Prospective Memory: impact of age and grocery shopping frequency on memory performance

Sara Albuquerque Pinto

Dissertation written under the supervision of Daniel Fernandes

Dissertation submitted in partial fulfilment of requirements for the MSc in Business Administration, at the Universidade Católica Portuguesa, 21-04-2020

ABSTRACT

Title: Prospective Memory: impact of age and grocery shopping frequency on memory performance

Author: Sara Albuquerque Fernandes da Silva Pinto

Keywords: Prospective, Memory, Time, Age, Frequency, Grocery, Shopping, Products

Remembering to do things at the right time, is as important as being able to retrieve information from our past. For this reason, prospective memory is an important concept one should bear in mind in order to maintain function in everyday life. This dissertation seeks to understand to what extent does age and frequency influence memory performance for the prospective task of grocery shopping. Particularly, to test if consumers who are older and have more experience in performing grocery shopping tasks, are those who have the best memory to recall specific items, after a short interval of time. To achieve this aim, 181 participants from ages between 19 and 66 years old were surveyed. Results indicated that neither higher age nor higher frequency have a correlation with higher memory performance scores. Despite this, a positive correlation was found between higher age and higher grocery shopping frequency, meaning that older people tend to visit grocery stores more often than do younger ones. For future research is advised to collect a larger sample size, in order to provide more accurate results.

RESUMO

Título: Memória Prospectiva: impacto da idade e frequência de compras de supermercado no desempenho da memória

Autor: Sara Albuquerque Fernandes da Silva Pinto

Palavras-chave: Memória, Prospectiva, Tempo, Idade, Frequência, Supermercado, Produtos

Ter a capacidade de nos lembrarmos de executar tarefas no momento certo, é tão importante quanto podermos recuperar informações acerca do nosso passado. Por este motivo, para que se mantenha um funcionamento correto do nosso dia-a-dia, a memória prospectiva é um conceito essencial a ter em consideração. Este estudo visa compreender em que medida a idade e a frequência influenciam o desempenho da memória para a tarefa prospectiva de compras de supermercado. Em particular, testar se os consumidores com mais idade e que frequentam os supermercados com maior frequência, são aqueles que apresentam melhores desempenhos de memória para se lembrarem de produtos específicos, após um curto intervalo de tempo. De forma a alcançar este objetivo, foram inquiridas 181 pessoas com idades compreendidas entre os 19 e os 66 anos de idade. Os resultados demonstraram que nem mais idade, nem mais frequência têm uma correlação com um melhor desempenho de memória. Apesar disso, foi encontrada uma correlação positiva entre idade mais elevada, e uma maior frequência em compras, o que significa que pessoas com maior idade tendem a frequentar mais os supermercados do que a pessoas mais jovens. Para futuros estudos e pesquisas, é aconselhado recolher uma maior amostra, de forma a obter resultados mais precisos.

ACKNOWLEDGMENTS

First, and most of all, I would like to express my deep and sincere gratitude to my advisor, Professor Daniel Fernandes, for his expertise, guidance, and assistance throughout the process of writing my dissertation.

To my amazing mum and dad for the sacrifices made when providing me the best tools and opportunities to succeed. For always reminding me that life comes with ups and downs, and that strength and growth only comes through continuous effort and struggle. To my sweet little brother for all the laughs and memories created during this journey.

To Manuel, my role model, for teaching me how to be a better person every day. For making me smile and believe that every dream is reachable. Above all, for riding this crazy highway with me.

Finally, to my best friends, Sofia, Marta and Inês, for being present and providing me all the support needed.

TABLE OF CONTENTS

INTRODUCTION

Prospective memory (PM) is our ability to remember forthcoming events: it refers to the memory required to carry out activities to be performed in the future (Einstein & McDaniel, 2005; D. C. Park, Morrell, Hertzog, Kidder, & Mayhorn, 1997). Since PM is present in our everyday life situations, from managing work activities (e.g., remembering to attend a meeting at a specific time) to addressing health-related needs (e.g., remembering to take medication), to planning grocery shopping (e.g., remembering to buy some item in the grocery store), having a good PM is important in order to avoid the consequences of forgetting (Einstein & McDaniel, 1990).

Despite the fact that previous research and studies have clearly demonstrated a correlation between memory performance and task experience (more practice and experience = better memory skills), these were mainly for tasks that involved retrospective memory (memory for events that occurred in the past; Andrzejewski, Moore, Corvette, & Herrmann, 1991; Chase & Ericsson, 1982). Regarding prospective remembering, few studies have allocated resources to explore whether this type of memory might also be associated with the experience factor.

The primary objective of this study is to analyse the influence of *age*, *frequency* of shopping (which can be automatically linked with one's experience in this task), and *memory performance* for the prospective event of grocery shopping.

- If one's age increases, does one's memory performance scores increase?
- Does frequency/experience lead to a better memory performance?
- Is age related with how frequently one goes shopping?
- Does age lead to frequency/experience that leads to memory performance?

Questions like these might suggest a series of connections where an antecedent variable affects a mediating variable, which then affects an outcome variable (MacKinnon, Fairchild, & Fritz, 2007). This type of model is called Mediation. Figure 1 illustrates the single-mediator model where the variables are in rectangles and the arrows represent hypothesised relationships between them.

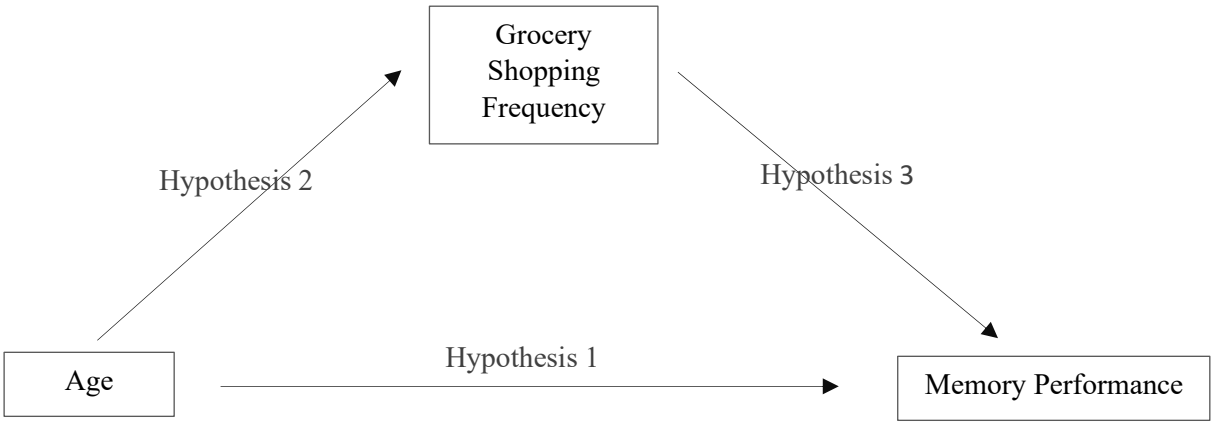

Figure 1 - Model and Hypothesis

Development of Hypotheses

Age and Memory Performance

Previous studies on memory generally involve information that the subject needs to recall later in response to some prompt (retrospective memory). However, less attention has been given to the capacity of remembering to recall without such a prompt (Maylor, 1990). Furthermore, it has been argued that remembering to perform an action in the future without being reminded (*remembering to remember*; prospective memory), is perhaps one of the most important conditions of memory functioning in our everyday lives (Wilkins, 1986). In addition, investigations of PM with respect to age have been majorly carried out in the laboratory and used experiments like remembering to press a specific key on the computer when the PM target cue appeared (Einstein & McDaniel, 1990) or remembering to stop a clock X minutes after the beginning of a trial (Rendell & Thomson, 1999). These concluded that younger adults generally perform better than older ones.

