IMPLICIT PROCESSES CONNECTING TWO INDIVIDUALS DURING TASK RELATED MERE CO-PRESENCE

by

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A Thesis submitted to the

Graduate School of Social Sciences

In Partial Fulfillment of the Requirements for

The Degree of

Master of Arts

In

Psychology

Koç University

September 2014

Koc University

Graduate School of Social Sciences and Humanities

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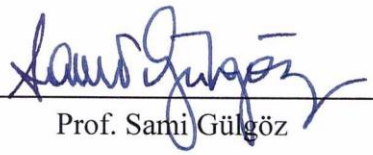

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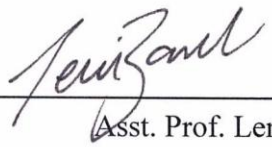

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ACKNOWLEDGEMENTS

When Neil Armstrong set his foot on the Moon, he said *"That's one small step for a man, one giant leap for mankind."* While I am writing these paragraphs I feel the same way as he did: Meeting my thesis advisor, Gün R. Semin, was just a small step, but turned out to be a giant leap for my career. Therefore I would like to start expressing my gratitude to him in the first place: Thank you for accepting me as your MA student and supporting me all the way throughout my thesis. I cannot express how grateful I am that you received me in Utrecht and provided me all kinds of resources and support to conduct my research. I know I could have been a very grumpy person if anybody else was my advisor, so thanks for being so comforting and uplifting. Last but not least, thank you for being responsive all the time and trusting in me.

Next, I would like to thank my colleagues Tomas A. Palma and Evi-Anne Dis for their contributions in the process of preparing my thesis. I would also like to thank Hannah Beckmann for her support as well as her valuable feedback for the past two years. Last but not least I should deeply thank my partner Erinç Arık, whom I consider as a colleague now, for his assistance in technical issues and his endless support in all respects.

I am also thankful to Assistant Professor Margarida V. Garrido and Associate Professor Marcello Gallucci for lending a hand with my analyses and my committee members Professor Sami Gülgöz and Assistant Professor Lemi Baruh for their constructive feedback. I am also thankful to my parents and my beloved grandmother for being there for me all the time.

Lastly, I would like to thank the Scientific and Technological Research Council of Turkey (TUBITAK) for the graduate scholarship that allowed me to complete this thesis.

ABSTRACT

Eskenazi, Doerrfeld, Logan, Knoblich and Sebanz (2012) demonstrated the incidental encoding of words assigned to another participant if the items were studied jointly. The present experiment tested subvocalization and self-expansion as two mechanisms driving this incidental encoding effect. The participants completed a categorization task twice (jointly and independently) for words that were assigned to themselves, their co-participant and neither of them, after which they engaged in free recall. Subvocalization was experimentally manipulated and subjective engagement with the co-participant's task was measured as an indicator of self-expansion motive. Surprisingly, subvocalization did not mediate the advantage for partner's words. However, the degree to which participants focused on their co-participant's task predicted how well they recalled their partner's words, signifying that self- expansion motivation is a factor contributing to incidental encoding effect.

Keywords: encoding, joint action, co-presence, subvocalization, self-expansion

ÖZET

Geçmiş araştırmalar aynı ortamda ve eşzamanlı olarak farklı kategorilere ait kelimeler gösterilen kişilerin farkında olmadan diğer kişinin kelimelerini de kodladığını göstermiştir (Eskenazi, Doerrfeld, Logan, Knoblich ve Sebanz, 2012). Bu çalışma, bahsi geçen istemsiz (gayri-ihtiyari) kodlama durumuna aracılık ettiği düşünülen iki mekanizmayı - sessiz tekrar ve benlik genişlemesi (self-expansion) motivasyonunu - araştırmaktadır. Katılımcılara birer kelime sınıfı (örneğin, hayvanlar) atanmış ve bir kez tek başlarına bir kez de diğer katılımcı ile beraber olmak üzere 2 farklı kelime sınıflandırma görevini tamamlamaları istenmiştir. Daha sonra ise serbest hatırlama yöntemi ile bu kelimeleri hatırlamaları beklenmiştir. Sessiz tekrar deneysel olarak manipüle edilmiş, benlik genişlemesi motivasyonunun bir göstergesi olarak ise katılımcıların diğer katılımcının görevine odaklanma dereceleri ölçülmüştür. Beklenenin aksine sessiz tekrarın diğer katılımcının kelimelerinin hatırlanmasına aracılık etmediği görülmüştür. Öte yandan, katılımcının diğer katılımcının görevine ne derece odaklandığının diğer katılımcının kelimelerini ne oranda hatırladığını yordadığı görülmüştür.

Anahtar Kelimeler: kodlama, ortak eylem, birarada bulunma, sessiz tekrar, benlik genişlemesi

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1

INTRODUCTION

As a social species we come to believe that the processes by which sociality is enabled are naturally given. This belief is best illustrated with the classic fiction about Tarzan the ape man who grew up with virtually no human contact and as a grown up adult meets people only to integrate flawlessly with a superior sense of morality. This fiction that has captured many an imagination contrasts with the story of a real child -generally known as Victor of Aveyron- who like Tarzan spent his childhood in the woods but only ended up in a depressing state, after being discovered in 1800 in France. Victor was unable to learn French, despite great efforts of Jean-Marc Itard, a physician, and he was incapable of 'normal' social interaction (Lightfoot, Cole, & Cole, 2009).

Even though the fiction about Tarzan reflects the conventional wisdom regarding human socialization, it is devoid of capturing the reality. Victor's story illustrates more accurately that being a social species, humans are in need of others throughout their development in order to learn how to fully function socially. In order to become truly social beings humans need to extend their capacities by acquiring regulatory mechanisms that have evolved over time. Those mechanisms, such as tools, customs and knowledge that have emerged throughout history, are not inherent; they can only be acquired through communication. Therefore it is important to understand mechanisms underlying human communication before interpreting sociality.

The study reported here is designed to examine two implicit processes that can contribute to establishing a joint reference between two or more individuals. Obviously there are many implicit social processes (e.g. chemosignaling) which are essential for a fully functioning social being – namely mechanisms that *contribute* to establishing sociality and thus the construction of a mutually accessible shared reality during the communication process. Subvocalization and self-expansion are two of those important yet understudied mechanisms, which we will scrutinize in this current paper as driving forces for joint reference.

The following section will provide a brief overview about human communication by discussing how it takes place and the function it serves. The subsequent sections will summarize existing research on the mechanisms that contribute to human communication across different modalities. Finally, we shall draw attention to the focus of the current research, namely the two mediating processes contributing to grounding a shared base.

Chapter 2

LITERATURE REVIEW

2.1. Grounding Human Communication

Compared to the offspring of other animals, which are generally born with many instincts that help them to develop into capable adults with minimum help from their parents, human infants are almost helpless during the first few years of their life. Thus, from infancy onwards they depend on support provided by other humans to guide their own behavior (Semin & Manstead, 1983; Striano, Chen, Cleveland, & Bradshaw, 2006).

Think about the number and variety of stimuli an adult encounters during a normal day. Humans live in complex and dynamic social environments that contain many individuals and objects, which need to be monitored continuously. Yet, individuals have to actively and selectively respond to the significant stimuli in order to handle the complexity of their everyday surroundings. To be able to draw conclusions about which stimuli are significant and act accordingly, people largely depend on other individuals (Semin & Cacioppo, 2009).

Luckily, the lifelong dependency on others is ensured by the human ability to communicate with others, which is a biological necessity for all social species (Semin, 2000). Humans are not just observers of their environment; they engage in dynamic processes in which they co-regulate their actions with other individuals in accordance with their own goals (Semin & Cacioppo, 2009). The success of human social life is tightly associated with communication and co-action between the members of the society. The former establishes parity among the members of the society whereas the latter allows people to engage in complementary actions and tune their interactions while performing joint tasks. In simple terms, communication and co-action put two individuals on the same page so that they share a “common ground” (Semin, 2007b).

