram, & D. Leake (Eds.), *Goal-driven learning* (pp. 407-419). Cambridge, MA: MIT Press/Bradford Books.
- Barsalou, L. W. (2003). Situated simulation in the human conceptual system. *Language & Cognitive Process, 18*, 513-562.
- Barsalou, L. W. (2008). Situating concepts. In P. Robbins, & M. Aydede (Eds.), *Cambridge handbook of situated cognition* (pp. 236-263). New York: Cambridge University Press.
- Barsalou, L. W., Sloman, S. A., & Chaigneau, S.E. (2005). The HIPE theory of function. In L. Carlson, & E. van der Zee (Eds.), *Representing functional features for language and space: Insights from perception, categorization and development* (pp. 131-147). Oxford: Oxford University Press.
- Barrett, L. F., Mesquita, B., & Gendron, M. (2011). Context in emotion perception. *Current Directions in Psychological Science, 20*, 286-290.

- Barrett, L. F., & Kensinger, E. A. (2010). Context is routinely encoded during emotion perception. *Psychological Science, 21*, 595-599.
- Beach, K. (1988). The role of external mnemonic symbols in acquiring an occupation. In M. M. Gruneberg & R. N. Sykes (Eds.), *Practical aspects of memory*, Vol. 1, (pp. 342–346). New York: Wiley.
- Bodenhausen, G. V. (1988). Stereotypic biases in social decision making and memory: Testing process models of stereotype use. *Journal of Personality and Social Psychology, 55*, 726-737.
- Brewer, W. F., & Treyens, J. C. (1981). *Role of schemata in memory for places. Cognitive Psychology, 13*, 207-230.
- Cantor, N., Mischel, W., & Schwartz, J. (1982). *Social knowledge: structure, content, use, and abuse*. In A. Hastorf, & A. Isen (Eds.), *Cognitive social psychology* (pp. 32-72). New York: Elsevier – North Holland.
- Carlston, D. E., & Smith, E. R. (1996). *Principles of mental representation*. In E. T. Higgins, & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 184-210). New York: Guilford.
- Chaigneau, S. E., Barsalou, L. W., & Zamani, M. (2009). Situational information contributes to object categorization and inference. *Acta Psychologica, 130*, 81-94.
- Clancey, W. J. (1997). *Situated Cognition: On human knowledge and computer representations*. New York, NY: Cambridge University Press.
- Clancey, W. J. (2009). *Scientific antecedents of situated cognition*. In P. Robbins, & M. Aydede (Eds.), *Cambridge handbook of situated cognition* (pp. 11-34). New York: Cambridge University Press.
- Clark, A. (1997). *Being there*. Cambridge, MA: MIT Press.
- Clark, A., & Chalmers, D. (1998). The extended mind. *Analysis, 58*, 7-19.



- Collins, A. M., & Loftus, E. F. (1975). A spreading-activation theory of semantic memory. *Psychological Review*, *82*, 407-428.
- Collins, A. M., & Quillian, M. R. (1969). Retrieval time from semantic memory. *Journal of Verbal Learning and Verbal Behavior*, *8*, 240-247.
- Crawford, M. T., & Skowronski, J. J. (1998). When motivated thought leads to heightened bias: High need for cognition can enhance the impact of stereotypes on memory. *Personality & Social Psychology Bulletin*, *24*, 1075-1088.
- Crocker, J., Fiske, S. T., & Taylor, S. E. (1984). *Schematic bases of belief change*. In J. R. Eiser (Ed.), *Attitudinal judgment* (pp. 197-226). New York: Springer-Verlag.
- Fiske, S. T. (1980). Attention and weight in person perception: The impact of negative and extreme behavior. *Journal of Personality and Social Psychology*, *38*, 889-906.
- Freeman, J. B., & Ambady, N. (2011). A dynamic interactive theory of person construal. *Psychological Review*, *118*, 247-279.
- Freeman, J. B., Ma, Y., Han, S., & Ambady, N. (2013). Influences of culture and visual context on real-time social categorization. *Journal of Experimental Social Psychology*, *49*, 206-210.
- Garcia-Marques, L., & Hamilton, D. L. (1996). Resolving the apparent discrepancy between the incongruity effect and the expectancy-based illusory correlation effect: The TRAP Model. *Journal of Personality and Social Psychology*, *71*, 845-860.
- Garcia-Marques, L., Hamilton, D. L., & Maddox, K. B. (2002). Exhaustive and heuristic retrieval processes in person cognition: Further tests of the TRAP Model. *Journal of Personality and Social Psychology*, *82*, 193-207.
- Garcia-Marques, L., Garrido, M. V., Hamilton, D. L., & Ferreira, M. (2012). Effects of correspondence between encoding and retrieval organization in social memory. *Journal of Experimental Social Psychology*, *48*, 200-206.