There are also – although much fewer – studies that have applied PM tasks in a naturalistic setting (i.e., in the everyday life of the participant with less or none guidance from the experimenter; Ihle, Schnitzspahn, Rendell, Luong, & Kliegel, 2012), such as asking participants to mail and call the experimenter at a specific point in time of the day. Surprisingly, these experiments revealed that older people tend to outperform younger ones (Ihle et al., 2012). For these reasons, we thus propose the following hypothesis:

Hypothesis 1: Higher the age, higher subsequent memory performance.

Age and Frequency in Grocery Shopping

Consumer behaviour examines "the processes involved when individuals or groups select, purchase, use or dispose of products, services, ideas or experiences in order to satisfy needs and desires" (Solomon, Bamossy, Askegaard, & K. Hogg, 2006, p.27). Since one primary human need is for food, then as a consequence, the trip to the grocery store is a necessary and routine activity for all consumers (Meneely, Burns, & Strugnell, 2009). Also, since the characteristics of a particular age group affect the way in which they perceive and use food, it is pertinent and reasonable to study specific age segments in order to determine consumer behaviour within and between age cohorts (Meneely et al., 2009).

Kahn and Schmittlein (1989), in a study about the shopping patterns of households, found that approximately one-third of their sample was composed by "quick" shoppers – those who spent relatively small amounts per trip but made a large number of trips. The remaining participants were considered "regular" shoppers - although spending more on each trip, they visited grocery stores less frequently. Also Bawa and Ghosh (1999) dedicated their research in developing a model of household shopping behaviour. The central assumption of their model was that elements such as age, income, or access to stores could have an impact on the shopping trip frequency. In fact, and contrary to other authors views, they discovered that frequency of grocery shopping was linked to age by verifying that households headed by an older individual were likely to shop with more frequency than those headed by younger adults. From this research it can be seen a connection between age and shopping behaviour. Hence, the following hypothesis is presented:

Hypothesis 2: Higher the age, higher the grocery shopping frequency.

Frequency in Grocery Shopping and Memory Performance

One of the most common notions in modern psychology is that humans are sensitive to event frequency, meaning that when something happens numerous times, some representation of its repetitiveness is recorded and stored in our memory (Howell, 1973). This information is believed to have a behavioural impact, from simple reaction times, to free recall, recognition, learning, and even on the process of making complex decisions (Howell, 1973). On the basis of the above argument, follows:

Hypothesis 3: Higher the grocery shopping frequency, higher subsequent memory performance.

LITERATURE REVIEW

Retrospective vs Prospective Memory

Previous research has shown that two different types of memory can be distinguished: retrospective and prospective memory.

Retrospective memory (RM) can be defined as the memory for past events, for example, remembering characters from a movie or remembering words from a specific list given in a past experiment (Einstein & McDaniel, 1990). In contrast, prospective memory (PM) is defined as memory for activities to be performed in the future (Einstein & McDaniel, 1990), for instance, having to remember to attend a meeting, call someone, or to buy some item at the local grocery store on the way home.

One of the main theoretical questions regarding this matter is whether exists a positive correlation between retrospective and prospective memory functions and if the cognitive processes used to remember things in the past are similar to those used to remember things in the future (Conway, 1997). Although there are different perspectives amongst different authors, a central distinction between these two types of memory is that with PM, one must "remember to remember", meaning that no one prompts the individual to remember the deferred intention when the execution time comes (Dismukes, 2012). For this reason, prospective memory requires a greater degree of self-initiation than retrospective memory (Einstein & McDaniel, 1990).

Aging and Prospective Memory

It is generally known that aging is related to a decrease in the cognitive resources available to process mental information (Bisiacchi, Borella, Bergamaschi, Carretti, & Mondini, 2008). Hence, older people usually have worse performances in memory tasks that require a more difficult degree (i.e. recall tasks) than younger do (G. Smith, Della Sala, Logie, & Maylor, 2000). Considering that forgetting to perform intended activities can have major consequences, for example forgetting to take our prescribed medication at the right time or meeting-health related appointments, it is of utmost importance that prospective memory is on its best functioning (Einstein & McDaniel, 1990).

In order to enable a better PM performance, it is required to know if relevant internal or external cues are available to prompt remembering (G. Smith et al., 2000). According to Craik's theory of aging (1986) when external cues (i.e. recognition) are not available to guide the reconstruction of an event or action, one must rely on self-generated cues, which involve the

use of internal retrieval processes. For example, when remembering to make a phone call at a given time, or to attend a specific event at a given day, subjects have available a different set of external cues such as calendars or notes to help them remember. If, in another scenario, these external cues were not available, subjects had to initiate an internal process where they would be looking for cues.

Another aspect of Craik's theory (1986) is that prospective memory requires a greater degree of self-initiation since it is heavily linked to the "remembering to remember" type of memory. For this reason, if we assume that memory deteriorations derive from cognitive functions, then internal cuing should be poorer for the elderly (G. Smith et al., 2000).

Event and Time-based Tasks

According to Kvavilashvili and Ellis (1996), PM requires the execution of a previously formed intention that prompts our brain to remember the action in the future. Although several types of intentions exist, only event and time-based intentions are proven to be manageable under laboratory control (Hicks, Marsh, & Cook, 2005). Therefore, most of the studies use either one or both of these types (Hicks et al., 2005).

Event-based intentions/tasks are characterized for being actions performed when a certain external event or cue occurs (G. Smith et al., 2000). An example could be if someone happened to see a specific word on a screen, they were to press a response key on the keyboard (Einstein & McDaniel, 1990), or someone remembering to buy their mother a birthday card because they passed through a stationary store. In contrast, time-based tasks happen when the intended action has to be executed after a period of time has passed or at a particular point in time (Kliegel, Martin, McDaniel, & Einstein, 2001). For instance, perform an action at noon or every 8 minutes. In this case, there is no obvious external or specific cues to trigger remembering, meaning that subjects have to initiate the prospective memory function on their own (Einstein & McDaniel, 1990).

For reasons that are not fully understood, the great majority of research has investigated event-based prospective memory whereas only few articles have studied time-based prospective memory (Hicks et al., 2005).

Another important aspect that has arisen in the literature regarding this subject is whether identifying a cue can be done almost automatically or if it requires processing resources (Hicks et al., 2005). The multiprocess framework (McDaniel & Einstein, 2000; McDaniel, Einstein, Guynn, & Breneiser, 2004) states that in order for a cue to be detected automatically at least

one of the following conditions needs to be fulfilled: when there is a high association level between the cue and the to-be-performed action (e.g. the target "stationary store" might be highly associated with the intention to buy a birthday card – for someone who always buys birthday cards at stationary stores), when the cue is salient in some way (e.g. presenting low-meaningful words as targets vs presenting words with upper case font when the remainder of words are in lower case), and when the ongoing task requires focal processing of the cue (e.g. printing some photos to make an album. Though the intention had been formed last week, for some unknown reason the subject was not able to prompt remembering, and only when he/she were at the office and saw some pictures they had at the desk, were they able to remember the prior intention they had). If these conditions are not met, cue detection can require significant processing resources (Hicks et al., 2005).

Encoding, Storage and Retrieval

The term *memory* is most commonly defined as the retention of information for future use (Rahmatian & Armiun, 2013), and it is conceptualized as being a process consisting of three independent, though interrelated processes: encoding, storage and retrieval (Baddeley, 2012).

Encoding relates to the initial experience of perceiving and learning information. Whenever an external stimulus enters our sensory system, it generates neural impulses which will be received by different areas of our brain for further processing (Butler, 2018). Storage is the second stage of memory, and it is defined by the process in which encoded information is retained and held over a period of time. Just like we usually write a note to remind us of performing something in the future, so does our brain (Sternberg & Sternberg, 2011). Finally, retrieval refers to bringing the previously stored information to awareness, so that it can be used in performing cognitive tasks (Butler, 2018). In this sense, retrieval operations close the act of remembering that begins with encoded information about an event into the memory store (Tulving & Thomson, 1977). For example, if we meet someone for the first time, we have to encode her/his name while associating the name with the face. Then, the information is stored and maintained over time. If that person is seen again a month later, we need to recognize her/his face and have it served as a cue to retrieve her/his name.