In order to create common ground between individuals, media are needed by which joint reference can be established (Semin, 2007b). The media that contribute to grounding human communication are driven by multiple modalities (i.e. auditory, chemical, visual, linguistic etc.). These modalities are attuned to each other such that parity among individuals does not rely on a single modality. Although the mechanisms responsible in achieving parity are all dynamically co-present, existing research which will be discussed in the next section is unfortunately based predominantly on amodal perspectives, as a consequence of which the majority of the experiments focus on a single modality at a time and lack explanations of potential interdependencies between different modalities, their functions, and mechanisms. Despite their limitations these experiments shed light on diverse mechanisms by which joint reference can be established.

2.2. Establishing Joint Reference

Among different possible processes driven by alternative modalities, linguistic (representational) modality has attracted most of the attention from social psychologists who study interpersonal relations. Their assertion is that language allows members to achieve joint reference through transmission of shared representations (Semin, 2007b). Despite being a focal candidate language is not the only medium that grounds human communication.

Compared to the extensively studied contributions of language as a medium for establishing joint reference other modalities have been largely neglected for a long time. Fortunately, researchers have started to focus on other modalities and interactions between modalities. For instance, recent experiments regarding chemosignals (de Groot, Smeets, Kaldewaij, Duijndam and Semin, 2012; de Groot, Semin & Smeets, 2013) show that olfaction is as effective as the audiovisual modality when communicating affective states, especially fear and disgust. Furthermore, Nygaard and Queen (2008) demonstrated an interaction effect between acoustic modality and linguistic modality during communication. Their experiment showed that congruence between the emotional tone and the meaning of a word accelerates the recognition of that word.

The mechanisms that aid the establishment of joint reference in visual modality are as extensively studied as the linguistically based mechanisms of human communication. From infancy onwards humans are sensitive to visual social cues such as emotional expressions, body movements, gestures, and eye contact, to which they are constantly exposed (Striano et al., 2006). Such visual cues ease the establishment of joint attention, which can be defined as the process of directing one's own attention to the objects in the focus of other people (Frischen, Bayliss, & Tipper, 2007). Substantial amount of empirical and theoretical work has been done regarding joint attention processes, mostly without an explicit intent to uncover how it can be established.

Among the mechanisms that are proposed to mediate joint attention, eye contact and gaze following have attracted most attention by researchers, especially by developmental psychologists. Since gaze monitoring is a well-studied process and serves an important function on establishing joint reference, next section will provide a brief summary of the relevant gaze following literature before continuing with other proposed mechanisms that may underlie establishing joint reference.

2.2.1. Joint Attention and Gaze Following

Joint attention and gaze following are extensively studied phenomena since they reveal a great deal about human functioning. Humphrey (as cited in Hood, Willen, & Driver, 1998) suggests that examination of other humans' gaze may have had an essential role in the progress of human socialization. Eye gaze may disclose thoughts, beliefs or goals of its owner (Ristic, Mottron, Friesen, Iarocci, Burack, & Kingstone, 2005) and therefore aid communication between two individuals.

Despite being a universally significant social cue, the meanings attributed to eye gaze are relative to culture. Thus, eye gaze should be interpreted with great caution, since it may gain different meanings in different cultures. For instance, in Western cultures a speaker can be interpreted as being respectful if he or she directly makes an eye contact with the audience. On the other hand, the same behavior might be regarded as disrespectful in an East Asian culture where downwards averted eye

gaze is a sign of respect (Adams et al, 2010). However, following one other's gaze leads to establishing common ground between two individuals regardless of culture.

In addition to the social information that eye gaze provides about people, an important social function of eye gaze is that it may indicate events, objects or people in the environment that are significant for the owner of the gaze (Ristic et al., 2005). Humans may acquire information regarding potential sources of interest or danger in their environment by following others' gaze (Hood, Willen, & Driver, 1998). Given this adaptive function of gaze following in terms of helping one to identify significant stimuli in the environment, it is not surprising that developmental psychologists have demonstrated gaze following during the early years of an individual's life.

Even though the social function of gaze following in infants has clearly been demonstrated, there has been a debate about the age when this skill develops (Morales, Mundy, Delgado, Yale, Neal, & Schwartz, 2000). In their earliest work about infant joint attention, Scaife and Bruner (1975) suggested that the ability to follow others' gaze starts at 6 months of age. Later on Hood, Willen and Driver (1998) demonstrated that even 3-month-olds direct their attention in the same direction as the eyes of a digitized adult face. More recently Tomasello (1995) defined the period between 9 and 18 months as the time when infants' joint attention skills fully emerge. Even though these studies suggest different age ranges as the beginning of the development of gaze following ability, all demonstrate that children start to develop skills to establish joint reference in the very first year of their life.

A more recent study conducted with 4-month-olds supports the claim that children develop certain communication skills very early and reveals a functional outcome of gaze following in infants (Reid, Striano, Kaufman, & Johnson, 2004). The results of the study show that infants not only focus their attention in the direction of an adults' gaze but also process the objects that appear in that direction better than the objects appear in other directions. This finding notably illustrates the important function of gaze following on establishing a common base between humans; people follow

others' gaze in order to see what others see. Even infants as young as 4-months follow the gaze of others to be able to distinguish significant stimuli in their surroundings and the consequence is that they react towards those stimuli differently.

In 2012, Hoel, Wahl, Michel and Striano (2012) refined the findings of Reid et al. (2004) by unexpectedly showing that familiarity of the adults' face moderated the effect of gaze following on infants' object processing. Contrary to their expectations, 4-month-olds produced differential brain waves only for the objects that were gazed towards and away by their own caregiver, but not for the objects that were cued or uncued by a stranger. The authors concluded that infants may have attended their caregiver's gaze more compared to a stranger's face since it was salient for them. Another viable possibility is that even if they attended equally to both faces it was easier for the infants to identify a familiar face and follow the eye gaze provided by it. Either way, it is not surprising that gaze following is moderated by familiarity since caregiver faces belong to people that are learned to be dependable and trustable, which makes establishing joint reference with them of special interest for the infants.

Despite being highly informative about the developmental trajectory of gaze perception and joint attention in humans, the experiments conducted with young infants require simple stimuli due to infants' limited cognitive abilities. Yet, a demonstration of gaze following in everyday life, which consists of several complex stimuli, is needed to qualify its function in terms of establishing joint reference. Meeting this need, Freeth, Ropar, Chapman and Mitchell (2010) investigated the impact of others' eye gaze on attention and memory of adolescents, using complex scenes that can be encountered in daily life. The results showed that adolescents paid more attention to the people and to the objects in other people's gaze direction in a complex photograph. In a second experiment this attentional preference was qualified by biases in memory about the previously viewed scenes, such that a higher proportion of the scene in the direction of gaze was remembered. Both of these

outcomes once again support the function of gaze following: humans unwittingly follow other's gaze in order to establish a common reference point with them.

One can claim that gaze following is practical and informative for infants and adolescents exploring their environment but not for adults who already know a lot about their setting. However, differentiating stimuli in the environment is not the only function of gaze following; it more importantly directs people to what others regard as important. In other words, gaze following informs one about others and their point of interest, therefore establishes a common base between them. In fact, empirical evidence shows that adults rely on joint attention processes during their daily life and direct their focus of attention in accordance with social cues (e.g. gaze of another adult), almost reflexively (Friesen & Kingstone, 1998; Langton, & Bruce, 1999, Frischen et al., 2007). Recent experiments (Langton, O'Donnell, Riby, & Ballantyne , 2006; Lachat, Hugueville, & George, 2012), also demonstrate that adult participants detect changes faster and more accurately if the changing object is gazed at by another individual. These findings support of the claim that gaze of another human is socially relevant for everyone and serves the function of establishing a shared reference.