- Garcia-Marques, L., Santos, A. S. C., Mackie, D. M. (2006). Stereotypes: Static abstractions or dynamic knowledge structures? *Journal of Personality and Social Psychology*, *91*, 814-831.
- Garrido, M. V., Garcia-Marques, L., Hamilton, D. L. (2012a). Hard to recall but easy to judge: Retrieval strategies in social information processing. *Social Cognition*, *30*, 57-71.
- Garrido, M. V., Garcia-Marques, L., Hamilton, D. L. (2012b). Enhancing the comparability between part-list cueing and collaborative recall. *Experimental Psychology*, *59*, 199-205.
- Garrido, M. V., Garcia-Marques, L., Hamilton, D. L. (2013). Collaborative impression formation. *Manuscript in preparation*
- Garrido, M. V., Soeiro, V., & Palma, T. A. (2011). Da cozinha ao hospital: Um pré teste de comportamentos específicos de diferentes ocupações profissionais. *Laboratório de Psicologia*, *9*, 3-22.
- Hamilton, D. L., Katz, L. B., & Leirer, V. O. (1980). Cognitive representation of personality impressions: Organizational processes in first impression formation. *Journal of Personality and Social Psychology*, *39*, 1050-1063.
- Hastie, R., & Carlston, D. (1980). Theoretical issues in person memory. In R. Hastie (Eds.), *Person memory: The cognitive basis of social perception* (pp. 1-54). Hillsdale, NJ: Lawrence Erlbaum.
- Hastie R., & Kumar, P. A. (1979). Person memory: Personality traits as organizing principles in memory for behaviors. *Journal of Personality and Social Psychology*, *37*, 25-38.
- Hutchins, E. (1995). *Cognition in the wild*. Cambridge, MA: MIT Press.
- Kirsh, D. (1995). The intelligent use of space. *Artificial intelligence*, *73*, 31-68.

- Kirsh, D., & Maglio, P. (1994). On distinguishing epistemic from pragmatic action. *Cognitive Science, 18*, 513-549.
- Macrae, C. N., Hewstone, M., & Griffiths, R. J. (1993). Processing load and memory for stereotype-based information. *European Journal of Social Psychology, 23*, 77-87.
- Palma, T. A., Garrido, M. V. & Semin, G. R. (2011). Grounding person memory in space: Does spatial anchoring of behaviors improve recall? *European Journal of Social Psychology, 41*, 275-280.
- Reis, H. T. (2008). Reinvigorating the concept of situation in social psychology. *Personality and Social Psychology Review, 12*, 311-329.
- Robbins, P., & Aydede, M. (Eds.) (2009). *Cambridge handbook of situated cognition*. Cambridge, UK: Cambridge University Press.
- Roediger, H. L., & Gynn, M. J. (1996). Retrieval processes. In E. L. Bjork, & R. A. Bjork (Eds.), *Memory* (pp. 179-237). San Diego, CA: Academic Press.
- Schwarz, N., & Sudman, S. (Eds.) (1992). *Context effects in social and psychological research*. New York: Springer Verlag.
- Semin, G. R., & Smith, E. R. (2002). Interfaces of social psychology and situated and embodied cognition. *Cognitive Systems Research, 3*, 385-396.
- Semin, G. R., Garrido, M. V. & Palma, T. A. (2012). Socially situated cognition: Recasting social cognition as an emergent phenomenon. In S. Fiske, & N. Macrae. (eds.) *Sage handbook of social cognition* (pp. 138-164). Sage: California: Sevenoaks
- Sherman, J. W., & Hamilton, D. L. (1994). On the formation of inter-item associative links in person memory. *Journal of Experimental Social Psychology, 30*, 203-217.
- Smith, E. R. (1998). Mental representation and memory. In D. Gilbert, S. Fiske, & G. Lindzey (Eds.), *Handbook of social psychology* (4th ed.; pp. 391-445). McGraw-Hill.