Previous research has long debated whether the processes of encoding and retrieval of information are similar. While some studies believe that in fact, there exists a similarity between these two and that such similarity constitutes one of the prerequisites for successful remembering (Kolers, 1973; Morris, Bransford, & Franks, 1977), others, however, are not in

line with this view and define encoding and retrieval as two different processes. More specifically, studies shown marked differences between encoding and retrieval when divided attention was used, meaning that subjects´ attention was divided between two different activities (Naveh-Benjamin, Craik, Perretta, & Tonev, 2000). During encoding, when divided attention was tested, performing a parallel task demonstrated to have a clear detrimental impact on memory performance comparing to when subjects were fully committed to only the task of encoding (Naveh-Benjamin et al., 2000). Nonetheless, the effects of divided attention in retrieval process shown only small reductions on memory performance (Naveh-Benjamin et al., 2000).

Memory failures can occur in any of the encoding, storage or retrieval stages, which might lead to forgetting or to having false memories (e.g. seeing that person one month later, and do not remember her/his name). The key to improve one's memory is to enhance the processes of encoding and to search for techniques that guarantee a better effective retrieval (Butler, 2018). Good encoding means being able to relate new information with what one already knew or being able to create associations among information that needs to be remembered, while successful retrieval means being able to develop cues that will lead us back to the encoded information (Butler, 2018).

Memory Metacognition and Memory Performance

Memory metacognition refers to people's knowledge and ability to monitor and control their own learning and memory processes (Dunlosky & Bjork, 2008). This vision has an impact on learners' behaviour by notify them whether or not more study is needed (Dunlosky & Nelson, 1992). Meaning that pessimistic predictions about one's future memory might lead to behaviour that ensures better memory accuracy and performance (Fernandes, 2013), while in contrast, optimistic predictions about one's future memory might lead consumers to think that is unnecessary to employ strategies to achieve better memory performance (Fernandes, 2013).

Also, according to Fernandes (2013), another strategy to establish accurate memory performance in the future is to rely on memory aids, which might be partially determined by our predictions about future memory. For example, consumers who predict they are more likely to forget to buy an item at the grocery shop, will be more willing to write a shopping list than those who believe they are less likely to forget an item (Fernandes, 2013).

The Zeigarnik Effect

In 1927, an experiment regarding finished and unfinished tasks was conducted by Bluma Zeigarnik. Zeigarnik presented participants within her study with a variety of tasks to perform, such as manual works or mental problems (Zeigarnik, 1927). Participants were allowed to complete half of the tasks as rapidly and correctly as possible, whereas the remaining tasks, were interrupted before participants could complete them. Immediately after the completion, participants were asked to recall the tasks upon they had worked during the experiment. The results of the study showed that participants recalled more of the interrupted tasks that those they were able to complete (Zeigarnik, 1927).

The Zeigarnik effect is then the tendency one has to remember things that are undone more than remembering things that have been completed (Burke, 2011). This suggests that the interruption of an ongoing task/activity facilitates subsequent memory performance (Mäntylä & Sgaramella, 1997), possibly because the failure on completing a task creates a feeling of unresolved tension, which prompts greater recall of the unfinished task (Savitsky, Medvec, & Gilovich, 1997).

Although Zeigarnik effect deals with retrospective remembering, a study to examine Zeigarnik-like effects in prospective memory was also found (Mäntylä & Sgaramella, 1997). In this experiment, task-interruption paradigm was used in the context of verbal problem solving, and it also showed that interrupted items were more efficient reminders of the to-be-performed action than were completed items (Mäntylä & Sgaramella, 1997).

Delayed JOL Effect

Judgements of Learning (JOLs), are individuals' predictions and expectations of the likelihood of consequent memory performance for recently studied items (Dunlosky & Nelson, 1997): a student who is studying for an upcoming exam should a) monitor what he/she knows, providing a basis for predicting subsequent retention; and b) control his/her allocation of time. The interaction between these two factors, called a judgement of learning, will allow for an efficient use of study time and has a guiding role in the acquisition of new information (Nelson & Dunlosky, 1991).

In a previously conducted experiment by Dunlosky & Nelson (1991), subjects studied a list of paired associations (e.g. *elephant-sunburn*) and then predicted future recall (by making a JOL): JOLs were prompted by the appearance of the cue word alone (e.g. *elephant*). As the cue word was presented, participants were then encouraged to make a prediction regarding the likelihood of successful recall of the second word (target). The study showed that JOLs made immediately

after the experiment, were a lot less accurate than by delaying JOLs until 5 minutes after study. The delayed-JOL effect is then defined as the finding in which judgments of learning are more effective to predict future recall when they are made a short time after testing (e.g. X minutes) rather than immediately after study (Dunlosky & Nelson, 1992).

Consequently, one important question that has been raised is *why do judgements of learning improve over time.* Researchers Dunlosky & Nelson (1991) suggested that this phenomenon is due to target-based information from long-term memory (LTM). Since the cue word triggers JOLs and represents the approximate probability of the target word being retrieved in the future, one way to evaluate this is to make a covert attempt to recover the target and then base the JOL on the results of the search (Nelson & Dunlosky, 1991). By using this strategy, successful retrieval of the target word (when the participant makes a JOL) should lead to higher JOL ratings. On the other hand, unsuccessful retrieval should result in lower JOLs (Kelemen & Weaver, 1997). Despite this, with immediate JOLs, the target is still in short-term memory (STM). JOLs that only tap in LTM should be more reliable since eventual recall of the target word only tests LTM. According to the authors, STM information contaminates JOLs immediately, but not delayed JOLs (Nelson & Dunlosky, 1991).

Grocery Shopping

Grocery shopping is an ongoing and essential activity (M. F. Smith & Carsky, 1996a) characterized by several buying goals achieved through the experience of processing a variety of in-store stimuli (C. W. Park, Iyer, & Smith, 1989). Consumers are met with perfectly aligned products and brands full of different colours and shapes, intense and attractive smells, or even advertisements covering the floors (Inman, Winer, & Ferraro, 2009). Some consumers use these in-store stimuli as cues to prompt remembering groceries they intended to buy in the first place, while others have the intention to enter the store and only buy a certain set of products (Inman et al., 2009). Either way, in both cases consumers are exposed to in-store stimuli that might trigger unrecognized needs, which may lead to unplanned purchasing behaviour (Inman et al., 2009).

According to Bucklin and Lattin (1991), planned purchases are decisions that are completely formed before entering the store. In contrast, unplanned purchases are those that were not planned prior to entering the store. In this sense, any grocery item in a shopper's grocery basket might have been planned to the level of category, of brand, or not planned at all (Inman et al., 2009).

Memory Aids

When we want to remember to buy grocery items on our way home after work, we may write grocery shopping lists in advance, or if we want to remember to bring a certain book to school, we may put the book in our briefcase the night before. These activities demonstrate the use of memory aids – devices or strategies intended to improve memory (Intons-Peterson & Fournier, 1986). As trivial as these memory aids may seem, they play major roles in our lives.

Memory aids can be classified into two different types: internal and external (Intons-Peterson & Fournier, 1986). Internal memory aids rely on self-contained devices such as cognitive rehearsal and the use of rhymes or other mnemonic features, while external memory aids involve the use of tangible and physical aids external to the person, such as writing on one's hand or making lists, or putting a note on a calendar (Block & Morwitz, 1999).

Grocery Shopping Lists

When faced with a task with several decisions and multiple distractions, consumers may rely on aids to help ease decision-making (Block & Morwitz, 1999). Shopping lists are considered by cognitive phycologists as an effective external memory aid that enhances remembering, or prevents forgetting (Block & Morwitz, 1999). In addition, shopping lists have the power to influence consumers' buying behaviour (Fernandes, 2013). For example, consumers use shopping lists to help them make all their planned purchases and avoid unnecessary and impulsive purchases (Block & Morwitz, 1999).