Almost all of the studies regarding joint reference and gaze following reported in this section are conducted using individual participants and computerized stimuli that are without any social context. Ironically, evidence provided for social cues that underlie the establishment of joint reference is far from being social. However, in real life participants of a communication generally interact with each other and behave accordingly. The next section will focus on the latest research about interactive processes that contribute to the establishment of joint reference and depict the role of joint reference on encoding.

2.2.2. Joint Action and Learning

In the last decade a set of studies started to focus on other mechanisms than attentional processes that underlie joint reference. Those processes, namely joint action processes, are facilitated in visual modality and get transduced into motor movements. Any type of social contact can be

described as joint action if two or more interacting individuals represent actions of each other and coordinate their own actions in time and space accordingly (Sebanz, Bekkering, & Knoblich, 2006).

In order to investigate joint action processes, Sebanz, Knoblich and Prinz (2003) conducted a seminal experiment in which they recruited two participants and investigated their actions in the presence of the other individual. The two participants sat next to each other and engaged in a joint computerized task. One participant's task was to click the right mouse when a specific colored stimulus (e.g. green) appeared, whereas his/her co-actor was instructed to respond with the left click to another stimulus with a different color (e.g. red). The results showed that despite not being responsible for the stimulus designated for their co-actor, participants experienced a motor response conflict when that stimulus appeared on the screen, indicating that they represented the co-actor's action in their own motor system. This study pointed out that similar to joint attention, joint action recruited a common ground or parity between two individuals. As joint attention operates as a cue to others' point of reference, joint action allows coordination of actions in space and time between two or more individuals (Sebanz & Knoblich, 2009).

Even though Sebanz et al. (2003)'s study is a pioneering one in terms of examining people's actions at the presence of others, there is no joint or competitive interdependence between participants in that study. Thus the process under investigation is co-presence rather than joint action, although it is labeled so. Most of the research conducted under the joint action umbrella investigates in fact co-presence of 2 individuals. Strictly speaking: This is not joint action but co-presence. However, we use the 2 terms (joint action and co-presence) interchangeably in this paper.

Eskenazi, Doerrfeld, Logan, Knoblich and Sebanz (2012) recently conducted another study, which investigated the effect of co-presence on encoding. They asserted that two individuals learning jointly should experience improved memory for the items that require one's own as well as the others' attention. Their claim was that if the individuals consider the actions of another, then they should also learn items relevant to one's co-actor better than totally irrelevant items. However,

Eskenazi et al. (2012) did not further specify how this learning occurs and which mechanisms underlie this consideration. Instead, they conducted an experiment to test their assertion, in which participants were recruited as pairs and completed a word categorization test.

Each participant in a pair was assigned a different word category (e.g. participant 1 was assigned fruits/vegetables whereas participant 2 was assigned animals) and both participants were instructed to respond only to the words belonging to their assigned category by pressing a specified key on the computer keyboard. There was a third control category to which no one was expected to respond. In the individual condition, participants completed the categorization task on separate computers alone while in the joint condition they used the same computer screen and the same keyboard to respond. After the categorization task both participants were given a surprise recall test independently. As Eskenazi et al. (2012) expected, participants recalled more items from their assigned word-group than the other two word groups. In line with the main hypothesis, the participants remembered more items from the category assigned to the co-actor than the control category in the joint condition. More importantly, participants experienced an improved memory for the co-actor's items only when the co-actor responded to the items while sitting alongside the subject (i.e. in the joint condition). In the individual condition, co-actor's and control items were not remembered any better than each other.

In a second study following the same procedure, individuals were explicitly instructed to focus only on their own items and forewarned that they will be given a recall test and will be paid only for the items that they remember from their assigned group. Even with this explicit instruction not to attend to the co-actor's items, the results of the first study were replicated.

2.2.3. Mediating Mechanisms in Joint Learning

The two experiments conducted by Eskenazi and her colleagues (2012) suggest that individuals 'incidentally' encode and learn the information designated for a co-actor if the co-actor is present. Despite providing exciting evidence about social influence on cognition, the experimenters did not

specify or even speculate about the mechanisms driving this effect. This lack of explanation takes us back to the question; how is joint reference established? More specifically: what are the mechanisms that were in place while Eskenazi et al.'s (2012) participants were encoding the information designated for another individual? In this section, we aim to answer these questions.

As we mentioned briefly, language is an extensively investigated medium, which is proposed to underlie communication. However, in neither of the experiments by Eskenazi et al. (2012) participants interacted with each other verbally. Thus, language is not a viable mechanism to explain how participants encoded words that were assigned to their partner. A more subtle mechanism-gaze following- attracted interest from researchers and has been demonstrated to play a respectable role in human communication, even as young as 3 months of age (Hood et al., 1998). Then again, gaze following cannot be the medium by which incidental encoding of the co-actor's words took place, since the participants were sitting next to each other and were unable to follow each other's gaze. Besides, a word appeared at a time on the screen and both participants knew who was attending to what. However, language and gaze following are not all there is to the mechanisms underlying joint reference.

Participants' co-presence during the encoding phase of the experiments might have initiated at least two processes that Eskenazi and her colleagues did not consider as potential driving mechanisms of "incidental learning effect". First, being together might have activated subvocalization of one others' task, which in turn gave rise to inflated recall of co-participant's words. Second, co-presence of another person during the experiment might have aroused a psychological state of expanding one's self, leading participants to focus on the co-participant's task as if it was their own task. We now turn to these two processes that are proposed to contribute the establishment of joint reference will be discussed in more detail.

2.2.3.1. Subvocalization Hypothesis

Subvocalization is the conscious or unconscious act of internally repeating stimuli to oneself in a speech-like manner and has been empirically linked to cognitive processes such as thinking, learning, and reading (McGuigan, 1970). We suppose that, in conditions like in Eskenazi et al. (2012)'s experiments, unintended subvocalizing of other participant's words might be one potential explanation of the advances in the memory for words that were assigned to the co-participant.

Early studies reveal that subvocalization is highly predictive of working memory span for digits, letters and words (Standing, Bond, Smith, & Isely, 1980). Especially in conditions when people have to switch modalities across encoding and recall (e.g. when students take notes of the lecture which is orally presented by the professor) people unconsciously rely on subvocal repetition as a tool to aid encoding of phonemes (Locke & Fehr, 1972). More recent findings support these preliminary studies and provide neurophysiological evidence for people covertly pronouncing what they read or listen to (Aleman & Van't Wout, 2004; Jäncke & Shah, 2004; Perrone-Bertolotti et al., 2012).

Subvocalization plays an important role on cognitive processes since it increases perceptual fluency of perceived stimuli. If a stimulus is encountered and processed over and over again, processing will be quicker and more fluent each time (Jacoby & Dallas, 1981). This assumption is valid for repeated overt articulation of words as well as covert pronunciation of them. Topolinski and Strack (2009) conducted a series of experiments and showed that blocking subvocalization leads to reductions in perceptual fluency of words and related outcomes such as mere exposure effect.

Considering the well-established role of subvocalization on cognitive processes, we hypothesized that subvocalization, operating without conscious awareness, might be an implicit medium underlying enhanced learning that Eskenazi et al. (2012)'s participants demonstrated for other people's items.