- Smith, E. R., & Collins, E. C. (2009). Contextualizing person perception: Distributed social cognition. *Psychological Review*, *116*, 343-364.
- Smith, E. R., & Semin, G. R. (2004). Socially situated cognition: Cognition in its social context. *Advances in Experimental Social Psychology*, *36*, 53-117.
- Smith, S. M. (2007). Context and human memory. In H. L. Roediger, III, Y. Dudai, & S. M. Fitzpatrick (Eds.), *Science of memory: Concepts* (pp. 111-114). Oxford University Press.
- Skowronski, J. J., McCarthy, R. J., & Wells, B. M. (in press). Person Memory: Past, Perspectives, and Prospects. In D. E. Carlston (Ed.), *The Oxford handbook of social cognition*. New York: Oxford University Press.
- Strull, T. K. (1981). Person memory: Some tests of associative storage and retrieval models. *Journal of Experimental Psychology: Human Learning and Memory*, *7*, 440-463.
- Strull, T. K., Lichtenstein, M., & Rothbart, M. (1985). Associative storage and retrieval processes in person memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *11*, 316-345.
- Strull, T. K., & Wyer, R. S., Jr. (1989). Person memory and judgment. *Psychological Review*, *96*, 58-83.
- Taylor, S. E. (1981). *A categorization approach to stereotyping*. In D. L. Hamilton (Ed.), *Cognitive processes in stereotyping and intergroup behavior* (pp. 83-114). Hillsdale, NJ: Erlbaum.
- Tulving, E., & Pearlstone, Z. (1966). Availability versus accessibility of information in memory for words. *Journal of Verbal Learning and Verbal Behavior*, *5*, 381-391.
- Tulving, E., & Thomson, D. M. (1973). Encoding specificity and retrieval processes in episodic memory. *Psychological Review*, *80*, 359-380.
- Tulving, E. (1974). Cue-dependent forgetting. *American Scientist*, *62*, 74-82.

- Yeh, W. & Barsalou, L. W. (2006). The situated nature of concepts. *American Journal of Psychology*, *119*, 349-384.
- Williams, L. E., & Bargh, J. A. (2008). Experiencing physical warmth promotes interpersonal warmth. *Science*, *322*, 606–607.
- Wilson, R. A., & Clark, A. (2009). How to situate cognition: Letting nature take its course. In P. Robbins & M. Eydede (Eds.), *Cambridge handbook of situated cognition* (pp. 55-77). Cambridge University Press.
- Wyer, R. S., Jr., & Carlston, D. E. (1994). The cognitive representation of persons and events. In R. S. Wyer, Jr. & T. K. Srull (Eds.), *Handbook of social cognition* (2<sup>nd</sup> edition, pp. 41–58). Hillsdale, NJ: Erlbaum.
- Wyer, R. S., & Srull, T. K. (1989). *Memory and cognition in its social context*. Hillsdale, NJ: Lawrence Erlbaum Associates.

**Footnotes**

1. For a discussion of the multiple meanings of the term ‘context’, see, for example, Reis (2008) and Yeh and Barsalou (2006).
2. Importantly, our argument is independent from the discussion of whether knowledge is represented modally or amodally in the brain (for a similar argument, see Yeh & Barsalou, 2006).
3. Task-order had no effect on participants’ performance on the two tasks.

Table 1  
*Mean Recall of Congruent and Neutral Behaviors (collapsed across targets) as a  
 Function of the Context Condition*

Behaviors	Context		
	Match	Mismatch	Control
Congruent	3.76 (1.14)	2.90 (1.31)	2.98 (1.53)
Neutral	2.79 (1.67)	2.86 (1.69)	2.84 (1.91)
	<i>n</i> = 80	<i>n</i> = 79	<i>n</i> = 82

*Note.* Standard deviations are in parentheses.

Table 2  
*Mean Recall of Congruent and Neutral Behaviors as a Function of Processing Goals  
 and Context*

Behaviors	Processing Goals			
	Impression Formation		Memory	
	Context: Match	Context: Mismatch	Context: Match	Context: Mismatch
Congruent	7.05 (2.44)	5.58 (2.06)	2.15 (1.35)	2.74 (1.41)
Neutral	6.09 (2.28)	4.84 (1.92)	2.75 (1.94)	2.00 (1.25)
	<i>n</i> = 21	<i>n</i> = 19	<i>n</i> = 20	<i>n</i> = 19

*Note.* Standard deviations are in parentheses.



Table 3  
*Correlation Between Recall of Behaviors and Recall of Objects as a Function of  
 Context and Processing Goals*

Processing Goals	Recall Behaviors/Recall Objects		
	Context: Match	Context: Mismatch	Overall
Impression Formation	.43**	-.21	.30*
Memory	.25	-.09	.05

*Note.* \*\* $p < .05$ ; \* $p < .10$

**Figure Captions**

*Figure 1.* Background with Construction Tools (top) and Background with Cooking Utensils (bottom) used to manipulate the context in Experiments 2 and 3.