Furthermore, consumers who rely on shopping lists spend less money than those who don't, and are less likely to make in-store decisions (Fernandes, 2013). For these reasons, shopping lists are considered mechanisms that improve self-regulation and make grocery shopping easier (Fernandes, 2013).

METHODOLOGY

The purpose of this chapter is to explain in detail the research methods and methodology used to conduct this study, with a clear and precise description of how the experiment was done, and the rationale for the specific experimental procedures chosen.

Research Approach

This thesis strives to understand to what extend does consumers' experience in grocery shopping affect memory performance. Particularly, to test if consumers who are older and have more experience in performing grocery shopping tasks, are those who have the best memory to

recall specific items, after a short interval of time. Therefore, for the purpose of this research, secondary data has been collected through previous and relevant literature, adopting a descriptive research approach.

In order to answer our research question and subsequent hypothesis, primary data was collected by the means of quantitative methods, through an online questionnaire.

Data Collection Procedure

For the collection of quantitative data, an online questionnaire was developed using Qualtrics. The decision to choose an online survey relies on the fact that this is a much more flexible and convenient method since respondents can answer at the most suitable time for themselves. Also, regarding speed and timeliness, online surveys can be administrated in a time-efficient manner, minimizing the time it takes for the survey to be conducted in the field and for data collection, when compared with other commonly used research methods (Evans & Mathur, 2005).

Despite their numerous strengths, online surveys can also face some potential weaknesses if not properly addressed. For instance, security and privacy issues regarding the usage of personal data are frequently expressed by respondents as well as unclear answering instructions, which might lead respondents to feel confused or frustrated and leave the questionnaire without finishing it (Evans & Mathur, 2005). In order to avoid these circumstances, the survey was kept short and straightforward and it was stated at the beginning that all the information gathered would be confidential and used for study purposes only.

Concerning the software used to develop the survey, Qualtrics was elected as being the preferred platform because of its considerable advantages. Not only it offers the possibility to build our survey in different languages at the same time, but it also gives suggestions of possible questions. For distribution purposes, the software automatically generates a link that can be easily shared among different channels. Finally, for finalizing the process of collecting data and further analysis, the results can be quickly transferred either to Excel or SPSS.

Before launching the questionnaire, a pre-test to approximately 15 participants was conducted in order to verify if all the requirements concerning structure and content were met.

The data was collected during a month, from beginning December 2019 to beginning January 2020, and it was mainly distributed using two different approaches: through social media platforms (Facebook, LinkedIn and WhatsApp) and also via e-mail. When using Facebook and LinkedIn, the survey's link was shared within researcher's profile and then reshared by some

friends and family members as a way to obtain more responses. Also in Facebook, the survey was shared within a set of different groups related to psychology and consumer behaviour. The strategy used for WhatsApp and e-mail focused on trying to reach all the potential contacts from researcher's network by simply sending them the link and explaining some basic rules for them to successfully complete the questionnaire.

Questionnaire Design

The survey aimed to evaluate consumer's memory prediction vs memory performance for grocery shopping after a short period of time. In this regard, it was of utmost importance understand respondent's involvement with this particular activity.

In order to reach a larger audience and guarantee more effective responses, the questionnaire was available both in Portuguese and English. Also, participants were asked not to use mobile devices such as smartphones or tablets when completing the survey. Due to the time interval that was placed in the middle, if for some reason the phone or tablet locked, they would have to start all over again, meaning that the results could be potentially biased since they had previously read the questions.

The online questionnaire was structured in four different parts. Before all the questions, respondents were presented with an introduction to the topic that explained the main objective of the study. In addition, it was also stated that all the data collected would be kept anonymously and used for study purposes only.

The second part of the survey focused on demographics. By asking questions related to age or gender, it is possible to ensure that our study is being directed to the right audience (Hughes, Camden, & Yangchen, 2016). Furthermore, demographics might allow us to understand if certain factors could potentially influence respondent's choice of answers (Hughes et al., 2016).

The third block was designed with the aim of getting to know respondent's grocery shopping behaviour: whether were they familiar with the task, if was there someone at home responsible for it, and how frequently did they go shopping. Since consumer involvement is an important aspect within grocery shopping, it was extremely relevant to understand what type of relationship did the shopper have with the activity itself (M. F. Smith & Carsky, 1996).

Lastly, gathered information concerning demographics and grocery shopping behaviour, it was time to assess memory (prediction and performance). This block had three main questions: 1 - respondents were asked if they usually forget to buy something they intended to buy in the first

place; 2 – respondents were asked to name 10 grocery products they intended to buy next time they go to the grocery shop; 3 – respondents were asked to rewrite the 10 products they had previously named. Before being able to move on to the third question, participants were asked to wait a period of 10 minutes. During this time and as an attempt to recreate a real-life situation, participants were encouraged to perform other activities while waiting. When the timer reached 00:00, the final question appeared on the screen.

The idea of having a time interval in the middle of the questionnaire was strictly for the purpose of memory testing. If for instance respondents were to answer all the questions in a row, the likelihood of remembering all the named products would be much higher, not living up to the expectations of a real-life situation where people are constantly being distracted by external or internal factors.

FINDINGS

Preliminary Analysis

From all the questionnaires, a total of 240 responses were recorded in which only 181 were considered valid. The remaining 59 participants were not taken into account because they did not finish the study. That being said, the completion rate was approximately 75% and the dropout rate approximately 25%.

In terms of demographic results, out of the sample n= 181; 64 participants were male (35,4%) and 117 were female (64,6%). Regarding age, the majority of respondents were categorized as being *>50 years old* (28,2%), followed by the *<25 years old* (27,6%) category, then *25-29 years old* (25,4%) and lastly *30-49 years old* (18,8%).

Grocery Shopping Behaviour Analysis

Since the questionnaire's main purpose was to provide an answer to our previously defined hypothesis, it was extremely important to gather data regarding respondent's grocery shopping habits. From the data collected, it was possible to state that the vast majority of participants was familiar with the activity itself: 167 participants, representing 92,3% said *Yes* when questioned if they usually do grocery shopping vs. the remaining 7,7% who said *No.*

Concerning frequency of shopping, respondents had to choose from a scale of *1: + than 3 times a week* to *6: Never* in order to classify their experience. The most chosen category was *3: 1 time per week* with 72 participants (39,8%), followed by *2: 2-3 times per week* with 52 participants (28,7%), *1: + than 3 times a week* with 25 participants (13,8%), *4: 1 every two weeks* with 19 participants (10,5%), then *5: 1 time per month* with 8 participants (4,4%), and finally *6:Never*

with only 5 participants (2,8%). If we add the first 3 categories, we can conclude that 82,3% of the population prefers to shop on a weekly basis, mainly once per week.

As a better way to get to know respondent's role within the grocery shopping task, they were questioned if - at their homes - was there usually someone responsible for carry on this activity, and if were they the ones responsible of doing so. While 74% admitted to have someone at home responsible for that task, the remaining 26% said that there was not specifically someone in charge of that. Furthermore, 103 participants accounting for 56,9% said that they were the ones who did all the shopping, while 78 participants (43,1%) said that they were not the person in charge

Finally, the last block of questions was created with the purpose of assess respondents 'memory. In a first stage, they were asked regarding their memory for planned purchases, and then, to name 10 products they intended to buy next time they went to the grocery store. It was possible to conclude that consumers tend to forget some previously planned purchases when going grocery shopping - 74.6 % of the participants' stated "definitely yes" when asked if they usually forget to buy something. After naming the products, participants were asked to wait a period of 10 minutes (between this time interval, was where the dropout rate of 25% got concentrated). When the timer reached 00:00, the final question appeared and participants were asked to rewrite the products they remembered.

Hypotheses Analysis

H1: Higher the age, higher subsequent memory performance.