2.2.3.2. Self-Expansion Motivation

As we stated at the very beginning of this paper humans are social creatures and they need to extend their capacity by communicating with other people. Expansion of self is a central human motivation which derives from this essential need for others, and directs individuals towards other humans' resources and perspectives (Aron, Lewandowski, Mashek, & Aron, 2013). Alongside with subvocalization, unintentional sharing of the co-participant's perspective and focus might be another viable mechanism establishing joint reference in Eskenazi et al. (2012)'s experiments.

The self-expansion motivation brings about inclusion of others' resources, perspectives and identities in one's own self. This means that individuals who include a second person into themselves share that person's cognitive resources and somewhat experience the environment from his/her point of view, either consciously or without conscious awareness (Aron et al., 2004).

Several studies in the context of close relationships have been conducted to test these assumptions. Those studies showed that people extend their self-related cognitive biases to close others, who they include in themselves. A comprehensive meta-analysis by Symons and Johnson (1997) reveals that people react to and recall the stimuli that they have processed with reference to themselves better than the stimuli that they have processed with reference to other people. However, this so called self-reference effect (Rogers, Kuiper, & Kirker, 1977) disappears if the other person is a close one; that is the self-reference effect expands to close others.

In Eskenazi et al. (2012)'s experiments an effect similar to self-reference effect is observed; participants remember words that are assigned to themselves better than the words that are assigned to other participant. However, this advantage in recall spills over to co-participant's words in the joint context, even though the co-participant is a stranger. Thus, we might argue that self-relevance effect expands to strangers in shared contexts as it has been shown to expand to close others. Unfortunately, there are not many studies investigating self-expansion motivation in contexts other than close relationships. Eskenazi and her colleagues may have unwittingly demonstrated that inclusion of even

strangers in self is possible. Thus, inclusion of others in self might be a spontaneous and unconscious outcome of sharing (e.g. a task, a cubicle), which in turn results in acquisition of other's perspective.

Based on the assumptions of self-expansion theory we proposed that increased focus towards the co-participant and his/her task might explain why participants in Eskenazi et al. (2012)'s study display an incidental learning effect for the items that they are not obliged to learn yet their task partner is.

Chapter 3

PRESENT STUDY

The present study examined two possible processes driving incidental encoding, namely subvocalization and self-expansion, which we consider to be related to co-presence of two individuals.

As in the original experiment (Eskenazi et al., 2012) all participants of the current experiment completed a word categorization task individually and with a partner, whereby they were co-present only during one half of the presented words. In addition to the original condition we introduced 2 new experimental conditions. The first condition was to test subvocalization; one group of participants was instructed to chew a gum during categorization task, so that their facial muscles allowing sub-vocal rehearsal were blocked (Campbell, Rosen, Solis-Macias, & White, 1991). The second condition constituted another group of participants, who were asked to squeeze a soft ball instead of chewing, so that the effect of chewing a gum could be differentiated from distraction (Topolinski & Strack, 2009). Finally, all participants were given a surprise recall test asking them to recall all words that they have been presented, after which they completed a short questionnaire measuring their self-perceptions about how much they focused on their co-participant's task in the joint condition.

As a consequence, the current experiment had a 2 (task context: individual vs. joint) X 3 (word category: self, partner, irrelevant) X 3 (experimental manipulation: control, gum, ball) mixed design, whereby task context and word category were independent within subjects variables, while experimental manipulation was the between subjects variable.

Assuming that Eskenazi et al. (2012)'s findings were robust; we expected to replicate those findings in our control condition, which was identical with the original experiment. The participants in the soft ball condition were expected to exhibit an identical recall pattern as the control condition; even though an overall decline in recall due to distraction was anticipated. As for the gum condition 2

outcomes were likely to occur. First, words from all 3 categories were expected to be recalled poorly compared to the control condition, since gum chewing was expected to reduce subvocalization of all words. The second likely outcome was that our manipulation would cause participants to compromise from subvocalizing their partner's and irrelevant words, resulting in no difference in recall of those categories, yet recall self-assigned words to some extent as it was their major task to attend them.

The second mechanism that we presumed to underlie the incidental learning effect was self-expansion, resulting in increased attention towards co-participant's task. In their second experiment Eskenazi et al. (2012) attempted to control this unintended focus towards the co-participant and his/her task by explicitly pre-warning participants to only focus on their own category. However, we considered this focus as a critical determinant of the joint learning effect; thereby we choose to measure it with a questionnaire. Participants' scores on this questionnaire constituted a continuous covariate in the design.

If self-expansion was the underlying process of incidental encoding of other's items, then number of words recalled from the partner's category should have been predicted by the degree to which participants included their partner in themselves. That is, the more participants focused their attention on their co-participant, the more words they were expected to recall from their co-participant's category. On the other hand, those scores were not expected to predict recall for self or irrelevant categories.

One should keep in mind that there are two potential relations between the two mechanisms that we propose to underlie joint learning. The first possibility is that subvocalization and self-expansion motivation are orthogonal; subvocalizing does not interact with the social psychological process of self-expansion. Then, only one of those mechanisms would mediate the incidental learning effect that was demonstrated by Eskenazi and her colleagues (2012). However, it is also likely that

those two mechanisms are correlated; that is the more participants included their co-participant in their self, the more they subvocalized the words that were assigned to their partner.

Chapter 4

METHOD

4.1. Participants

One hundred and sixty university students at Utrecht University participated in this study in return for monetary compensation or course credit.

4.2. Materials

The computerized word categorization task was adapted from Eskenazi et al. (2012)'s study. The semantic categories (animals, fruit/vegetables and household items) in the original experiment were preserved. In order to avoid confusion solely vegetables were used instead of both fruits and vegetables. All items that belonged to any one of these three categories were selected from the latest version of Battig and Montague (1969) norms (Van Overshelde, Rawson, & Dunlosky, 2004). Items with a total proportion[1] of more than .50 were left out, so that easily retrieved items did not oversimplify the task and inflate recall. After the exclusion of necessary items the median and the inferior and superior quartiles were calculated for each category. Then all the items that were in the extremes of the distribution were eliminated to have a homogenous set, with a small range between the items with more and less total proportions. As a last step all items were translated into Dutch (see Appendix A for the list of items).

[1] Total proportion is the proportion of all participants who give that particular response. It is calculated for every single item through division of the number of participants who produced that response by the number of all participants who generated any response for that category. For instance, *dog* was produced by 98 % of the 703 participants who responded to the "a four footed animal" category (Van Overshelde et al., 2003).

This resulted in 32 items from each category comprising a total of 96 words. Half of the items in each category were used in the individual condition, whereas the other half were presented in the joint condition. The presentation order of the words was randomized using E-Prime 2.0 software.

4.2.1. Questionnaire. Participants' focus on their co-participant's task was measured with a 9-item self-report questionnaire. The participants were asked to rate a total of 9 statements regarding the joint word categorization task on a 7-Point Likert Scale (1= I disagree, 7= I agree). The instructions and the items of the questionnaire are presented in Appendix B.

7 items of the questionnaire were directly implying participant's subjective engagement with their co-participant's task. After negatively worded items were reverse coded, the scores on those 7 items were averaged to form the Focus on Co-Participant (FOC) index (M=4.25, SD=1.13, α=.72).

The remaining 2 statements (items 5 and 8) were about the sharedness of the experience and group formation and correlated weakly (r=.249, p=.004).

4.3. Procedure

Participants were randomly matched with another participant as they arrived at the psychology laboratory. The pairs attended the same experimental session and were informed about the procedure together. Approximately one third of the participant pairs were asked to chew 2 pieces of sugar free gum (Stimorol original) during the study, whereas another one third of the participants were instructed to squeeze a soft ball, rhythmically. The rest of the participants did not engage in any secondary task during the procedure. The participants were watched during the whole session through a hidden camera to ensure that the ones who did not follow the instructions would be removed from the analysis.