Figure 1



## Appendix A

Construction Tools and Cooking Utensils (Objects) used in the Three Experiments to  
Manipulate the Context at Encoding and at Retrieval

---

**Construction Tools**


---

Gloves<sup>1,2,3</sup>Helmet<sup>1,2,3</sup>Hammer<sup>1,2,3</sup>Ladder<sup>1,2,3</sup>Saw<sup>1,2,3</sup>Shovel<sup>1,2,3</sup>Paint Roller<sup>1,2,3</sup>Electric Drill<sup>1,2,3</sup>Tape Measure<sup>2,3</sup>Pliers<sup>2,3</sup>


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**Cooking Utensils**


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Rolling Pin<sup>1,2,3</sup>Kitchen Knife<sup>1,2,3</sup>Pan<sup>1,2,3</sup>Pot<sup>1,2,3</sup>Chef's Hat<sup>1,2,3</sup>Pot Holder<sup>1</sup>Roasting Tray<sup>1</sup>Fork<sup>1</sup>Oven Mittens<sup>2,3</sup>Electric Hand-Mixer<sup>2,3</sup>Spoon<sup>2,3</sup>Toaster<sup>2,3</sup>Chopping Board<sup>2,3</sup>

*Note.* The numbers 1, 2, and 3 represent the experiments where these objects were used to manipulate the context.

## Appendix B

## Behavioral Descriptions used in the Three Experiments

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**Behavioral Descriptions Congruent with the Construction Worker Occupation**

---

Unloaded several sand bags from a truck<sup>1-3</sup>  
 Got up very early to be the first to arrive at the construction site<sup>1-3</sup>  
 Arrived from work with the clothes completely dirty and stained<sup>1-3</sup>  
 Flirted with women passing by the construction site<sup>1-3</sup>  
 Correctly attached the tiles to the bathroom walls<sup>1-3</sup>  
 Fixed a broken shingle in a professional way<sup>1-3</sup>  
 Filled two containers with rubble<sup>1-3</sup>  
 Suffers from back pain due to the hard work he performs<sup>1-3</sup>  
 Perspired a lot on that day<sup>2-3</sup>  
 Spoke loudly over the noise of the machines<sup>2-3</sup>  
 Operated the crane with concentration and caution<sup>2-3</sup>  
 Has low schooling because he started to work when he was very young<sup>2-3</sup>

---

**Behavioral Descriptions Congruent with the Cook Occupation**

---

Is able to prepare different kinds of food<sup>1-3</sup>  
 Bought fresh ingredients in the market<sup>1-3</sup>  
 Always serves the meals with an excellent presentation<sup>1-3</sup>  
 Used different spices to get a special flavor<sup>1-3</sup>  
 Everyone praised the meal he prepared<sup>1-3</sup>  
 Beats the egg whites firmly for the meringue<sup>1-3</sup>  
 Opened a bottle of wine very easily<sup>1-3</sup>  
 Washed the salad<sup>1-3</sup>  
 Cut the carrot thinly<sup>2-3</sup>  
 Peeled and cut potatoes in slices<sup>2-3</sup>  
 Weighed the sugar to make a cake<sup>2-3</sup>  
 Prepared a list of ingredients needed to prepare a meal<sup>2-3</sup>

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**Behavioral Descriptions Neutral for both Target-Occupations**

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Went out to buy clothing<sup>1-3</sup>  
 On the way to work bought a magazine<sup>1-3</sup>  
 Opened the mail box and collected the mail<sup>1-3</sup>

Had a haircut at the barber in the neighborhood where he lives<sup>1-3</sup>

Spent Wednesday night watching TV<sup>1-3</sup>

Woke up in the morning and turned on the radio<sup>1-3</sup>

Took the key from his pocket to open the door<sup>1-3</sup>

Went to the store to renew his identity card<sup>1-3</sup>

Collected the children from school in the evening<sup>2-3</sup>

Went to the post office to get a package<sup>2-3</sup>

Parked his car close to home<sup>2-3</sup>

Found a two-euro coin at the doorstep<sup>2-3</sup>

*Note.* Behavioral descriptions marked with 1-3 were used in all Experiments and

behavioral descriptions marked with 2-3 were used in Experiments 2 and 3.