First, to examine the degree of relationship between age and memory performance in the grocery shopping field, a Pearson product-moment correlation was conducted. One hundred and eighty-one people were surveyed regarding their age ($M = 36.64, SD = 14.33$) and assessed by their memory performance ($M = .896, SD = .1299$). Results indicated that there was no statistically significant association between the two variables as we can observe from *table 1*, meaning that changes in one variable are not correlated with changes in the second variable ($r = .052, n = 181, p > .05$).

Pearson Correlation

		Age in years	Memory Performance
Age in years	Pearson correlation	1	.052
	Sig. (2-tailed)		.486
	N	181	181

Memory Performance	Pearson correlation	.052	1
	Sig. (2-tailed)	.486	
	N	181	181

Table 1 - Pearson Correlation for H1

Second, a scatterplot was built in order to support the above findings and provide a general illustration of the relationship between age and memory performance. From *figure 2 (see appendix)* we are able to observe that the coefficient of determination (R^2) is equal to .003. Whereas correlation explains the strength of the relationship between an independent and dependent variable, R^2 explains the amount of variance in the dependent variable (memory performance) that is predictable from the independent variable (age). In this particular case, since 0.3% is nearly 0, we are able to conclude that there is almost no relation between variables, meaning that memory performance cannot be predicted using age. Also looking at the scatterplot, there appears to be one extreme outlier.

Lasly, to assess variables' distribution a normality test was performed. The null hypothesis for this test states that a sample X comes from a normally distributed population (this will be rejected if *sig.* (*p-value*) < .05). Results indicated that none of the variables was normally distributed: in both *Kolmogorov-Smirnov* and *Shapiro-Wilk* tests our *sig.* was always equal to 0.00 (*see table 3 – appendix*). We therefore rejected this null hypothesis. This test is an important feature to measure because of the fact that many statistical tests (including Pearson product-moment correlation) require the parametric assumption of normality: variables must be normally distributed.

Despite this, according to the Central Limit Theorem, as the sample size becomes larger (N ≥ 30), the distribution of sample means tends to a normal distribution, meaning that the bigger the N, the more results take the shape of a normal distribution. For this reason, the previous *H1* and next H2 and H3 analysis were conducted disregarding the normality assumption.

H2: Higher the age, higher the grocery shopping frequency.

Hypothesis 2 states that age is positively related to frequency/experience with grocery shopping. Note that when measuring *frequency*, the scale ranged from 1 to 6, being 1 associated with more frequency and 6 being associated with no frequency at all.

This relationship was investigated using Pearson product-moment correlation coefficient, similarly to H1. One hundred and eighty-one people were surveyed regarding their age (*M = 36.64, SD = 14.33*) and frequency of shopping (*M = 2.71, SD = 1.14*). Results indicated that

there was a small, but statistically significant negative correlation between the two variables (*r = -.149, n = 181, p < .05*), meaning that as age increases, people´s frequency in shopping will also increase.

Pearson Correlation			
		Age in years	**GS Frequency**
Age in years	Pearson correlation	1	-.149*
	Sig. (2-tailed)		.046
	N	181	181
GS Frequency	Pearson correlation	-.149*	1
	Sig. (2-tailed)	.046	
	N	181	181

Table 2 - Pearson Correlation for H2

*. Correlation is significant at the 0.05 level (2-tailed).

For a better estimated idea of the nature (strength and direction) of the relationship of our two variables, a scatterplot was built. From *figure 3 (see appendix)* we are able to observe that the coefficient of determination (R^2) is equal to .022, suggesting that only an amount of 2.2% of the dependent variable (frequency) can be predicted by the independent variable (age).

Regarding normality, results indicated that none of the variables was normally distributed: in both *Kolmogorov-Smirnov* and *Shapiro-Wilk* tests our *sig.* was always equal to 0.00 (*see table 4 – appendix*).

From hypothesis 2, it was also relevant to understand whether being in charge of the grocery shopping task could be predicted based on age (i.e., where the dependent variable is "being in charge of the grocery shopping task", measured on a dichotomous scale – "yes" or "no" – and the independent variable "age"). For this, a binomial logistic regression was performed. The reason for choosing this test instead of a multiple regression was due to the fact that in this research situation, our dependent variable of interest was categorical where for multiple regression the dependent variable must be measured continuously. Results indicated that the model containing our predictor (independent) variable was statistically significant, X^2, (*1, n = 181) = 7.219, p = .007.* The model as a whole explained between 3.9% (*Cox and Snell R squared*) and 5.2% *(Nagelkerke R squared*) of the variance of our variable "being in charge of the grocery shopping task", classifying 57.5% of the cases correctly. As shown in *table 5*, the independent variable “age” made a statistically significant contribution to the model (*p = .009*), recording an odds ratio of 1.03. This means that for every unit increase in the independent

variable (one more year), the odds of a participant scoring "1 – Yes" in the dependent variable - "being in charge of the grocery shopping task" – increases by a factor of 1.03.

Logistic Regression						
	B	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
Age in years	.029	.011	6.856	1	.009	1.030
Constant	-.765	.420	3.315	1	.069	.465

Table 5 - Logistic Regression for H2

H3: Higher the grocery shopping frequency, higher subsequent memory performance.

Hypothesis 3 states that frequency is positively related to memory performance. Note that when measuring *frequency*, the scale ranged from 1 to 6, being 1 associated with more frequency and 6 being associated with no frequency at all.

This relationship was investigated using Pearson product-moment correlation coefficient, as done in H1 and H2. One hundred and eighty-one people were surveyed regarding their frequency of grocery shopping ($M = 2.71, SD = 1.138$) and assessed by their memory performance ($M = .896, SD = .1299$). Results indicated that there was no statistically significant association between the two variables as we can observe from *table 6,* meaning that changes in one variable are not correlated with changes in the second variable ($r = .085, n = 181, p > .05$).

Pearson Correlation			
		GS Frequency	**Memory Performance**
GS Frequency	Pearson correlation	1	.085
	Sig. (2-tailed)		.253
	N	181	181
Memory Performance	Pearson correlation	.085	1
	Sig. (2-tailed)	.253	
	N	181	181

Table 6 - Pearson Correlation for H3

For a better estimated idea of the nature (strength and direction) of the relationship of our two variables, a scatterplot was built. From *figure 4 (see appendix)* we are able to observe that the coefficient of determination (R^2) is equal to .007. Since 0.7% is nearly 0, we are able to conclude that there is almost no relation between variables, meaning that memory performance cannot be predicted using frequency. Also looking at the scatterplot, there appears to be one

extreme outlier, which were respondents who only scored 0.1 in memory performance (out of the 10 products, only remembered 1).

Regarding normality, results indicated that none of the variables was normally distributed: in both *Kolmogorov-Smirnov* and *Shapiro-Wilk* tests our *sig.* was always equal to 0.00 (*see table 7 – appendix*).

Robustness Check

After a thorough analysis, researchers found pertinent to check if the main conclusions reached were correct. In order to do so, a second - but less extensive - analysis of our two hypotheses (only those who had reported outliers were re-assessed) was done, but this time with no the present outliers.

H1: Higher the age, higher subsequent memory performance.

Hypothesis 1 was re-investigated using Pearson product-moment correlation coefficient. One hundred and eighty people were surveyed ($n = 180$ without outlier) regarding their age ($M = 36.41$, $SD = 14.342$) and assessed by their memory performance ($M = .900$, $SD = .1158$). Results confirmed once again that there was no statistically significant association between the two variables as we can observe from *table 8 – see appendix,* meaning that changes in one variable are not correlated with changes in the second variable ($r = .026$, $n = 180$, $p > .05$).

H3: Higher the grocery shopping frequency, higher subsequent memory performance.

Hypothesis 3 was re-investigated using Pearson product-moment correlation coefficient. One hundred and eighty people were surveyed ($n = 180$ without outlier) regarding their grocery shopping frequency ($M = 2.71$, $SD = 1.141$) and assessed by their memory performance ($M = .900$, $SD = .1158$). Results confirmed once again that there was no statistically significant association between the two variables as we can observe from *table 9 – see appendix,* meaning that changes in one variable are not correlated with changes in the second variable ($r = .106$, $n = 180$, $p > .05$).