After instructions were given and the informed consent documents were completed, participants were asked to perform a computerized word categorization task. Each participant completed half of the categorization task alone (task context: individual) and the other half together

with their partner (task context: joint). The order of individual and joint conditions was counterbalanced to avoid any possible order effect; thus half of the participants started in separate cubicles and joined the co-participant subsequently whereas the other half started together and were later separated.

Before starting the categorization task, each participant was assigned one of three semantic categories (animals, vegetables, household items) and one of the two computer keys ("z" or "m") to press when they encounter a word that belonged to their assigned category. The word category and the response key designated for each participant remained unchanged during the course of the experiment; participants responded to the same category of words using the same key in both individual and joint conditions. Every category was assigned to an approximately equal number of participants (53 animals, 52 vegetables, and 55 household items). The use of 6 possible category pairs was balanced such that every combination was assigned to an equivalent number of participant pairs. Response key- category pairings were also counterbalanced across participant pairs so that both keys were equally often used to respond to every category.

The word categorization task required participants to press their designated key on the computer keyboard when items belonging to their assigned category appeared on the computer screen. The instructions emphasized that participants should avoid any action in response to other categories that were not assigned to them. During the instructions all three categories were mentioned equally often to prevent any priming effects. In order to familiarize the participants with the task there was a short practice session consisting of words that were not used in the original experiment.

In the joint condition, participants viewed the items on the same computer monitor and used the same keyboard to respond to items. Participants were seated on chairs either to the left or right of the monitor. In the individual condition, participants completed the task in separated cubicles and the chairs at their side remained unoccupied. In each condition, a total of 48 words were displayed on the screen one at a time for 1,500 milliseconds. A fixation cross appeared between stimuli for 500

milliseconds. Participants were asked to react to the items that belonged to their assigned category as fast as they could by pressing the key designated for them and do nothing in response to items that belonged to other two categories.

After completing the word categorization task individually and together, participants were given a surprise recall test which they completed by themselves in separated cubicles. Before starting the recall phase participants in the chewing gum and ball conditions were instructed to remove their gum and put down their soft ball. They were instructed to type all the words that they were able to recall across the two parts of the experiment regardless of whether the items belonged to their assigned category or not. As in the original experiment of Eskenazi et al. (2012) the recall test was terminated after 2 minutes.

Finally, participants were asked to complete the questionnaire and answer demographic questions after which they were thanked, paid and debriefed.

Chapter 5

RESULTS

5.1. Preliminary Analyses

The dependent variable used for the main analyses was the number of correctly recalled words from each word category. Preliminary analyses were undertaken to clean up the data before the main analyses. Twelve participants were excluded from analyses a priori either because they did not follow the instructions (e.g. they did not chew the gum) or because they did not recall any words from 2 out of 3 categories across both individual and joint conditions.

For the remaining 148 participants response accuracy scores designating the percentage of correct responses in joint and individual conditions were calculated. The trials in which participants pressed their designated key in response to the words that were assigned to them were evaluated as correct. The trials in which participants responded to the words belonging to other two categories (partner or irrelevant) or failed to respond to the self-assigned words were coded as incorrect. Then, two separate accuracy scores for each participant were calculated for the individual and joint conditions by dividing the number of correct trials to incorrect trials. Thirteen additional participants whose accuracy scores were 2 standard deviations lower than the mean accuracy (M_{ind}=0.97, SD_{ind}=0.05; M_{joint}=0.97, SD_{joint}=0.04) in one or more condition were removed from the analyses. Elimination of those participants left us with a final sample size of 135 (99 female): 42 participants in the control condition, 53 participants in the gum condition and 40 participants in the ball condition.

Sixty two percent of the participants knew each other before the experiment (i.e. acquaintance); however their recall rates were not different than the participants who met their partner for the first time (i.e. strangers). See Table 1.

Table 1

Differences in Recall for Word Categories by Acquaintance

	Stranger (*N*=51)		Acquaintance (*N*=84)			
Category	*M*	*SD*	*M*	*SD*	*F*(1,133)	*p*
Self	3.79	.20	3.85	.15	.041	.839
Partner	2.34	.17	2.53	.13	.878	.350
Irrelevant	1.98	.14	1.71	.11	2.478	.118

5.2. Robustness of Original Findings

In order to test the robustness of the results that Eskenazi et al. (2012) reported, recall rates of the whole sample were examined in an ANOVA with the two task contexts (individual, joint) and three word categories (self, partner, irrelevant) as independent within participants variables. The order of experiencing a particular condition (joint first, individual first) was introduced as a between participants control variable in order to investigate any possible effects due to order.

The main effect of task context was significant, F (1,133) =21.048, p=.000, η^2=.14, indicating that recall rate was significantly higher in the joint condition (M= 2.93, SD=1.85) than in the individual condition (M= 2.47, SD=1.97). The main effect of category was also significant (F (2,266) =12.614, p=.000, η^2=.09), indicating that recall rate varied for the categories. Pairwise comparisons showed that participants recalled significantly more words from their assigned category (M= 3.83, SD=2.01) than the category that was assigned to their co-participant (F (1,133)=91.115, p=.000, M= 2.46, SD=1.73) or the category that was irrelevant to both of them (F (1,133)=215.269, p=.000, M= 1.81, SD=1.44). In comparison to irrelevant words co-participant's words were recalled better (F (1,133)=26.304, p=.000); however this significant difference was qualified by the interaction between category and condition (F (2,266)=110.123, p=.000, η^2=.45). Partner words (M= 3.03, SD=1.76) were recalled more frequently than the irrelevant words (M= 1.97, SD=1.48) in the joint condition (F (1,133)=36.227, p=.000) but not in the individual condition (F (1,133)=2.312, p=.131), replicating

the results that was reported by Eskenazi et al.(2012). See Figure 1 for means and confidence intervals.

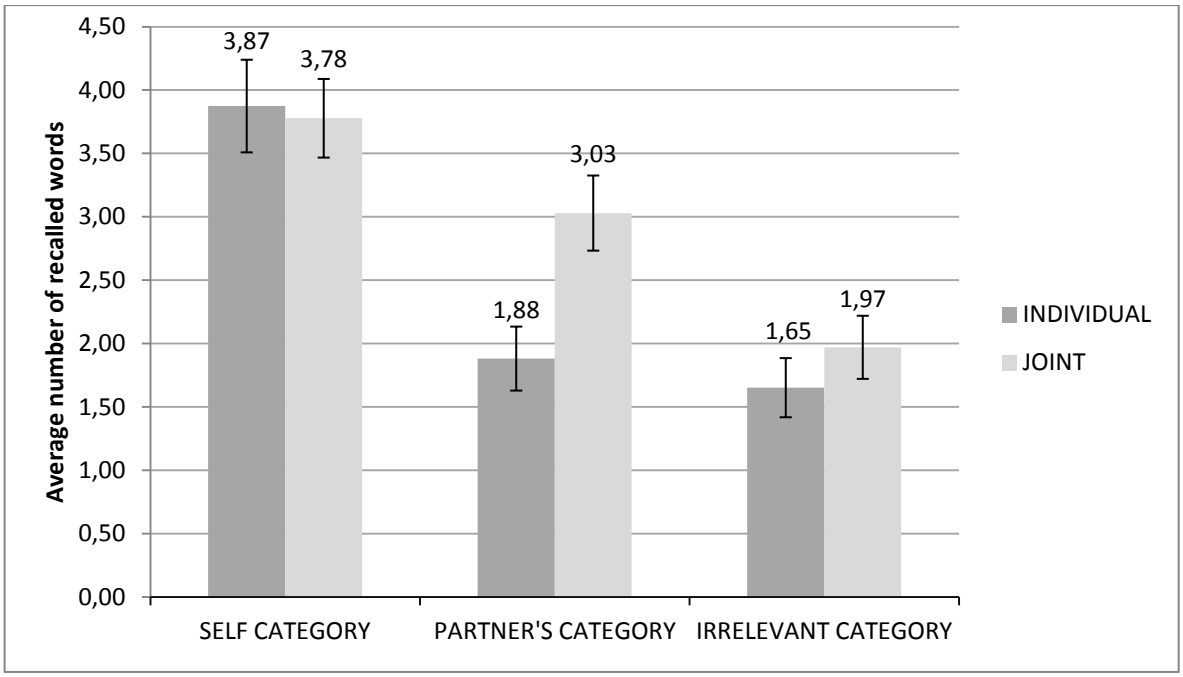

Figure 1. Average number of correctly recalled words as a function of Task Context and the Word Category. The error bars indicate 95% confidence intervals. Means are displayed above each error bar.