As we were able to observe, no new conclusions were reached.

CONCLUSION

Prospective memory, defined as memory for activities to be performed in the future, is a real-world memory task (Kliegel et al., 2001). This research aimed to identify if consumers' experience in grocery shopping could have an impact in one's prospective memory. In particular, to what extent would age and frequency of shopping influence memory performance.

An online survey was conducted where, among other questions, participants had to write 10 products they would like to purchase next time they went to the grocery store and, after a 10-minute interval, try to recall the previously written products. Prospective memory requires the execution of a previously formed intention that causes our brain to recall the action in the future (Kvavilashvili & Ellis, 1996). In this particular case, the survey focused on time-based rather than event-based intentions, since the intended action (remember the products) had to be executed after a period of time has passed (Kliegel et al., 2001). Furthermore, since there were no obvious external cues to trigger remembering, respondents had to self-initiate PM function on their own – remembering to remember (Einstein & McDaniel, 1990).

Another aspect of this research is the fact that it can be distinguished from other studies simply because it was not conducted as being a laboratory experiment, as most of the research testing memory. Despite this, one has to bear in mind that there was much less control over potential distractions that could damage respondents 'performance than if it had occurred under laboratory control.

Following the effect from both age and frequency in memory performance, the above questionnaire was delivered, and the following hypothesis were tested:

Hypothesis 1 stated that age was positively correlated with memory performance, meaning that as age increased, memory scores would also increase. To test this hypothesis, a Pearson product-moment correlation including age as our independent variable and memory performance as our dependent variable was conducted. Results described in the previous section shown that hypothesis 1 was not supported ($p = .486$). A theory that might explain this finding is Craik's theory of aging (1986). According to this theory (previously addressed in the literature review), when the task or the environmental context does not provide external cues to prompt remembering - of an event/action - the subject is forced to rely more heavily on self-generated cues. The main argument is that the use of these internal retrieval processes become more difficult to execute with increasing age, due to a decline in cognitive functions (Craik,

1996). Hence, if memory derives from cognitive functioning, it might be expected to be poorer for the elderly (G. Smith et al., 2000). Applying Craik's theory to our study, if we assume that when answering the survey respondents had no external cues available (i.e. notes with the written products or someone by their side to help) and had to rely on themselves to remember the products, it may be reasonable that age and memory performance are not positively correlated.

Hypothesis 2 stated that age was positively correlated with frequency in grocery shopping - as age increased, one's frequency in shopping would also increase. To test this hypothesis, a Pearson product-moment correlation including age as our independent variable and grocery shopping frequency as our dependent variable was conducted. Results described in the previous section shown that hypothesis 2 was supported ($p = .046$). This finding goes in line with previous research from Bawa and Ghosh (1999), who found - in their model of household shopping behaviour – that age had an impact on the shopping trip frequency, by verifying that families headed by an older individual were likely to shop with more frequency than those headed by younger adults. Also in H2, researchers found to be relevant to analyse whether being in charge of the grocery shopping task could be predicted based on age. For this, a binomial logistic regression was performed. Results indicated that the model containing our predictor (independent) variable was statistically significant, X^2, $(1, N = 181) = 7.219, p = .007,$ and that the independent variable "age" made a statistically significant contribution to the model ($p = .009$).

Lastly, hypothesis 3 stated that grocery shopping frequency was positively correlated with memory performance, meaning that as one's grocery shopping frequency increased, memory scores would also increase. To test this hypothesis, a Pearson product-moment correlation including grocery shopping frequency as our independent variable and memory performance as our dependent variable was conducted. Results described in the previous section shown that hypothesis 3 was not supported ($p = .253$). When reading previous literature to build this hypothesis, not many studies were found. Stuart and Hulme (2000), in an article regarding the effects of word frequency, discovered that repeated words tend to be better recalled than those who are not repeated. In fact, and according to Howell (1973), humans are sensitive to event frequency, which means that when something occurs several times, some of its repetitiveness is registered and stored in our memory. For this reason, it seemed to be reasonable to study if there was indeed a correlation between frequency and memory.

LIMITATIONS

Even though this research provides significant academic and managerial insights concerning the effect of age and frequency on memory, results must be interpreted in light of some limitations:

i. The sample gathered to conduct the study was not as big as one could expect. Researchers accounted to have a sample of approximately 250 to 300 people, a number considered reasonable when compared to the sample of other memory studies. This number was indeed reached, but because of the non-finished questionnaires, the number decreased about 25%.

ii. Since participants were reached through an online questionnaire mostly distributed through social media platforms (Facebook, LinkedIn and WhatsApp), the level of environmental control was weak. Hence, making it hard to assess under what type of conditions did they answer the survey. For this reason, it seems almost impossible to know how concentrated were respondents or if they used any kind of reminders to successfully complete the task.

iii. Due to a technical feature from Qualtrics, and because of the 10-minute interval condition, participants were unable to complete the survey using their smartphones or tablets. The timer required participants to always keep their screen unlocked and the survey tab always open, which could be difficult when using devices other than laptops/computers. This constraint might have reduced the possibility of reaching a broader audience, and then having more responses.

iv. Also regarding the 10-minute interval, maybe it should have been larger. Most likely results would have been more precise if the time participants had to wait before naming the products again was bigger.

v. The vast majority of research on memory was carried on under laboratory control. The advantage of a laboratory task for studying prospective memory is that it enables researchers to reach much higher levels of control when evaluating the influence of variables (Einstein & McDaniel, 1990). However, our experiment was done in a real-

life setting, making it hard to replicate the study or to control extraneous variables which could bias the results.

After completing the study and having in mind its limitations, the following recommendations can be made for future research:

a) A similar research can be conducted with a larger sample size, so that one may be able to use the diverse demographic information when comparing the results, in order to obtain a more accurate study.

REFERENCES

Andrzejewski, S. J., Moore, C. M., Corvette, M., & Herrmann, D. (1991). Prospective memory skill. *Bulletin of the Psychonomic Society*, *29*(4), 304–306. https://doi.org/10.3758/BF03333926

Baddeley, A. (2012). Working Memory: Theories, Models, and Controversies. *Annual Review of Psychology*, *63*(1), 1–29. https://doi.org/10.1146/annurev-psych-120710-100422

Bawa, K., & Ghosh, A. (1999). A Model of Household Grocery Shopping Behavior. *Marketing Letters*, *10*(2), 149–160. https://doi.org/10.1023/A:1008093014534

Bisiacchi, P. S., Borella, E., Bergamaschi, S., Carretti, B., & Mondini, S. (2008). Interplay between memory and executive functions in normal and pathological aging. *Journal of Clinical and Experimental Neuropsychology*, *30*(6), 723–733. https://doi.org/10.1080/13803390701689587

Block, L. G., & Morwitz, V. G. (1999). Shopping lists as an external memory aid for grocery shopping: Influences on list writing and list fulfillment. *Journal of Consumer Psychology*, *8*(4), 343–375. https://doi.org/10.1207/s15327663jcp0804_01

Bucklin, R. E., & Lattin, J. M. (1991). A Two-State Model of Purchase Incidence and Brand Choice. *Marketing Science*, *10*(1), 24–39. https://doi.org/10.1287/mksc.10.1.24

Burke, W. W. (2011). A perspective on the field of organization development and change: The Zeigarnik Effect. *Journal of Applied Behavioral Science*, *47*(2), 143–167. https://doi.org/10.1177/0021886310388161

Butler, A. (2018). General Psychology (Fall 2018). In *Psychology Curricular Materials* (Vol. 2). Retrieved from https://scholar.valpo.edu/psych_oer/2

Chase, W. G., & Ericsson, K. A. (1982). Skill and working memory. In *Psychology of Learning and Motivation - Advances in Research and Theory* (Vol. 16). https://doi.org/10.1016/S0079-7421(08)60546-0

Craik, F. I. M. (1996). A functional account of age differences in memory. *Memory, Attention, and Aging: Selected Works of Fergus I. M. Craik*, (August), 147–157. https://doi.org/10.4324/9781315440446

Dismukes, R. K. (2012). Prospective Memory in Workplace and Everyday Situations. *Current Directions in Psychological Science*, *21*(4), 215–220. https://doi.org/10.1177/0963721412447621

Dunlosky, J., & Bjork, R. A. (2008). The Integrated Nature of Metamemory and Memory. In *Handbook of Memory and Metamemory* (pp. 11–28).

https://doi.org/10.4324/9780203805503.ch2

Dunlosky, J., & Nelson, T. O. (1992). Importance of the kind of cue for judgments of learning (JOL) and the delayed-JOL effect. *Memory & Cognition*, *20*(4), 374–380. https://doi.org/10.3758/BF03210921

Dunlosky, J., & Nelson, T. O. (1997). Similarity between the cue for Judgments of Learning (JOL) and the cue for test is not the primary determinant of JOL accuracy. *Journal of Memory and Language*, *36*(1), 34–49. https://doi.org/10.1006/jmla.1996.2476

Einstein, G. O., & McDaniel, M. A. (1990). Normal Aging and Prospective Memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *16*(4), 717–726. https://doi.org/10.1037/0278-7393.16.4.717

Einstein, G. O., & McDaniel, M. a. (2005). Multiple retrieval processes. *Current Directions in Psychological Science*, *14*(6), 286–291.

Evans, J. R., & Mathur, A. (2005). The value of online surveys. *Internet Research*, *15*(2), 195–219. https://doi.org/10.1108/10662240510590360

Hicks, J. L., Marsh, R. L., & Cook, G. I. (2005). Task interference in time-based, event-based, and dual intention prospective memory conditions. *Journal of Memory and Language*, *53*(3), 430–444. https://doi.org/10.1016/j.jml.2005.04.001

Howell, W. C. (1973). Representation of frequency in memory. *Psychological Bulletin*, *80*(1), 44–53. https://doi.org/10.1037/h0034648

Hughes, J. L., Camden, A. A., & Yangchen, T. (2016). Rethinking and Updating Demographic Questions: Guidance to Improve Descriptions of Research Samples. *Psi Chi Journal of Psychological Research*, *21*(3), 138–151. https://doi.org/10.24839/b21.3.138

Ihle, A., Schnitzspahn, K., Rendell, P. G., Luong, C., & Kliegel, M. (2012). Age benefits in everyday prospective memory: The influence of personal task importance, use of reminders and everyday stress. *Aging, Neuropsychology, and Cognition*, *19*(1–2), 84–101. https://doi.org/10.1080/13825585.2011.629288

Inman, J. J., Winer, R. S., & Ferraro, R. (2009). The interplay among category characteristics, customer characteristics, and customer activities on in-store decision making. *Journal of Marketing*, *73*(5), 19–29. https://doi.org/10.1509/jmkg.73.5.19

Intons-Peterson, M. J., & Fournier, J. A. (1986). External and Internal Memory Aids. When and How Often Do We Use Them? *Journal of Experimental Psychology: General*, *115*(3), 267–280. https://doi.org/10.1037/0096-3445.115.3.267

Kahn, B. E., & Schmittlein, D. C. (1989). Shopping trip behavior: An empirical investigation. *Marketing Letters*, *1*(1), 55–69. https://doi.org/10.1007/BF00436149

Kelemen, W. L., & Weaver, C. A. (1997). Enhanced metamemory at delays: Why do judgments of learning improve over time? *Journal of Experimental Psychology: Learning Memory and Cognition*, *23*(6), 1394–1409. https://doi.org/10.1037/0278-7393.23.6.1394

Kliegel, M., Martin, M., McDaniel, M. A., & Einstein, G. O. (2001). Varying the importance of a prospective memory task: Differential effects across time- and event-based prospective memory. *Memory*, *9*(1), 1–11. https://doi.org/10.1080/09658210042000003

Kolers, P. A. (1973). Remembering Operations. *Memory & Cognition*, *1*(3), 347–355. https://doi.org/10.3758/BF03198119

Kvavilashvili, L., & Ellis, J. a. (1996). Varieties of intention: Some distinctions and classifications. *Prospective Memory: Theory and Appliations*, (June), 23–51.

MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation Analysis. *Annual Review of Psychology*, *58*(1), 593–614. https://doi.org/10.1146/annurev.psych.58.110405.085542

Mäntylä, T., & Sgaramella, T. (1997). Interrupting intentions: Zeigarnik-like effects in prospective memory. *Psychological Research*, *60*(3), 192–199. https://doi.org/10.1007/BF00419767

Maylor, E. A. (1990). Age and Prospective Memory. *The Quarterly Journal of Experimental Psychology*, *4987*(October). https://doi.org/10.1080/14640749008401233

McDaniel, M. A., & Einstein, G. O. (2000). Strategic and automatic processes in prospective memory retrieval: a multiprocess framework. *Applied Cognitive Psychology*, *14*(7), S127–S144. https://doi.org/10.1002/acp.775

McDaniel, M. A., Einstein, G. O., Guynn, M. J., & Breneiser, J. (2004). Cue-focused and reflexive-associative processes in prospective memory retrieval. *Journal of Experimental Psychology: Learning Memory and Cognition*, *30*(3), 605–614. https://doi.org/10.1037/0278-7393.30.3.605

Meneely, L., Burns, A., & Strugnell, C. (2009). Age associated changes in older consumers retail behaviour. *International Journal of Retail and Distribution Management*, *37*(12), 1041–1056. https://doi.org/10.1108/09590550911005010

Morris, C. D., Bransford, J. D., & Franks, J. J. (1977). Levels of processing versus transfer appropriate processing. *Journal of Verbal Learning and Verbal Behavior*, *16*(5), 519–533. https://doi.org/10.1016/S0022-5371(77)80016-9

Naveh-Benjamin, M., Craik, F. I. M., Perretta, J. G., & Tonev, S. T. (2000). The effects of divided attention on encoding and retrieval processes: The resiliency of retrieval processes. *Quarterly*

Journal of Experimental Psychology Section A: Human Experimental Psychology, *53*(3), 609–625. https://doi.org/10.1080/713755914

Nelson, T. O., & Dunlosky, J. (1991). When People's Judgments of Learning (JOLs) Are Extremely Accurate at Predicting Subsequent Recall: The 'Delayed-JOL Effect. *Psychological Science*, *2*(4), 267–270. https://doi.org/10.1111/j.1467-9280.1991.tb00147.x

Park, C. W., Iyer, E. S., & Smith, D. C. (1989). The Effects of Situational Factors on In-Store Grocery Shopping Behavior: The Role of Store Environment and Time Available for Shopping. *Journal of Consumer Research*, *15*(4), 422. https://doi.org/10.1086/209182

Park, D. C., Morrell, R. W., Hertzog, C., Kidder, D. P., & Mayhorn, C. B. (1997). Effect of age on event-based and time-based prospective memory. *Psychology and Aging*, *12*(2), 314–327. https://doi.org/10.1037/0882-7974.12.2.314

Rahmatian, R., & Armiun, N. (2013). Cognitive strategies of encoding, storage, and retrieval of Lexicon popular techniques applied by Iranian French language learners. *International Education Studies*, *6*(8), 47–57. https://doi.org/10.5539/ies.v6n8p47

Rendell, P. G., & Thomson, D. M. (1999). Aging and prospective memory: Differences between naturalistic and laboratory tasks. *Journals of Gerontology - Series B Psychological Sciences and Social Sciences*, *54*(4), 256–269. https://doi.org/10.1093/geronb/54B.4.P256

Savitsky, K., Medvec, V. H., & Gilovich, T. (1997). Remembering and regretting: The Zeigarnik effect and the cognitive availability of regrettable actions and inactions. *Personality and Social Psychology Bulletin*, *23*(3), 248–257. https://doi.org/10.1177/0146167297233004

Smith, G., Della Sala, S., Logie, R. H., & Maylor, E. A. (2000). Prospective and retrospective memory in normal ageing and dementia: A questionnaire study. *Memory*, *8*(5), 311–321. https://doi.org/10.1080/09658210050117735

Smith, M. F., & Carsky, M. L. (1996a). Grocery Shopping Behavior: A comparison of involved and uninvolved consumers. *Journal of Retailing and Consumer Services*, *3*(2), 73–80. https://doi.org/10.1016/0969-6989(95)00048-8

Smith, M. F., & Carsky, M. L. (1996b). Grocery shopping behavior. *Journal of Retailing and Consumer Services*, *3*(2), 73–80.