The main effect for order of experiencing individual and joint conditions was also significant, $F(1,133)= 8.263$, $p=.005$, $\eta^2=.06$. Participants who started with the joint task recalled on average more words ($M= 2.89$, $SD=1.97$) than participants who started alone ($M= 2.50$, $SD=1.86$). However, the significant interaction between order and task condition ($F(1,133)= 112.828$, $p=.000$, $\eta^2=.46$) implied a recency effect. That is, recall was better for the words that were presented in the second half of the experiment compared to words that were presented in the first half of the experiment. Pairwise comparisons between conditions by order, as well as means and standard deviations of recall as a function of order can are presented in Table 2.

Table 2

Pairwise Comparisons Between Individual and Joint Conditions by Order

	Joint Condition		Individual Condition			
Order	*M*	*SD*	*M*	*SD*	*F*(1,133)	*p*
Individual - Joint (*N*=64)	3.33	1.81	1.67	1.52	108.554	<.001
Joint - Individual (*N*=71)	2.56	1.81	3.21	2.07	17.266	<.001

5.3. Subvocalization Hypothesis

The subvocalization hypothesis proposed better recall for the conditions in which participants were able to subvocalize. We therefore tested the effects of inhibiting subvocalization on recall of items from word categories across individual and joint task conditions.

A three-way analysis of variance was carried out on recall with experimental condition (control, gum, ball) as the between-subjects variable, and with task context (individual, joint), and word category (self, partner, irrelevant) as within-subjects factors. Since the effect of order was due to a recency effect, order of experiencing the individual and joint conditions was left out in these analyses.

The main effect of experimental condition was significant (F (2,132)= 9.809, p=.000, η^2=.13), suggesting that overall recall was suppressed when participants were chewing a gum (M= 2.58, SD=0.10) and when they were squeezing a ball (M= 2.42, SD=0.12) compared to participants who were not occupied with any additional tasks (M= 3.11, SD=0.12). To further clarify this effect, we examined the significant two-way interactions. Only the interaction between category and task context was significant (F (2,264) =13.091, p=.000, η^2=.09), indicating that recall rate varied as a function of task context and word category. None of the two-way interactions of experimental manipulation were significant. That is, chewing a gum or squeezing a ball did not influence the differences in recall across individual and joint tasks or word categories.

As a corollary of the non-significant two-way interactions, the three way interaction between experimental manipulation, word category, and task context was also not significant (F (4,264) =1.278, p=.279, η^2=.02). These results did not lend support to the subvocalization hypothesis and showed that the systematic differences in recall across word categories and individual and joint conditions followed a similar pattern for participants irrespective of whether they were chewing a gum, squeezing a ball or doing nothing. Pairwise comparisons demonstrated that participants whose subvocal activity was blocked recalled more or less the same number of self-assigned words (M= 3.71, SD=0.27) as the participants who were squeezing a ball (F (1,132)=0.206, p=.651, M= 3.58, SD=0.31) and recalled slightly less words than participants who were not engaged in any distracting activity (F (1,132)=3.096, p=.081, M= 4.21, SD=0.30). Number of words recalled from the co-participant's category in the joint condition was also similar across all groups (see Figure 2 for the mean recall rates).

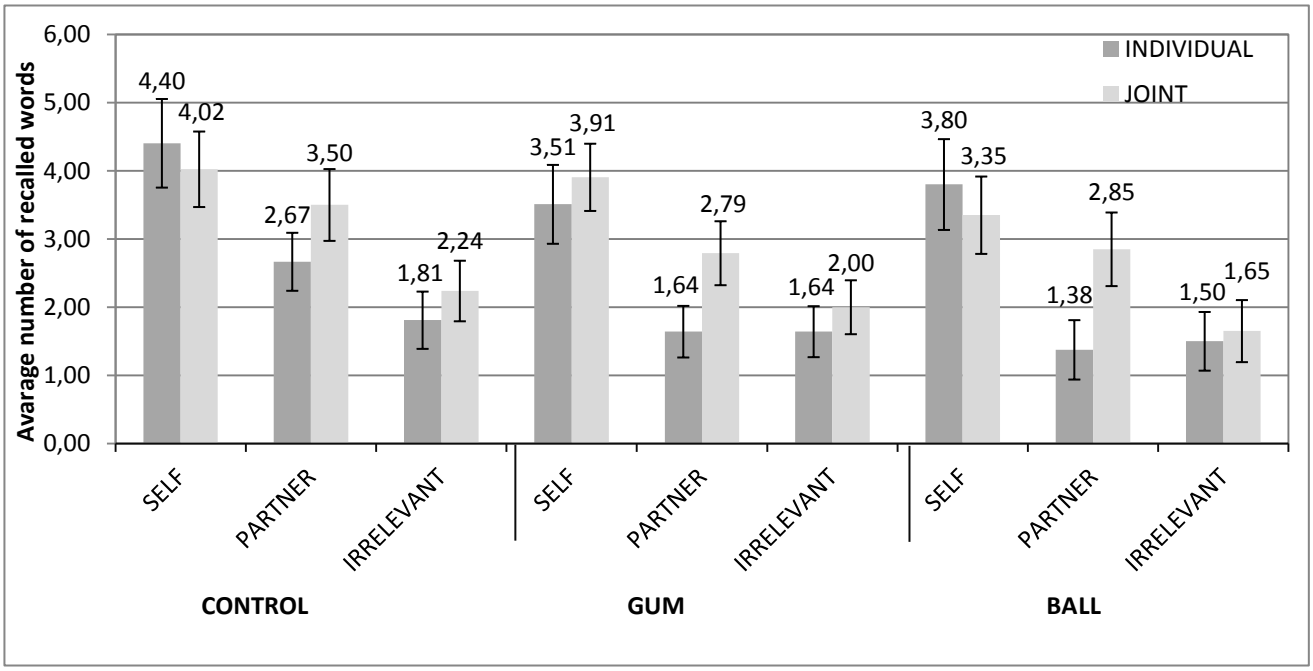

Figure 2. Average number of correctly recalled words as a function of Task Context, Word Category, and Experimental Manipulation. The error bars indicate 95% confidence intervals. Means are displayed above each error bar.

Contradicting our expectations, the results revealed a general distraction effect on learning due to chewing and squeezing, but not any support for subvocalization as the underlying mechanism of incidental learning effect.

5.4. Focus on Co-Participant (FOC)

We expected that the degree of attention directed to the co-participant during the joint task would be related to the strength of incidental learning effect for words that were designated for the other participant. Therefore, Focus on Co-Participant (FOC) Index[2] was introduced as a covariate in further exploratory analyses. Experimental manipulation was dropped since none of the interactions with this variable were significant.

The three-way ANCOVA with standardized FOC Index as the covariate yielded a significant interaction between FOC and word category (F (2,266) =3.113, p=.046, η^2=.02). That is, the differences in recall between the three word categories (self, partner, irrelevant) varied as a function of attention that was directed to the co-participant. In other words, FOC had a differential effect on recall for all 3 word categories. As can be seen in Figure 3, the more participants focused on their co-participant and his/her task, the more words they recalled from their partner's category. However, the interaction between FOC and task context was not significant (F (1,133) =1.068, p=.303, η^2=.01), indicating that predictability of recall by FOC was similar across individual and joint conditions.

[2] Standardized scores for the FOC Index were computed and used in further analyses.

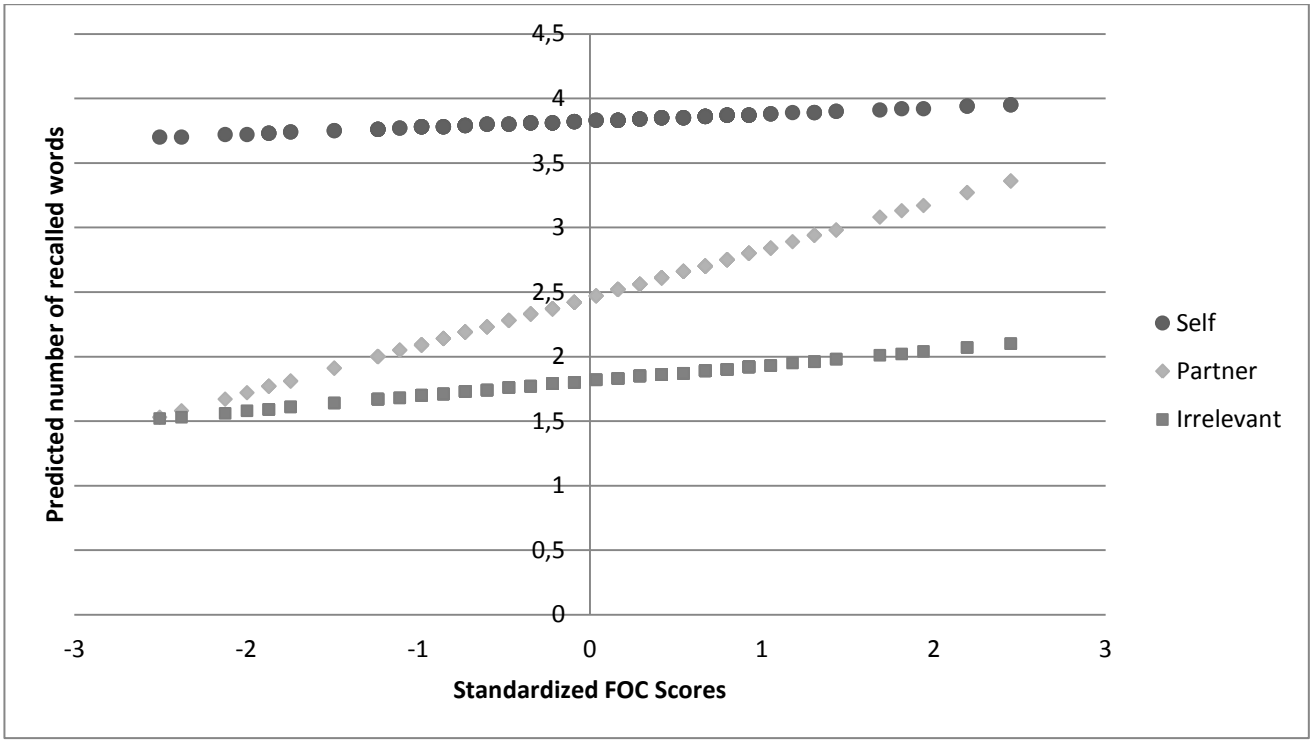

Figure 3. The simple effect of Focus on Co-participant on recall for the three different word categories (self, partner, irrelevant). The number of recall for each category was predicted with three separate regression analyses using standardized FOC Scores as the predictor.

Chapter 6

DISCUSSION

The main goal of the present research was to identify the cognitive and social mechanisms related to establishing common ground during the co-presence of two individuals. In particular, we were interested in uncovering the processes driving the incidental encoding of items from another person's word list.

In two recent experiments, Eskenazi and her colleagues (2012) have demonstrated that people experienced improved memory for words that were assigned to them compared to words that were assigned to another participant or that were irrelevant to both of them. The more intriguing finding those authors have reported was that the participants recalled their co-participant's words better than the irrelevant words. In the current study, we were indeed able to replicate these results, showing the stability of the incidental encoding effect exhibited for another person's word list.

Taking Eskenazi et al.'s (2012) research one step further; we investigated two processes, which could be driving this incidental encoding effect due to the presence of another person. The first process we proposed was unintentional subvocalizing of co-participant's items, and the second was self-expansion motivation, expressed through elevated engagement with the other participant and his/her task. To this end, we experimentally manipulated subvocalization and obtained self-report measures of subjective engagement. Our results showed that subvocalization manipulation caused distraction; however inhibiting subvocalization did not eliminate the incidental encoding of words assigned to the other participant. On the other hand, the degree to which a participant empathized with their co-participant predicted the number of words recalled from the other participant's list, suggesting that self-expansion might be the driving force behind the incidental encoding effect.

In the following sections, we will discuss potential implications of the current findings and future directions.

6.1. Subvocalization Hypothesis

Based on the assumption that subvocalization is a mechanism assisting phonetic coding (Locke & Fehr, 1972), we expected inhibition of subvocalization to extinguish the incidental encoding effect demonstrated by Eskenazi et al. (2012). Contrary to our expectations, subvocalization turned out not to be a mediator of the recall advantage for the other's words; as was evidenced by a recall *pattern* that was identical across experimental groups irrespective of the type of manipulation they received (i.e. gum vs. ball vs. control).

This null finding can be interpreted in two ways. First, we can argue that subvocalization was not the underlying mechanism of joint learning and therefore our subvocalization hypothesis was not supported. However, studies conducted to date ascribe an important role to subvocalization in terms of influencing cognitive processes such as encoding and working memory span (McGuigan, 1970; Standing, Bond, Smith, & Isely, 1980). Therefore, the second interpretation, namely the possibility of the inhibition method using chewing gum not being successful, is more likely. In the following, we will discuss why our subvocalization hypothesis might have failed and consider alternative explanations.

Two recent studies (Topolinski & Strack, 2009; Topolinski, Lindner, & Freudenberg, 2013) using chewing gum as an inhibitor of subvocalization encouraged us to use this manipulation in our own experiment. Repeated exposure to a stimulus and the resulting processing ease has been shown to elicit positive attitudes towards that recurring stimulus (for mere exposure effect, see, Zajonc, 1968). In both of these studies, chewing gum was assumed to inhibit subvocalization of repeatedly encountered stimuli by engaging relevant facial muscles, and in turn obstruct processing fluency and the consequential mere exposure effect. In fact, there is no direct neurological evidence showing that chewing interferes with muscles responsible for subvocalization. On the other hand, there is ample evidence showing that gum chewing occupies facial muscles involved in "happy expressions" (i.e.

zygomaticus major and buccinators muscles[3]) and keeping those muscles busy interferes with relevant affective processing as for instance in studies showing that it impairs recognition of happy faces (Tassinary & Cacioppo, 2000; Oberman, Winkielman, & Ramachandran, 2007). What prevented mere exposure effect to take place in the aforementioned studies might be the fact that chewing gum impaired participants affective processing rather than inhibiting subvocalization. That is, participants who were chewing gum during those experiments were not able to express pleasant facial expressions while they were encountering the stimuli, which probably could have caused them to evaluate those stimuli less favorably. In our case neither categorization nor recall tasks required affective processing of stimuli, which were affectively neutral. Therefore, it is likely that gum manipulation served as a mere distractor rather than suppressing subvocalization that our participants engaged in during the experiment.