Solomon, M., Bamossy, G., Askegaard, S., & K. Hogg, M. (2006). Consumer Behaviour - A European Perspecive (3rd Edition). In *Pearson Education Limited*. https://doi.org/10.1007/978-94-011-6868-7_14

Sternberg, R., & Sternberg, K. (2011). Cognitive Psychology. In *Schizophrenia Research* (6th ed.,

Vol. 36). https://doi.org/10.1016/s0920-9964(99)90033-6

Stuart, G., & Hulme, C. (2000). The Effects of Word Co-Occurrence on Short-Term Memory: Associative Links in Long-Term Memory Affect Short-Term Memory Performance. *Journal of Experimental Psychology: Learning Memory and Cognition*, *26*(3), 796–802. https://doi.org/10.1037/0278-7393.26.3.796

Tulving, E., & Thomson, D. (1977). Encoding Specificity and Retrieval Processes in Episodic Memory. *Psychological Review*, *80*, 352–373. https://doi.org/10.1037/h0020071

Wilkins, A. J. (1986). Remembering to do things in the laboratory and everyday life. *Acta Neurologica Scandinavica*, *74*(109 S), 109–112. https://doi.org/10.1111/j.1600-0404.1986.tb04869.x

Zeigarnik, B. (1927). On Finished and Unfinished Tasks. *Psychologische Forschung*, *9*. Retrieved from http://books.google.com/books?id=NZP6AQAAQBAJ&pg=PA899&dq=inauthor:Kevin+P+Murphy+ti+intitle:Machine+LearningA+Probabilistic+Perspective&hl=&cd=1&source=gbs_api%0Apapers3://publication/uuid/165A6781-E913-4BA6-9150-718BF26557BB

APPENDIX

Online Questionnaire

Thank you for agreeing to take part in this important survey! My name is Sara and I am currently a master student at Católica-Lisbon School of Business and Economics.
This assessment was developed on behalf of my Master Thesis in Consumer Behaviour, and its purpose is to help understand memory performance for grocery shopping.
It will take about 10 minutes for you to complete the questionnaire. All responses will be kept anonymous.

Thank you once again.

What is your gender?

- Male
- Female

What is your age?

Do you usually do grocery shopping?

- Yes
- No

How frequently do you do your grocery shopping?

- + than 3 times per week
- 2-3 times per week
- 1 time per week
- 1 every two weeks
- 1 time a month
- Never

At your place, is there usually someone responsible for the grocery shopping tasks?

- Yes

- No

Is that person you?

- Yes
- No

In the second part of this survey, your memory will be tested. In one of the questions we will kindly ask you to name 10 grocery products that you intend to buy next time you go to the grocery shop. Then a time interval of 10 minutes will take place and after, we will ask you to name those 10 products again. You can perform other activities while you wait for the 10 minutes to pass. When the timer reaches 00:00, you will be able to proceed to the last question.

Thank you!

Do you usually forget to buy something that you intended to buy in the first place?

- Definitely yes
- Probably yes
- Probably no
- Definitely no

Please name 10 products that you intend to buy next time you go to the grocery shop

You are almost done! Please wait for the timer to end, so you can move to the final question. When the timer reaches 00:00, you will be able to proceed to the next question. You can perform other activities while you wait for the 10 minutes to pass.

(10-minute interval)

Please rewrite the products you remember

Tables

Tests of Normality						
	Kolmogorov-Smirmov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Age in years	.229	181	.000	.832	181	.000
Memory Performance	.237	181	.000	.756	181	.000

Table 3 - Tests of Normality for H1

Tests of Normality						
	Kolmogorov-Smirmov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Age in years	.229	181	.000	.832	181	.000
GS Frequency	.224	181	.000	.893	181	.000

Table 4 - Tests of Normality for H2

Tests of Normality						
	Kolmogorov-Smirmov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Memory Performance	.237	181	.000	.756	181	.000
GS Frequency	.224	181	.000	.893	181	.000

Table 7 - Tests of Normality for H3

Pearson Correlation			
		Age in years	Memory Performance
Age in years	Pearson correlation	1	.026
	Sig. (2-tailed)		.733
	N	180	180
Memory Performance	Pearson correlation	.026	1
	Sig. (2-tailed)	.733	
	N	180	180

Table 8 - Pearson Correlation for H1

Pearson Correlation			
		Memory Performance	**GS Frequency**
Memory Performance	Pearson correlation	1	.106
	Sig. (2-tailed)		.158
	N	180	180
GS Frequency	Pearson correlation	.106	1
	Sig. (2-tailed)	.158	
	N	180	180

Table 9 - Pearson Correlation for H3'

Figures

Figure 2 - H1 Scatterplot

Figure 3 - H2 Scatterplot

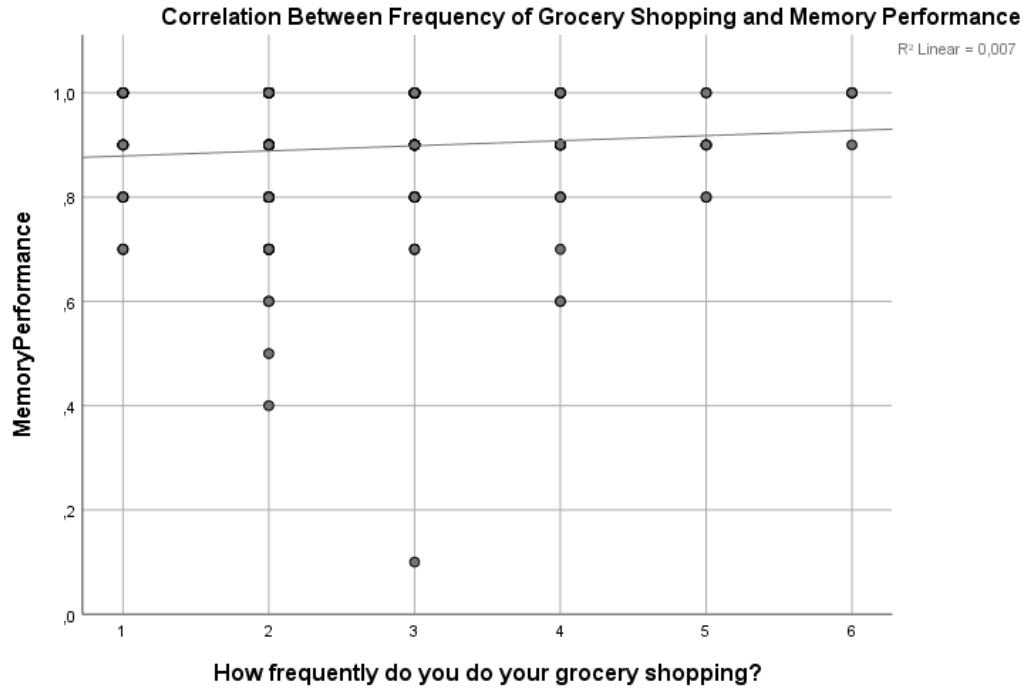

Figure 4 - H3 Scatterplot