There are several enhancements that can be implemented in the future to resolve this dispute about the role of subvocalization in our study. We still believe that subvocalization is a likely mechanism that is activated in the presence of another person as in the experimental paradigm we used. To this end, a minor improvement would be to use other methods of subvocal inhibition, which occupy additional muscles that are related to speech production. For instance, instructing participants to repeatedly articulate an irrelevant word (e.g. the day of the week, a letter sequence) has been used as another method to suppress subvocalization (Topolinski & Strack, 2009; Eiter & Inhoff, 2010) and can be considered as an alternative. However, one should keep in mind that regardless of whichever method is used; inhibiting subvocalization is a crude method since it affects all conditions and does not allow differential interpretations between conditions.

[3] Zygomaticus major is the facial muscle that is mainly responsible for pleasant expressions; it moves the corner of the mouth when a person smiles. Buccinator muscle's main function is chewing and it aids smiling by retracting the corner of the mouth and flattening the cheek.

A better option might be to directly measure the amount of subvocal activity during the categorization task rather than manipulating it. There is ample evidence showing that physiological techniques such as electromyogram (EMG; Cacioppo & Petty, 1981; Schultz & Wand, 2010) or event-related functional magnetic resonance imaging (fMRI; Huang, Francis, & Carr, 2008) are highly sensitive in capturing muscle and brain activity during subvocalization. Even though those are costly measures and obtrusive compared to other methods of subvocal manipulation, they can provide reliable information about subvocalization of words in the co-presence of another participant. We suggest that future research should consider alternative methods to manipulate subvocalization as well as the physiological approach to investigate the possible mediating role of subvocalization between co-presence of two individuals and incidental encoding effect.

6.2. Self-Expansion Motivation

The major finding of the present study was that self-expansion, expressed through increased focus on co-participant's task, influenced the strength of the facilitating effect of co-presence on encoding of co-participant's words. That is, the more participant's focused on the word category assigned to their partner, the more words they remembered from that particular category. There are several implications of this finding, which we will discuss in this section alongside with suggestions for future studies.

As we stated before, self- expansion is a basic human motivation and is mostly realized by including others' perspectives and resources in one's self (Aron et al., 2004). Research conducted up to now solidly established that people include close others and in-group members in themselves (for a review, see, Aron, Lewandowski, Mashek, & Aron, 2013); however this motivation has not been investigated in terms of including strangers into one's self. The current study makes an important contribution to self-expansion literature by demonstrating that people engage in self-expansion even when they are with strangers with whom they only share a task for a limited time. This finding

requires a reevaluation and extension of self-expansion theory in terms of short-term co-presence of people and necessitates future research in this domain.

One of the important issues that emerge from the findings of the current study is that the so called "incidental" encoding of other's words was not as incidental as Eskenazi et al. (2012) envisioned. The participants who reported to be engaged with their co-participant's words recalled more of their partner's words, indicating that they were well aware of the fact that they were focusing on their co-participant's task even if they were not supposed to do so. Unfortunately, the questions in the current study were designed to inquire only if the participants attended to their partner's task or not and did question if they did so deliberately or unintentionally. The present findings are adequate to conclude that encoding of partner's words were not incidental; however future work is required to gain a more complete understanding of this conscious partner-focus and the motivations behind it.

Even though our results suggest an important role of self-expansion and consequential partner-focus on encoding, the findings should be interpreted with caution since the established relation is correlational and does not imply causality. In future investigations, it might be possible to use a different measure of self-expansion, or experimentally manipulate the degree of self vs. partner focus. For instance, self-awareness, a psychological state in which one temporarily places oneself on his/her attentional focus, can be evoked by simple experimental procedures such as asking people look at a hand mirror or write about themselves (Duval & Wicklund, 1972). Thus, such primes of self-awareness might be used in future studies to manipulate attentional focus of participants.

6.3. Conclusion

In summary, while Eskenazi et al. (2012) demonstrated the effects of co-presence on encoding of items from another's list, those authors did not attempt to uncover the underlying mechanisms. The present study investigated how joint reference was established in such situations and revealed that self-expansion, which is a social motivation, was influential in very basic cognitive processes

such as attention allocation and encoding. The current study therefore emphasizes the importance of incorporating social aspects while studying human cognition.

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Appendix A

Animals, Vegetables and Household Items used in the experiment (in Dutch, English translations are presented in brackets)

Animals	**Vegetables**	**Household Items**
paard (horse)	wortel (carrot)	mes (knife)
koe (cow)	courgette (zucchini)	lepel (spoon)
leeuw (lion)	tomaat (tomato)	vork (fork)
olifant (elephant)	komkommer (cucumber)	pan (pot)
muis (mouse)	sperzieboon (green bean)	pollepel (large spoon)
schaap (sheep)	aardappel (potato)	bord (plate)
tijger (tiger)	kool (cabbage)	kom (bowl)
konijn (rabbit)	boon (bean)	glas (glass)
varken (pig)	erwt (pea)	blender (blender)
giraffe (giraffe)	bloemkool (cauliflower)	schaar (scissors)
rat (rat)	salade (salad)	oven (oven)
hamster (hamster)	aubergine (aubergine)	beker (mug)
wolf (wolf)	raap (turnip)	eetstokje (chopstick)
beer (bear)	peper (pepper)	spons (sponge)
schildpad (turtle)	spinazie (spinach)	hamer (hamer)
zebra (zebra)	broccoli (broccoli)	schroevendraaier (screwdriver)
ezel (donkey)	radijs (radish)	drilboor (drill)
hert (deer)	artisjok (artichoke)	schroef (screw)
luipaard (leopard)	asperge (asparagus)	zaag (saw)
aap (ape)	selderij (celery)	tang (pliers)
stier (bull)	linze (lentil)	schop (shovel)

panter (panther)	ui (onion)	liniaal (ruler)
kameel (camel)	biet (beet)	handdoek (towel)
gazelle (gazelle)	sla (lettuce)	ladder (ladder)
hagedis (lizard)	avocado (avocado)	stoel (chair)
neushoorn (rhino)	spruit (sprout)	tafel (table)
krokodil (crocodile)	champignon (mushroom)	bank (sofa)
eekhoorn (squirrel)	pompoen (pumpkin)	planken (shelf)
buffel (buffalo)	augurk (gherkin)	lamp (lamp)
panda (panda)	maïs (corn)	bureau (desk)
pony (pony)	knoflook (garlic)	tapijt (carpet)
bever (beaver)	rijst (rice)	bed (bed)

Appendix B

Questionnaire

Below is a list of statements regarding the ***joint*** word categorization task. Please read each statement carefully and rate how much you agree with those statements. Please press the number key (1-7) that best corresponds to your answer. Rate each statement considering how you were during the word categorization task that you have completed with your partner. Please answer as honestly as you can.

1= I disagree 7= I agree

1. I was as involved in my partner's words as in mine.
2. I only concentrated on my own words and ignored other words. (R)
3. I think that I recalled more words from my partner's category than the third category.
4. I was focused only on my own words during the presentation of the words. (R)
5. I think that my partner and I were like a team during the learning session.
6. I ignored my partner's words. (R)
7. I did not attend any of the words from the category we were supposed to ignore.(R)
8. I felt that I was sharing the same experience as my partner while I was with my partner.
9. I was totally independent from my partner during the task. (R)

Items marked with an (R) are reverse coded.